

The Book Chain Project

Environment Report



2024

Building better supply chains for books

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Introduction

About the Book Chain Project

The Book Chain Project (BCP) is a collaboration of 25 leading publishers, over 400 paper mills and over 400 first-tier suppliers to make the supply chains of printed books and journals more sustainable.

It operates as a platform where paper mills, printers and other suppliers can share information with publishers and work together to drive social and environmental responsibility in product supply chains.

It started life in 2006, partly in response to the Greenpeace report 'The Paper Trail' which casted light on the potential impacts of the publishing industry on global deforestation. Together, we built relationships with paper mills to gather tree species and country of origin data for each fibre used in every brand of paper and board.

Since then, our work has expanded to cover four themes:



Climate Change, Nature & Deforestation

The Climate Change, Nature & Deforestation workstream collects and analyses the origins of tree fibres used in paper and board, helping publishers identify responsible forest sources for their books. We hold data on over 4,000 paper and board brands from 400 paper mills around the world, covering deforestation, transshipment, biodiversity, and species risk. We also engage with paper mills on environmental performance through environmental questionnaires, which form the basis for this report.



Human and Labour Rights

Through our work on human and labour rights, we help define expectations and share information on labour practices. We set expectations through our industry Code of Conduct; support publishers in conducting risk assessments; facilitate audit sharing; gather data on labour through questionnaires; and collaborate on topics that are important for the industry such as responsible recruitment and health & safety.



Waste & Circularity

Waste and Circularity focuses on how to make more sustainable material and design choices. This includes a design guide for the publishing industry, exploring the environmental, recyclability, and health & safety impacts of key material and process choices.



Chemical Safety

This workstream aims to simplify how chemical safety information is shared between publishers and their print suppliers, helping publishers to comply with safety legislation and stay ahead of new developments.

Publishers use the Book Chain Project to make informed buying decisions by capturing information on the 'full story of the book'.

Environmental Questionnaire (EQ)

One way that publishers are responding to climate change and demands for circularity through BCP is via Environmental Questionnaires. This is a self-assessment questionnaire that mills and suppliers complete on the BCP system to establish their environmental performance and share this information with publishers. The questions cover policies, management systems, energy use, greenhouse gas emissions, water use, wastewater treatment, material use and waste disposal.

Each completed questionnaire is assigned a maturity level, based on a maturity ladder which ranks sites from Beginner through to Learning, Advanced, and Leading. This gives publishers and the site itself an idea of where they are in their journey to environmental leadership.

Based on the site inputs, the system calculates intensity metrics such as:



Energy intensity

- MWh/tonne of paper produced for mills
- MWh/tonne of paper used for printers



Greenhouse Gas (GHG) intensity

- tonnes Scope 1&2/tonne of paper produced for mills
- tonnes Scope 1&2/tonne of paper used for printers



Water intensity

- m3/tonne of paper produced for mills
- m3/tonne of paper used for printers

These intensity metrics are then benchmarked against internal and external benchmarks. Publishers can use these intensity metrics to compare sites against each other, and to calculate their own Scope 3 emissions from the production of the paper they have used in their books, as well as the printing of their books.

The pulp and paper sector is expected to see continued demand growth through to

2030

Context for the report

Why climate change is important for the publishing industry

The impacts of rising GHG emissions are increasingly urgent. Recent data shows global temperatures are now approaching or temporarily exceeding the 1.5°C threshold, with [further record-breaking years likely](#) in the near term. This highlights the narrowing window for effective climate action.

The publishing industry is closely linked to these challenges through its reliance on resource- and energy-intensive processes. Paper production in particular requires significant heat and energy inputs, largely due to the need to evaporate water during pulp and paper drying. The pulp and paper sector is a significant contributor to emissions from industry and is expected to see continued demand growth through to 2030, increasing pressure to reduce emissions intensity. According to new [statistics published by CEPI](#), paper consumption rose 7% in 2024 in Europe, coupled with a 6% increase in production. However, production across all energy-intensive sectors, which includes paper, is still 10-15% lower than in 2021, at the height of the COVID pandemic. The difference from 2021 rates can partly be explained by high energy prices and a challenging European economic climate, but other production and regulatory costs also continue to play a role.

