PUBLISHING
2030 ACCELERATOR

Publishing 2030 Accelerator

CO^2e emissions calculation for printed books

Version 4 | October 2023

Introduction to Publishing 2030 Accelerator

The fear that books would lose their value in the digital era has proved unfounded, with fresh evidence coming to light year on year to demonstrate consistent demand for the printed book.

One thing that is clear is that publishers must continuously adapt to changing circumstances and evolving buying behaviours. In the past 10 years alone, the industry has responded to the introduction of e-books and audiobooks, the migration of retail from physical stores to online, the emergence of niche communities, and changes in reading genres. The publishing sector is clearly adept at managing change.

However, like many other business sectors, book publishing is under scrutiny for the negative environmental impact of many of the outdated processes still in use across the industry. With sustainability an increasing priority for brands and consumers, there is an urgent need to relook at the printed book and consider how we can make it more sustainable.

The good news is that businesses across the publishing supply chain are expressing their interest and commitment to improving their own practices and making the industry more sustainable as a whole. We know that seismic shifts will not happen overnight. It takes research, testing and scaling before substantial changes can be implemented industry-wide. But, importantly, there is positive intent, growing collaboration and forward momentum.

With the aim of accelerating the industry's progress towards a more sustainable future, a group of industry stakeholders at Canon's Future Book Forum in 2022 formed the Publishing 2030 Accelerator strategic initiative. Our collective aim is to build awareness among book publishers and producers of the opportunity to optimise the existing book supply chain and, ultimately, drive positive systemic change.

The Publishing 2030 Accelerator initiative followed the COP 26 Joint Statement, which highlighted the prioritisation of climate action, and the International Publishers Association (IPA) Sustainability Summits, which called for an internationally coordinated approach to tackling the sector's climate impact.

"What our industry must do to address our climate impact entails fundamental, and sometimes challenging, rethinking. This requires buy-in from all sectors, all jurisdictions, and all participants at every level and in every function. Ageing publishers need to embrace and encourage those changes which will make books and journals ever more sustainable for following generations."

Richard Charkin
Publisher and former IPA President

The Publishing 2030 Accelerator Manifesto

All active participants in the Publishing 2030 Accelerator have committed to a five-point manifesto setting out our mission and principles:

1. Take responsibility for the world we create. The book has the power to educate, entertain, promote culture, and stimulate diversity and democracy. As an industry, we must work to reduce negative impact, specifically concerning the resources, energy, transportation and waste associated with the production and distribution of books.

2. Drive change by putting a sustainability-led purpose at the heart of our organisations and the 'smart' innovations we develop in the future. Let us join forces to empower the wider sector to act and challenge the established thinking and processes that often impede progress. Our passion is to transform ideas into reality, to help both our own organisations, and the wider sector, to be successful and make a positive impact for people and the planet.

3. Accelerate action because the time to talk is over. The technology needed to address sustainability concerns is already in reach. The United Nations has called for action on sustainability. Let's build a community of like-minded people to test ideas and assumptions, and reconsider what we refer to as 'standard' in our industry.

The Publishing 2030 Workstreams

PUBLISHING 2030 ACCELERATOR

The Publishing 2030 Accelerator is committed to climate action through three distinct workstreams.

Workstream one
The carbon footprint of a book

Lead: Rachel Martin, Global Director of Sustainability, Elsevier

This workstream focuses on how to calculate and communicate the carbon impact of a printed book. The main objective was to test the publishing sector's ability to collect and calculate the necessarily data, agree on a methodology and better understand the role of carbon labels in communicating to both authors and readers on the sustainability of a book. The workstream has delivered two distinct outputs – an initial industry agreed methodology and a carbon label prototype to test consumer attitudes. Both will help empower and inform actions across the book value chain – including the readers themselves – to make sustainable choices.

Workstream three
Re-evaluating costs and emissions

Lead: Richard Charkin, Publisher and former IPA President

There is a perception that the traditional approach to book production, where large quantities of books are printed and stored centrally and then shipped to their point of purchase, minimises the unit cost of the book. However, this does not consider the financial or environmental impact of shipping books worldwide, warehousing, and discarding unsold stock, nor the unseen but material overhead costs of managing these transactions. The final workstream focuses on shifting cost analysis away from cost per unit to take full consideration of the book's overarching lifecycle cost.