At the same time, the sector is undergoing a significant transformation. The pulp and paper industry has already demonstrated that progress is possible, achieving substantial emissions reductions over recent decades and continuing to invest heavily in clean energy solutions. For example, the European pulp and paper sector has reduced CO₂ emissions significantly since 2005 and is now pursuing further decarbonisation through renewable energy, electrification of heat, and large-scale industrial investment ([published by CEPI](#)). Achieving future reductions, however, will require accelerated deployment of new technologies such as industrial heat pumps, electrified processes, and carbon capture at scale.

For the publishing industry, the implications of these developments extend beyond production processes. The environmental footprint of books is shaped by a combination of factors—including paper sourcing, manufacturing, transportation, and end-of-life treatment—as well as inefficiencies such as overproduction and waste.

In parallel, the industry is evolving in response to growing expectations from consumers, regulators, and investors. Sustainability is no longer viewed solely as a moral responsibility but as a business imperative, linked to cost efficiency, resilience, and long-term competitiveness. New production models such as print-on-demand, increased use of recycled materials, and renewable-energy printing are being adopted across the sector, demonstrating how environmental and operational benefits can be aligned.

Why this report

Transparency on energy, material and water use, and greenhouse gas emissions, is fundamental to understanding and reducing environmental impacts. Establishing a robust emissions baseline enables organisations to track progress, identify hotspots, and develop targeted decarbonisation strategies. This is particularly important in the publishing industry, where a large proportion of emissions occur within complex global supply chains.

Reporting requirements requiring large companies to report on their GHG emissions such as the Streamlined Energy and Carbon Reporting requirements (United Kingdom) and Corporate Sustainability Reporting Directive (European Union), as well as voluntary reporting and decarbonisation targets being set by corporates, are increasing the need for comprehensive carbon accounting practices that capture emissions across the full value chain—from paper production and printing through to distribution and product use. This includes direct emissions (Scope 1), indirect emissions from purchased energy (Scope 2), and, critically, other indirect value chain emissions (Scope 3). Achieving this requires close collaboration with suppliers to collect reliable and consistent data, as well as the development of practical tools and methodologies to address data gaps.

Scope 3 emissions present a particular challenge for the publishing industry due to the complexity of its supply chains and the variability in data availability and quality. Differences in reporting maturity across mills and suppliers can result in inconsistencies and gaps in EQ data. At the same time, the increasing expectation for third-party assurance and standardised reporting is raising the bar for data completeness and accuracy.

Despite these challenges, there is a clear opportunity. The transition to more transparent and data-driven supply chains can enable better decision-making, support more effective emissions reduction strategies, and drive innovation across the industry.

In this context, the objectives of this Environment Report are to:

1

Support publishers in improving the accuracy of Scope 3 emissions calculations using EQ data, including the provision of proxy emissions factors.