Workstream two
Distributed Book Printing Network

Leads: Jörg Engelstädter, Tino Wägelein, Canon Europe

One contributor to the publishing industry's environmental impact is the carbon emissions from the global shipping of printed books. The second workstream is exploring how to build an international network of digital print-on-demand facilities whereby print files can be shared globally so that books can be produced locally to their point of sale to minimise transportation distance. The outcome vision for this workstream is an easily accessible global 'data highway' with a network of professional print-on-demand book printers, available for all publishers irrespective of size.

This white paper focuses on the first workstream – **The carbon footprint of a book**. Our aim is to outline a recommended international methodology for calculating the CO^2 equivalent (CO^2e) emissions of an individual copy of a particular book, or a portfolio of books.

While the methodology is still incomplete, it will form the basis for further industry discussions and action that will drive the positive evolution of the book publishing industry. It is also important to highlight that, as signatories of the Publishing 2030 Accelerator, we have worked independently and, in this white paper, we have documented our findings to the best of our ability.

4. Share experiences as members of the Publishing 2030 Accelerator. We recognise that we must use our knowledge, passion and resources to help the whole sector, experiment and try new approaches, and deliver simple solutions that will leave our planet and society in good hands for future generations.

5. Hold one another accountable for putting the ideas generated from the Publishing 2030 Accelerator initiative into practice, acknowledging that the stakes are high because the future depends on connections and these new approaches to the printed book.

1. Workstream one introduction

The latest report from the **United Nations committee on climate (IPCC)** outlines the need to urgently reduce greenhouse gas emissions to achieve a global 50% reduction by 2030 and climate neutrality no later than 2050. Every sector faces the collective challenge to understand and address its own emissions.

Broadly speaking the first step for any organisation wanting to reduce carbon emissions is to calculate their organisational carbon footprint. This is done by using the **Greenhouse Gas Protocol (GHG)**, a set of standards developed for all sectors which breaks emissions into three categories called scopes.

Organisations will gather data from across the business for things such as energy used in offices, warehouses, car fleets, but also for activities such as staff travel. Once known, a **science-based target** can be set and requires organisations to report on their performance against these targets each year. Common standards and methodologies exist to support this approach. In the publishing sector, organisations will either do this in-house with carbon experts, outsource the process to an external consultancy or use tools available via national associations. For example, in the United Kingdom, the Publishers Association has **launched a carbon calculator** for its members.

Complementary to this approach is a lifecycle assessment of an individual product. This approach seeks to account for the carbon emissions across the entire value chain. In the case of a book, it would account for the carbon needed for extraction or production of the raw materials at the start, through to how it is disposed of at the end of its use. This perspective is also known as “cradle to grave”. As such, the emission categories cover all emissions (scope 1, scope 2, and scope 3) from all the various parts of the value chain. Lifecycle assessments can assist supply chain members in identifying parts of the product lifecycle where the potential impact to climate change are the greatest and identify areas to improve and implement actions towards achieving net zero emissions. Lifecycle assessments help inform potential international standards and benchmarking, as well as forming a robust foundation for labelling and accreditations that help communicate the sustainability of a book to stakeholders such as authors, consumers, and regulators.

Within the publishing sector, there is no common international calculation or agreed approach for the lifecycle of a book. Additionally, gathering a shared understanding of the type of data required to calculate such emissions will help place sustainability as a core consideration, across the supply chain when producing, publishing, and selling books. In turn this will help create benchmarks, improve supply chain relationships, and develop our collective understanding about the drivers within an individual title or a portfolio that will reduce its climate impact over time.

Calculating the carbon footprint of publishing is critical for informing actions that will reduce carbon emissions and achieve a net zero future.

2. Objective

This whitepaper seeks to outline a recommended international methodology for calculating the CO^2 equivalent (CO^2e) emissions (i.e., the combined greenhouse gases emissions impact) of an individual copy of a particular book or a portfolio of books, as discussed and reviewed by a consortium of publishing partners, industry associations and eco-publishing experts (see authors and reviewers on back cover).

The recommended methodology outlined in this whitepaper creates an initial international approach that can evolve and develop as more accurate carbon data, emission factors and industry averages become available. This methodology is envisaged to provide the necessary common input for any development of industry carbon standards, tools or labelling for use in local publishing markets.

The ultimate objective of this whitepaper has been focused on developing an international approach to thinking about and calculating carbon emissions across the book supply chain in support of identifying actions to reduce emissions. We recognise that for some identified lifecycle stages, remaining emissions could be offset, however, any offsets have not been considered as part of the book's calculated carbon emissions outlined in this whitepaper.

The term 'book' is used in this white paper for simplicity and should be interpreted to include a range of bounded printed types, including journals and magazines.

The ultimate objective of this whitepaper has been focused on developing an international approach to thinking about and calculating carbon emissions

3. Key principles

The approach taken in this whitepaper builds off the following key principles:

Prioritise climate change
Throughout this methodology we have prioritised climate change as the first environmental impact to address. Other potential environmental impacts such as water scarcity, resource depletion and others, while important, have not been included into this methodology. We have proposed that the CO^2e emission number will be the units to measure and express the global warming potential as an indicator of the climate change impact. This will be the first step to gather international alignment, before addressing additional environmental impact over time.

Drive the right behaviours
Emission data, across every sector, remains imperfect. This methodology strikes a balance between focusing on the areas that will drive the biggest emission reductions and where reliable data exists, rather than aiming to solve all knowledge gaps. As such, this recommended methodology has first focused on a printed book. It is envisaged that digital reading and digital products would be addressed in a subsequent phase.

Aim for a total emissions number
Different ways to contextualise climate emissions for a book exist, and the authors and reviewers have prioritised the total CO^2e figure. This number will account for emissions across every major activity in the lifecycle of a printed book and can be further contextualised for various parts of the value chain as needed. For example, looking at emissions per weight or per reader etc.

Align approaches
This methodology will provide a starting point for an agreed understanding across the international publishing sector. International alignment will enable future comparisons and industry benchmarks across every market regardless of size and carbon data maturity.

Inclusive
The methodology has been designed to be flexible to provide an estimate of product level emissions, even where little information is known. For those publishers who already have more accurate insights from their suppliers, the methodology allows direct inputs to generate more accurate numbers.

4. Initial benefits and use cases

The primary benefit for publishers at this stage of the methodology development is to gain an understanding of the types of carbon related data required from their systems and processes to calculate such a figure, and the underlying drivers and decisions that influence such emissions. Additionally, once data has been gathered, publishers can establish and develop a baseline either on a product or portfolio level that will help inform, prioritise, and stimulate actions to drive down carbon emissions. As such, the methodology can be applied retrospectively post-sales to understand the key aspects which have driven carbon emissions. Alternatively, it can be used during the commissioning process to guide publishers to optimise their production, marketing and distribution approaches to minimise emissions.

Future steps for further development of this approach would ideally result in:

Industry benchmarks: With more complete data across diverse publishers, it would be possible to compare emissions across product types, markets, and sectors. Giving publishers an ability to benchmark their own publishing programs and gather more accurate industry averages to inform established emission factors.

Creating an international industry standard: The initial methodology will enable publishers to self-report on their individual products. In the future, it is envisaged that with greater data collection and agreed assumptions, this methodology can be used to create a validation process and an agreed international standard around carbon reporting for the publishing industry.

Carbon label and communications: By utilising an agreed transparent methodology and logical assumptions, climate impacts can be communicated to various stakeholders, such as readers, authors, librarians, in addition to other supply chain members, as needed and demanded in local markets. Transparent, reliable, and respected communication of product level emissions may also guide future consumer behaviour in a similar fashion to the FSC mark used to highlight responsible forestry practices in the production of paper.

5. Recommended methodology

The push to achieve net zero publishing will depend on high-quality, reliable, and comparable data across the supply chain. Currently, there are data gaps both in terms of missing data, or differences in how carbon data is reported, that vary across country, sector, and organisation. The following methodology is recommended as the best approach with the currently available data. As the carbon data availability in the market improves, the methodology should also be updated. For example, if emissions factors for the separate stages of paper production become widely available, then the method should be updated to allow these to be included. Similarly, as more up to date sources become available, the sources in the model should also be updated, for example annual updates to energy grid intensity factors.

5.1 Emission sources

We have identified five broad emissions categories that cover the lifecycle of a printed book from cradle to grave and can help the supply chain to categorise the carbon impact of an individual print book.