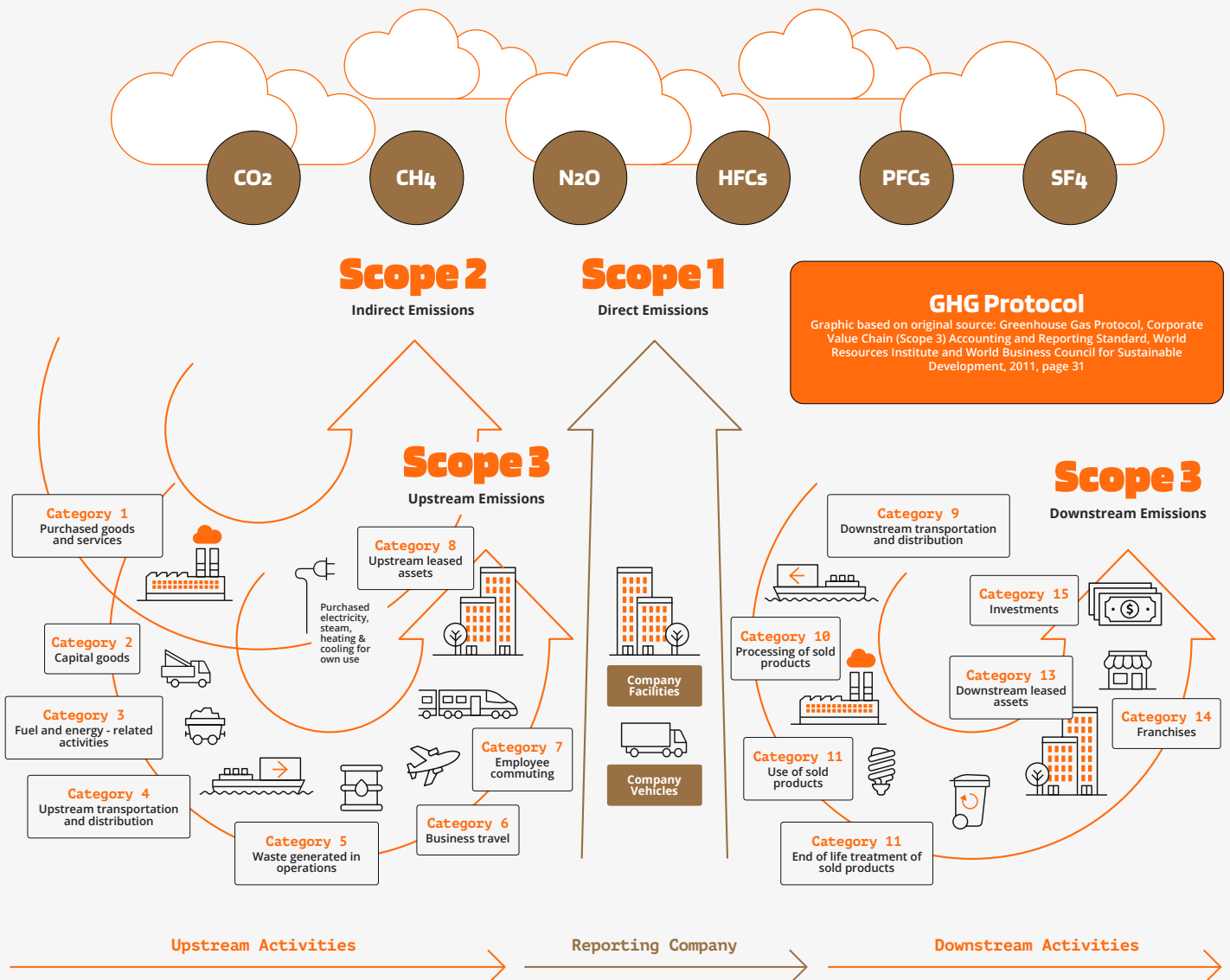
2

Enable publishers without access to BCP data to estimate their Scope 3 footprint using industry-specific emission factors.

3

Share examples of best practice from mills and suppliers to support continuous improvement in environmental management and performance across the publishing value chain.





Forest, Land, Agriculture (FLAG)

Agriculture, forestry and other land use (AFOLU) represent 22% of global greenhouse gas emissions. However, until the publication of The FLAG Guidance and Tool in September 2022, there wasn't a scientific, standardised approach on how companies could account for and report these emissions. At the time of writing, the timber and wood fibre pathway is currently suspended by Science Based Targets Initiative (SBTi) due to inconsistencies in their proposed approach. Further consultations are underway to resolve the issue, with the aim to publish an aligned approach to setting science-based FLAG targets in the timber industry. Given the reporting and target-setting frameworks are still under development, only a small number of mills and suppliers are reporting on FLAG emissions so far.



Methodology

Sample selection

This report includes data from the following reporting period:



The data from any EQs submitted and audited after 03/04/2026 has not been included within this report. Our sample includes data from 25 mills and 74 suppliers.