Content creation

Books provide content and that requires people to create, write, illustrate, and publish this content as part of the creative process. We have called this emission category "content creation". Emissions are created from the energy used by people working on the individual book. Outsourced roles are assumed to be home-based, and the emissions come from the incremental heating and electricity use in the home. For in-house roles, the emissions are from the scope 1 and 2 of the publisher – i.e., office heating and electricity, on-site server electricity, and vehicle fleets.

Paper production

Paper is the main raw material used in a printed book and this emission category covers the process of paper production specifically. For virgin paper there are both negative and positive emissions during this stage. During the growth of the tree, carbon dioxide is absorbed from the atmosphere. These positive effects are not included within the total emissions. The process of forestry, transportation, manufacturing chemicals, and electricity and fuel to operate the paper mill all generate emissions. For recycled paper, the emissions come from transportation, manufacturing chemicals and electricity and fuel to re-create pulp and to operate the paper mill. The paper production stage only includes emissions associated with the paper which ends up being used in the final book, i.e., not those emissions associated with trim and machine set-up at the printers.

Printing

Emissions are generated in this category by the energy used to print and bind the book, the manufacturing of the digital printers or the printing plates, and the other inputs like inks and chemicals. The printing category also includes the paper production emissions associated with creating the paper that is removed as trim and machine set-up, since this is primarily within the control of the printer to reduce.

Transport and retail

After the creation of the physical book, it needs to move to where the consumer is located and be sold. The transport (either land, sea or air) requires energy via fuel or electricity. There is also energy use associated with brick-and-mortar retail, and data servers for e-commerce.

End of use

The final emission category covers what happens to the book after it is disposed of either by a reader or by the publisher if unsold. Incineration and landfill both generate emissions. Emissions from the process of recycling the paper are not considered here, as they will form the emissions during the paper production stage of a different product.

During all the stages, the scope 2 (electricity) emissions are typically calculated using the average energy from the grid (known as location-based emissions). The only exception is where the organisation produces their own electricity and does not sell this to the grid or for renewable credits. Purchasing of renewable credits (known as market-based emissions), while a positive action, does not yet have sufficiently robust accounting methods to use in the calculation.

The methodology currently primarily uses national level emission factors for electricity grids, but where sub-national level data is available, this should be used instead. The grid factor is the total production fuel mix factor and includes emissions associated with transmission and distribution, sourced from CarbonFootprint[1] and EPA[2]. For the minority of countries where this is unavailable, the world average from OurWorldInData is used.[3]

[1] https://www.carbonfootprint.com/docs/2023_02_emissions_factors_sources_for_2022_electricity_v10.pdf
[2] https://www.epa.gov/climateleadership/ghg-emission-factors-hub
[3] https://ourworldindata.org/grapher/carbon-intensity-electricity?tab=table

5.2 Outputs from the method

The emissions are available as a total figure for the whole print run, and per sold book. Emissions for the whole print run include emissions from offcuts created during the paper manufacture and printing stage. The number of sold books will typically be less than the total print run as some books may be unsold and returned.

The emission figures are broken down by the five emission categories as described in section 5.1.

All emissions are calculated and output in carbon dioxide equivalents (CO^2e). This measurement factors in not only the associated carbon emissions, but all greenhouse gas emissions using their measured impact relative to CO^2.

5.3 Inputs and calculation approach

In all cases, the total emissions for the print run are first calculated, and subsequently may be divided by the number of sold books.

The inputs and calculation approach differs by source, as described in sections 5.3.2 to 5.3.6. Core information is also collected which is used in the calculation for multiple emission sources, as described in section 5.3.1.

Where a portfolio is being analysed (rather than a single book), the calculation steps are the same, but the method requires the user to input either averages for the portfolio or totals across the portfolio, depending on the question.

5.3.1 Core information

Data concerning the size and materials of the book is used to estimate emissions for the total print run.

The required data inputs are:

- Number of pages / average number of pages for a portfolio view
- Front cover material (i.e., hardback, paperback)
- Level of recycled material for pages and cover (if hardback)
- Final book weight, which can either be entered directly or calculated based on the final page sizes and paper density. For a portfolio view, average book weight would need to be used

To calculate the emissions per sold book, the required input data are:

- Total number of printed books (calculated either as total print run, if known, or projected sales if using print on demand)
- Unsold rate (calculated as a percentage of books produced but left unsold, including returns from e-commerce and physical retail)

5. Recommended methodology (cont.)

5.3.2 Content creation

There are two sources of emissions from content creation: outsourced roles and in-house roles.

Outsourced roles

Where roles are outsourced, emissions are estimated from the incremental heating and energy requirements from home working, based on EMEA home workers from the Anthesis Group analysis[4]. The EMEA region was chosen as it is the median of the three values. Since content creation is usually a small component of a book's footprint and not an area publishers will likely focus on reducing, the recommendation is not to use region-specific outsourced emission factors.

The required input data are:

- Which roles are outsourced vs. in-house, e.g., author, editor, illustrator, copy editing, etc
- Book type (e.g., Fictional – adult; Fictional – children's; Non-fiction - general audience; etc.)
- Level of illustration in the book

The recommended method is to use a fixed table with the number of hours worked per page, and to vary this by book type and level of illustration. These assumptions will be the same for all publishers, which avoids the need for resource-intensive and error-prone surveying of outsourced roles by each publisher. The recommendation instead is to generate these inputs using a smaller set of surveys, using a method agreed upon by a group of publishers.

In-house roles

Emissions for in-house roles and general management overheads are estimated by one of three methods:

1. Using the total scope 1 and 2 emissions for the publisher, and pro-rating these based on the proportion of revenue expected from the book or portfolio, compared to the total publisher revenue. The total scope 1 and 2 emissions for the publisher can either be:
   a. input directly if known, or
   b. calculated based on their energy use (e.g., from electricity, vehicles, heating, etc.).
2. Providing an estimate for publisher scope 1 and 2 emissions based on industry average emission factor (CO^2e per $), revenue expected from the book or portfolio, and location of the primary office. The location of the primary office sets the grid emission intensity of the scope 2 component of the emissions.

The required input data varies depending upon the method used:

1a. Scope 1 and 2 is known for the publisher

- Annual scope 1 and 2 total for publisher
- Total publisher revenue
- Expected revenue from book or portfolio

1b. Scope 1 and 2 are calculated for the publisher

- Fuels consumed onsite (natural gas, fuel oil, biofuels)
- Distance travelled by vehicles owned by the business (split by petrol/diesel car, hybrid car, electric car, petrol/diesel van, hybrid van, lorry)
- Purchased Electricity in kWh
- Total publisher revenue
- Expected revenue from book or portfolio

2. Scope 1 and 2 are estimated using typical values for the publishing industry

- Country of publisher's primary office
- Expected revenue from book or portfolio

[4] https://www.anthesisgroup.com/wp-content/uploads/2021/02/Anthesis_-Remote-Worker-Emissions-Methodology_Feb-2021.pdf
[5] https://ecoinvent.org/the-ecoinvent-database/
[6] https://www.intergraf.eu/images/pdf/202203_Intergraf_Roadmap_CarbonFootprint.pdf
[7] https://ecoinvent.org/the-ecoinvent-database/

5.3.3 Paper production

Paper production captures emissions associated with the paper that is used in the final book. It does not include paper emissions associated with trim and machine set-up generated at the printer – these are associated with the printing stage.

The required input data are:

- Proportion of paper from each mill.
- Scope 1 and 2 emission factors of each mill.
- Scope 3 emission factors of the suppliers from each mill.

All emissions factors are expressed as 'kg CO^2e per tonne paper' and apply to the pages and cover.

For users which do not have data on their mill emissions, suggested values are provided based on the following assumptions:

- For simplicity, each paper mill is located in the same region (e.g., Europe or North America) as the printer and has the same proportion of paper as the printer's share.

Emissions are estimated using the industry average from Ecoinvent[5], taking into account whether the paper is coated, uncoated, woodfree or mechanical, and the mill country which impacts scope 2. The proportion of the book made using recycled materials is assumed to use the average non-integrated mill emission factors, and the non-recycled materials use the average integrated mill emission factors.

Users can alter any of these suggested values.

5.3.4 Printing

The approach for printers is aligned with the recommendations made by Intergraf[6].