This time frame indicates a shift from the methodology of previous reports, where EQs were included based on the traditional UK financial reporting window: April to March. This change was made to better align our definition of the reporting year of an EQ within the actual Book Chain year, covering September to August.

We have also decided to stop publishing multiple years' worth of data in one report, mainly due to large differences in sample size between the two years. Going forward, we will publish an Environment Report every year covering a new year of data.

In line with previous Environmental Report, the emissions data has been provided at four geographic levels: country, sub-region, region, and global. We have provided a data point where there are at least two EQs for that geography for that year. More information on the data points can be found in the [Appendix](#).

Data check and review

All EQs that are submitted onto the system go through a multi-step review process to check the quality and robustness of the data submitted. This review process consists of three steps:

- The BCP system automatically checks the following:
 - Breakdowns match total: fossil fuels; renewable energy generated; Scope 3 emissions; water sources; water use (process/non-process); waste generated (hazardous/non-hazardous)
 - Certain values cannot be 0: weight of paper produced / used / product produced; reporting period; emission target base year & end year; % reduction target; waste materials produced (if 'yes' selected)

- The data is reviewed by a BCP subject-matter expert who has in-depth knowledge of environmental data. The EQ reviewer follows a [clearly defined review protocol](#) (internal BCP resource). If there are any queries in the data, these are raised with the site directly on the BCP platform and captured within an online audit log. For example, this includes cross-referencing information reported in the energy use and GHG emissions sections, and re-calculating GHG emissions based on energy use using internationally accepted emission factors.
- Once all queries have been raised and resolved with the subject-matter expert, EQs will move to a final round of checks, carried out by a BCP auditor, to either accept onto the system or returned to the site for further follow up questions.

GHG Protocol and Climate Disclosure Project (CDP)

The EQ was developed in accordance with the GHG Protocol and CDP, which provide best-practice self-reporting guidance and standards. This ensures that the data gathered through the EQs is appropriate for reporting purposes. In 2020, the EQ underwent significant revisions to enable more standardised reporting and to place greater emphasis on GHG emissions and climate impacts. Changes and improvements are made continuously to remain aligned with best practice.

GHG emission factors for the publishing industry

This report contains emission factors at the country, sub-region, region, and global level. When choosing which emission factor to use, we suggest that the hierarchy outlined below is followed. This is aligned with [recommendations from the GHG Protocol](#), whereby companies should select emission factors that are most representative in terms of time (temporal representativeness) and geography (geographical representativeness).

Site

1

Site-specific emission factors from the EQ

Country

2

Country-specific emission factors from this report

3

Country-specific emission factors from 2023 report

Sub-region

4

Sub-region specific emission factors from this report

5

Sub-region specific emission factors from 2023 report

Region

6

Region specific emission factors from this report

7

Region specific emission factors from 2023 report

Global

8

Global emission factor from this report

9

Global emission factor from 2023 report

Mills

Scope 1 and 2 emission factors for mills

The EQ asks mills to provide information on their emissions. This data is broken down into the following:



Scope 1

Fossil fuels used in direct operations



Scope 2

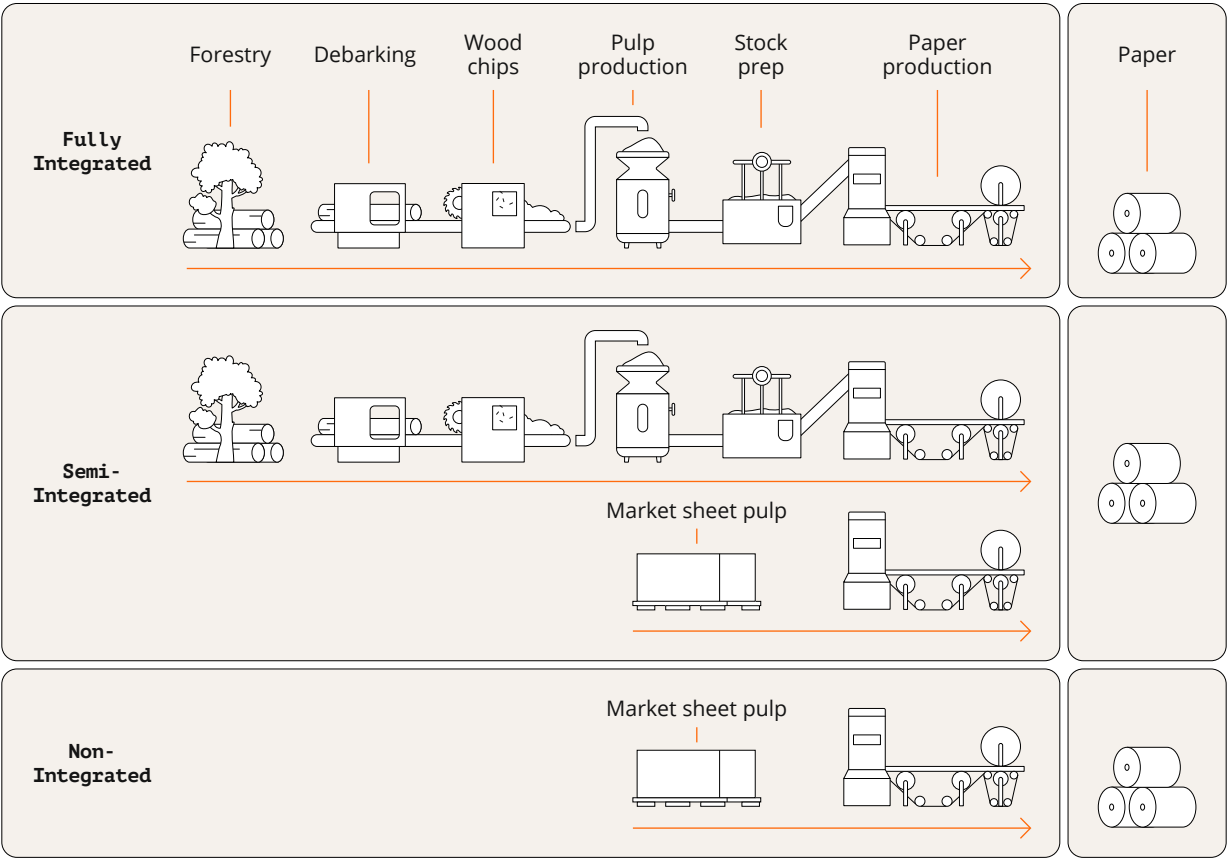
Purchased or generated electricity / renewable electricity



Scope 3

Activities in the supply chain

More mills are providing us with Scope 3 data than ever before, however geographic coverage remains patchy. Therefore, only Scope 1 and 2 emissions have been calculated at the country, sub-region and regional level where possible. However, we have enough quality Scope 3 data to provide a global average for Scope 3 as a share of total emissions (%), which can be used to estimate a Scope 3 figure.



We would expect to see higher direct (Scope 1 and 2 emissions) for fully integrated mills as they are accounting for the pulp production process, whereas those emissions would partially sit in Scope 3 for semi-integrated and non-integrated mills.

There are some instances where the emission factors are higher for non-integrated or semi-integrated mills. This was also found to be the case in the 2023 Report, although the mills within the sample differed. There are some instances, for example in the 2024 sample of mills in Asia, where this variation can be explained by semi-integrated and non-integrated mills having a higher emissions intensity compared to fully integrated mills.

Scope 3 as a share of total emissions

The reporting and quality of Scope 3 data is improving year on year, and a number of mills have reported a comprehensive Scope 3 footprint including the most relevant categories of the [Greenhouse Gas Protocol](#). For mills, we would expect the most relevant categories to include category 1 (purchased goods and services) due to the purchased of raw material and/or pulp, category 3 (fuel & energy related activities) given the energy intensity of the production process, category 4 (upstream transportation and distribution) due to the transportation of raw materials and distribution of products and category 9 (processing of sold product) due to the processing of paper and board. Data from mills which have reported emissions against the most relevant categories have been included within the Scope 3 as a share of total emissions calculation. This calculation can be used to estimate the Scope 3 intensity factor per tonne of paper produced, based on the more precise Scope 1 and 2 emission factors that have been calculated for the different geographies.