Where detailed information is available from the printer, the following data can be input:

- Production of packaging materials
- Production of inks, varnishes, toners and cartridges
- Production of plates, cylinders and other image carriers
- Production of Isopropanol or alternative fountain solutions additives, and cleaning agents
- Transport of raw materials (excluding paper, as this is captured in the paper manufacture stage)
- On-site combustion of fuels (scope 1 emission factor)
- Production of purchased energy (scope 2 emission factor)
- Employee commuting
- Company owned or leased vehicles
- Transport of finished product to printer hub

Where this detailed information is not available, the method focuses on estimating the main sources of emissions. The required input data are:

- Scope 1 and 2 emission factors of each printer
- Emission factor for production of inks, varnishes, toners and cartridges
- Proportion of waste paper from trim and machine set-up

All emissions factors are expressed as 'kg CO^2e per tonne paper' and apply to the pages and cover.

Suggested values are provided for the inputs, based on industry average sourced from Ecoinvent[7], with scope 2 being varied according to the grid intensity factor for the country.

5. Recommended methodology (cont.)

5.3.5 Distribution and retail

Distribution is broken into two stages, from printer hub to customer country distribution centre, and from distribution centre to the customer. Separate distribution emissions are calculated for each customer country, based on the location of the main printer hub which serves that country.

There are three primary methods available in the

methodology from printer hub to customer country distribution centre: via sea, land or air. The user can input how much of each method is used for distributing to each customer country. The required input data are:

- City nearest to the printer hub

  Via sea

  (i.e. from printer hub to departure port, departure port to destination port, and destination port to distribution centre.)

  - Departure port (used to calculate distance from the printer hub)
  - Emissions per km per tonne of finished books to get to the departure port
  - Destination port (used to calculate the distance travelled by sea)
  - Emissions per km per tonne of finished books by sea
  - City of distribution centre in customer country (used to calculate distance from the destination port)
  - Emissions per km per tonne of finished books to get to the distribution centre

  Via land

  - City of distribution centre in customer country (used to calculate distance from the printer hub)
  - Emissions per km per tonne of finished books

Via air

(i.e. from printer hub to departure airport, departure airport to destination airport, and destination airport to distribution centre.)

- Departure airport (used to calculate distance from the printer hub)
- Emissions per km per tonne of finished books to get to the departure airport
- Destination airport (used to calculate the distance travelled by air)
- Emissions per km per tonne of finished books by air, including indirect emissions (radiative forcing)
- City of distribution centre in customer country (used to calculate distance from the destination airport)
- Emissions per km per tonne of finished books to get to the distribution centre

This approach recognises that in real life, distribution distance will not be in a straight line from point A to point B. As such all land and sea distances are calculated as the Euclidean distance (as the crow flies), plus 35% add on, based on reasonable assumption[8].

Suggested values are provided for each of these inputs, based on the following assumptions:

- Departure ports and airports are those nearest the printer hub
- Distribution centres are in the same location as the port or airport
- Average sized vans are used to transport books from printer hub to port or airport
- Average sized HGVs are used to transport books from port or airport to distribution centre
- DEFRA scope 1+2 emission factors are used per km, assuming average load levels
- Sea is used where customer country and printer hub are in different regions. Land is used where the region is the same, except for island-dominated regions which will use sea

[8] "Analysis of the Difference between the Euclidean Distance and the Actual Road Distance in Brazil," Transportation Research Procedia 3, p. 876 - 885, 2014

The second stage is from distribution centre to the customer. The method for this stage varies depending on whether the books are sold via e-commerce or physical retail.

The required input data for e-commerce are:

- Retailer linehaul (as defined as the movement from the customer country distribution centre through the retailer's own distribution network)
- Last mile delivery
- Warehousing and IT energy
- Packaging

The required input data for physical are:

- Retailer linehaul
- Customer collection from store
- Warehousing and IT energy
- Retail store energy

The default data for all these except customer collection are sourced from European data given in 'Is e-commerce good for Europe' report[9]. Customer collection from this source has not been used as it assumes the journey is solely for the purchase of the book, which seems unrealistic. Customer collection is instead sourced from academic modelling[10]. In the cases of warehousing and IT energy, and retail store energy, with the exception of Spain which is an outlier, the emissions data in the report [8] are plotted against the grid intensity for each country. This formula is then used to predict the emissions for any other input customer country.

5.3.6 End of use

There are two paths by which a book can enter end of use: from the end user, or from the publisher/retailer.