Scope 3 intensity factor (per tonne of paper produced) calculation

There are two stages to this calculation.

Step 1

Calculating the total Scope 1, 2 and 3 intensity:

whereby x is the
**Scope 1 and 2
intensity factor**

$$x/(1-y)$$

y is the **Scope 3
share of the total
carbon footprint**

Step 2

Calculating the Scope 3 intensity factor:

whereby z is the **Scope 1, 2
and 3 intensity factor**
(from the calculation above)

$$z-x$$

and x is the **Scope 1 and 2
intensity factor**

Worked example

Using the emissions figures provided in the tables below, for a fully integrated mill located in Eastern Asia the total Scope 1, 2 and 3 intensity would be calculated as follows:

Emission Factors:

Scope 1 and 2 emissions factor for a mill in Eastern Asia: **0.68**

Global Scope 3 as share of total emissions (%) for a fully integrated mill: 51% (**0.51**)

Calculation:

Step 1

Calculating the Scope 1, 2 and 3 intensity factor:

$$0.68 / (1-0.59) = \mathbf{1.39 \text{ tonnes CO}_2\text{e per tonne of paper produced}}$$

Step 2

Calculating the Scope 3 intensity factor:

$$1.39 - 0.68 = \mathbf{0.71 \text{ tonnes CO}_2\text{e per tonne of paper produced}}$$

GHG emissions

Benchmarked against the global 2024 carbon intensity per year under a Below 2 Degree scenario, from the [Transition Pathway Initiative, Paper Industry Pathways](#). Global 2024 carbon intensity: **0.449** tCO₂e per tonne of pulp, paper and paperboard produced.

Green

CO₂e intensity is below the carbon intensity per year under a Below 2 Degree scenario.

Red

CO₂e intensity is above the carbon intensity per year under a Below 2 Degree scenario.

For Scope 1 & 2 Market-Based Emissions:

Country tonnes CO ₂ -equivalent (tCO ₂ e) per tonne paper produced (tPaper produced)	Fully Integrated	Semi-Integrated (> 50% own pulp)	Semi-Integrated (< 50% own pulp)	Non-Integrated
Austria	-	-	-	-
Canada	-	-	-	-
China	-	-	-	-
Germany	-	-	-	-
India	-	-	-	-
Indonesia	-	-	-	-
Mexico	-	-	-	-
Sweden	-	-	-	0.10
United Kingdom	-	-	-	-

Sub-region tCO ₂ e / tPaper produced	Fully Integrated	Semi-Integrated (> 50% own pulp)	Semi-Integrated (< 50% own pulp)	Non-Integrated
Central America	-	-	-	-
Northern America	-	-	-	-
Eastern Asia	-	-	-	-
Southern Asia	-	-	-	-
South-eastern Asia	-	-	-	-
Northern Europe	-	-	-	0.10
Western Europe	-	-	-	-

Region tCO ₂ e / tPaper produced	Fully Integrated	Semi-Integrated (> 50% own pulp)	Semi-Integrated (< 50% own pulp)	Non-Integrated
Americas	-	-	-	-
Asia	-	-	-	-
Europe	-	-	-	0.13

Global tCO ₂ e / tPaper produced	Fully Integrated	Semi-Integrated (> 50% own pulp)	Semi-Integrated (< 50% own pulp)	Non-Integrated
Global	0.25	-	0.15	0.03

For Scope 1 & 2 Location-Based Emissions:

Country tonnes CO ₂ -equivalent (tCO ₂ e) per tonne paper produced (tPaper produced)	Fully Integrated	Semi-Integrated (> 50% own pulp)	Semi-Integrated (< 50% own pulp)	Non-Integrated
Austria	-	-	-	-
Canada	-	-	-	-
China	0.68	0.79	0.89	0.81
Germany	-	-	-	-
India	-	1.26	-	1.46
Indonesia	-	-	-	-
Mexico	-	-	-	-
Sweden	-	-	-	0.11
United Kingdom	-	-	-	-