First, considering the end user path, the calculation only uses data already provided in earlier parts of the methodology:

- Customer counties to which books are sold and what proportion in each

The proportion of books which end up being recycled, incinerated and landfilled depending on the country, and will be the same for all publishers selling in that country. The recycling rate for all paper products is sourced from CEPI[11] which provides the rates for EC27+3, North America, Asia, Latin America, and Africa regions. For books which are not recycled, the proportion that is incinerated vs. landfilled is sourced from Wikipedia[12] for 32 countries. Where country data is unavailable, regional averages are used. The emission factors per tonne of books for incinerated and landfilled are sourced from the UK government[13].

Secondly, considering the publisher/retailer path, the required additional input data are:

- What happens to unsold and returned copies – what proportion is recycled, incinerated and landfilled

Again, UK government emission factors are applied to these copies[14], depending on the proportion disposed of in each manner.

To avoid double counting, emissions associated with recycling are ignored, as they will be included in the emissions of a different product.

[9] https://www.oliverwyman.com/content/dam/oliver-wyman/v2/publications/2021/apr/is-ecommerce-good-for-europe.pdf
[10] "Comparative Greenhouse Gas Footprinting of Online versus Traditional Shopping for Fast-Moving Consumer Goods: A Stochastic Approach," Environmental Science & Technology, 2020
[11] https://www.cepi.org/wp-content/uploads/2022/09/DRAFT_EPRC-Monitoring-Report-2021_20220909.pdf
[12] https://recycled-papers.co.uk/green-matters/recycled-paper-manufacture
[13] www.gov.uk/government/publications/greenhouse-gas-reporting-conversion-factors-2023
[14] www.gov.uk/government/publications/greenhouse-gas-reporting-conversion-factors-2023

6. Areas needing further investigation and alignment

This whitepaper acknowledges that aligning an international and diverse industry, on a complicated topic such as carbon reporting across the lifecycle of an individual book or journal, requires time. As acknowledged in the objectives and principles, this methodology does not seek to fill all knowledge gaps and instead serves to accelerate the agreed approach that can be applied today to start understanding and reducing carbon emissions. We acknowledge there are areas in the lifecycle assessment and emission factors which require further investigation and international alignment. We have outlined these areas below:

Time period calculation

Agreement is needed around time elements related to both when carbon data calculations should occur in the book production process, and when the methodology and subsequent carbon number per book/portfolio remains valid and accurate. It is envisaged that these decisions would feed into agreed data inputs for publication metadata and should be determined in a subsequent phase.

Content creation

There is little data that exists for this stage of a book production. It is proposed that pilot partners work together to further investigate, gather reliable data and refine this emission factor as we work to better understand the climate impacts of different types of books and editions.

Geographic grouping for electricity emission factors

There are two possible approaches to using energy emission factors from the supply chain, either to use an average for a large region (for example a European-wide factor or a US factor) or to use a more specific emission factor (for example, an individual European country's emission factor or in the case of the US a sub-region emission factor). The rationale behind this decision is to recognise and drive energy efficiencies across supply chains. However, the location in which a supplier is located, and their national energy systems will influence the calculations and it may not be realistic to move certain productions to other countries/regions. Further discussions are needed to ensure an international and fair approach is adopted that will allow comparisons across regions in a fair manner.

Gathering a better understanding of end of use

Again, there is little book specific data for this part of the lifecycle. The methodology outlined in this whitepaper assumes emission factors associated with mixed paper end of use as a best starting point. However, a 2009 report in the US suggested that the recycling rate of books specifically is lower than this overall paper figure[15], perhaps because of the specialist processing required, for example to remove the spine. Further investigation is needed to validate figures associated with the number of books recycled, sent to landfill, or incinerated. Additionally, the authors and reviewers suspect there are differences in how recycling and waste works in each country/region making general emission factors and comparisons difficult.

[15] https://nepis.epa.gov/Exe/ZyPDF.cgi/P100A0NX.PDF?Dockey=P100A0NX.PDF

Trim and machine set-up waste at printer

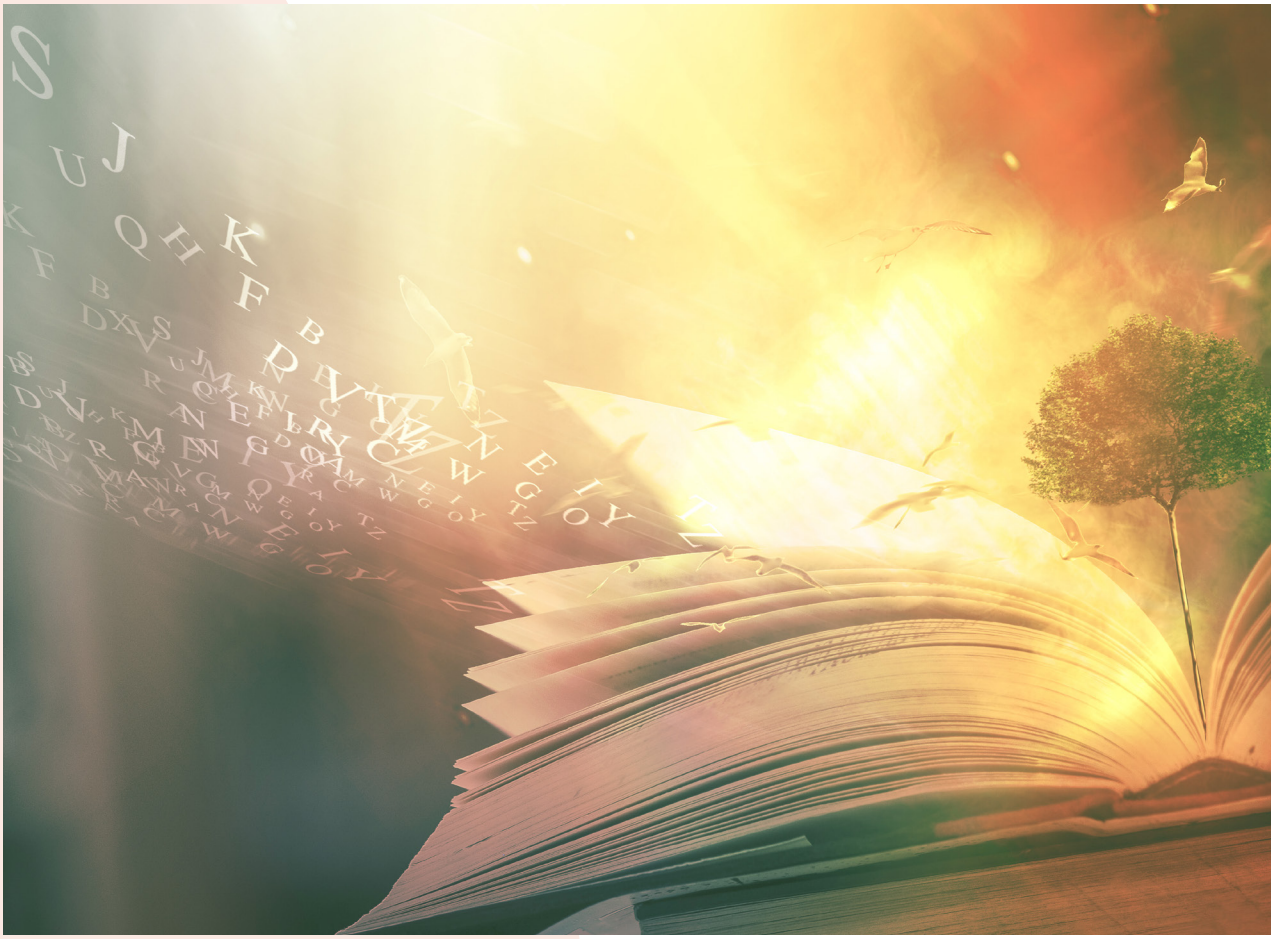
Initial estimates suggest that 10-20% of the paper purchased by the printer may not be used in the final product. It is proposed that the pilot partners better understand what determines the level of waste, e.g., dependency on paper size, to more accurately estimate this in the methodology.

Distribution and retail emissions associated with the second-hand market, returns and re-sale

The model does not currently include emissions from these sources. It is proposed that the pilot partners investigate some case studies to better understand the volumes through these channels and scale of emissions involved.

How to account for the carbon absorbed during tree growth

The climate impact of the printed books in the methodology, is that associated with the use of energy needed to turn the raw materials into a book, transport it, and eventually dispose of it. Prior to disposal, the book also acts as a carbon sink, helping to remove CO^2 out of the atmosphere. How to calculate and communicate this aspect is an area outlined for further investigation and alignment.



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