Sub-region tCO ₂ e / tPaper produced	Fully Integrated	Semi-Integrated (> 50% own pulp)	Semi-Integrated (< 50% own pulp)	Non-Integrated
Central America	-	-	-	-
Northern America	-	-	-	-
Eastern Asia	0.68	0.79	0.89	0.81
Southern Asia	-	1.26	-	1.46
South-eastern Asia	-	-	-	-
Northern Europe	-	-	-	0.11
Western Europe	-	0.18	-	-

Region tCO ₂ e / tPaper produced	Fully Integrated	Semi-Integrated (> 50% own pulp)	Semi-Integrated (< 50% own pulp)	Non-Integrated
Americas	-	-	-	-
Asia	0.65	0.9	0.89	1.24
Europe	-	0.18	-	0.13

Global tCO ₂ e / tPaper produced	Fully Integrated	Semi-Integrated (> 50% own pulp)	Semi-Integrated (< 50% own pulp)	Non-Integrated
Global	0.62	0.82	0.89	0.72

Global Scope 3 as share of total emissions (%)	Fully Integrated	Semi-Integrated (> 50% own pulp)	Semi-Integrated (< 50% own pulp)	Non-Integrated
Global	76%*	34%	-	68%

*No data available from the 2024 sample size based on our methodology. Proxy used from 2022-2023 Environment Report available here: <https://bookchainproject.com/downloadResourceFile?resource=579>

Global Scope 3 as share of total emissions (%)	All mill types
Global	76%*

*Global Scope 3 % calculated due to the limited data available from the 2024 sample size per mill type for Scope 3 based on our methodology.

GHG Reduction targets

Globally, 60% of mills have set a Scope 1 and 2 reduction target and over 10% have set a Scope 1 Only target. The share of mills setting Scope 3 reduction targets is lower, at 28%, which is expected as fewer mills have started to calculate their Scope 3 emissions.

To achieve Scope 1 and 2 targets, mills are implementing emission reduction projects. These projects include switching to bioenergy, the onsite generation of renewable electricity and carrying out energy efficiency initiatives. To achieve Scope 3 reduction targets, mills are switching to rail for the transportation of raw materials where possible, switching to locally sourced raw materials where possible and engaging with the supply chain to support their decarbonisation efforts. One European mill group has established their own supply chain decarbonisation programme through which it supports value chain partners to calculate their own carbon footprint and encourages the setting of science-based targets.

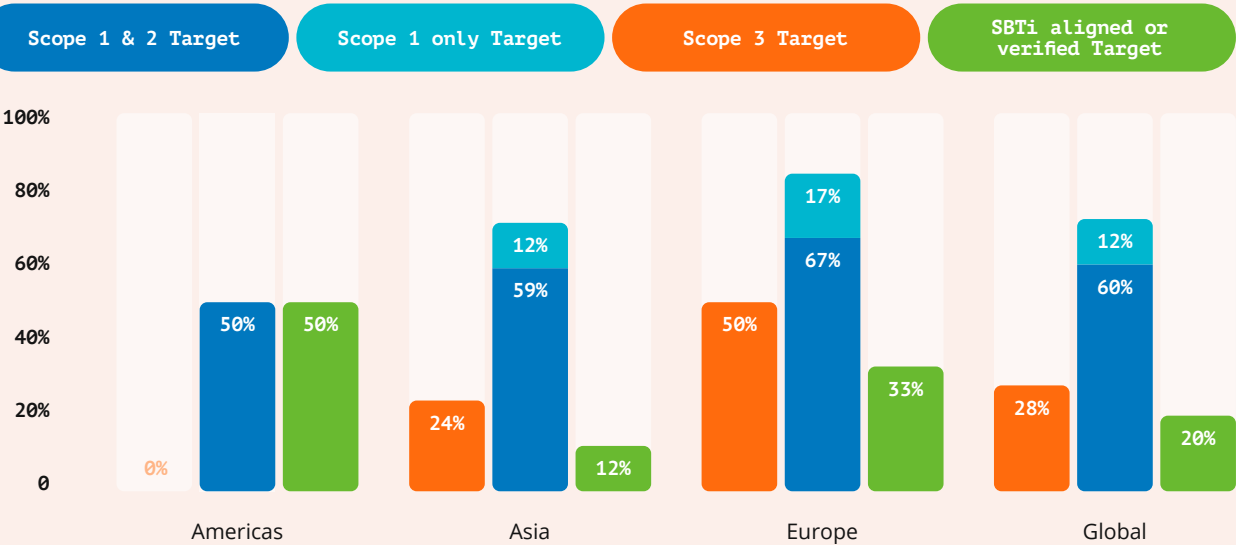
Science Based Targets initiative (SBTi) uptake

The [SBTi](#) helps companies to set emissions reduction and net-zero targets aligned with climate science. Aligned targets use the SBTi methodology but are not verified by the SBTi, while verified targets go through the formal SBTi validation process.

In this year’s report, 20% of mills reported having a verified or aligned SBTi target in place, with a spread across the Americas, Europe and Asia. These targets were set at the mill group level and covered near-term Scope 1, 2 and 3 targets which include absolute, intensity and engagement targets.

The SBTi data in the above graph are not additional to the targets data. For example, 50% of mills from the Americas in our sample have set Scope 1 and 2 reduction targets and all of these targets are SBTi aligned or verified.

Mill GHG Emission Reduction Targets 2024



Suppliers



Scope 1 and 2 emission factors for suppliers

We distinguish suppliers as either a print or non-print supplier. Print suppliers are responsible for putting words onto the paper. Non-print suppliers, however, cover the additional aspects that may be included as part of a book, such as a soft toy. Non-print suppliers can be broken down into different types, such as assembler, audio, binary and novelty components.

As print and non-print suppliers produce different products, the emissions are calculated slightly differently. For print suppliers, the calculation includes the weight of paper used in the production of books and/or other paper products. For non-print suppliers, the calculation includes the weight of non-paper products produced.

As we only have a small number of non-print suppliers taking part in the Book Chain Project, and even fewer currently providing their emissions data, we are not able to provide data for non-print suppliers in this report.

We are continuing to see an uptake in the number of suppliers providing Scope 3 data, however geographic coverage is still varied. Therefore, only Scope 1 and 2 emissions have been calculated at the country, sub-region and regional level where possible, based on the number of suppliers providing data per category. That said, we have enough Scope 3 data to provide a global average for Scope 3 as a share of total emissions (%), which can be used to estimate a Scope 3 figure. This calculation follows the same steps as outlined in the mill GHG emissions section.

We are continuing to see an uptake in the number of suppliers providing Scope 3 data, however geographic coverage is still varied



GHG emissions

Benchmarked against the BCP system calculated global 2024 carbon intensity weighted for paper products: **0.14** tCO₂e per tonne paper used

Green

CO₂e intensity is below the weighted average across similar sites on the BCP system.

Red

CO₂e intensity is above the weighted average across similar sites on the BCP system.

For Scope 1 & 2 Market-Based Emissions:

Country Tonnes CO ₂ equivalent (tCO ₂ e) per tonne paper produced (tPaper produced)	Print suppliers
Australia	-
Bosnia and Herzegovina	-
Brazil	-
Bulgaria	-
China	0.32
Colombia	-
Czech Republic	-
Germany	-
India	0.08
Italy	0.24
Latvia	-
Lithuania	-
Malaysia	-
Mexico	-
Netherlands	0.02
Peru	-
Poland	0.14
Singapore	-
South Africa	-
Spain	0.08
Turkey	-
United Arab Emirates	-
United Kingdom	0.03
United States	0.11
Vietnam	-

Sub-region tCO ₂ e / tPaper used	Print suppliers
Central America	-
Eastern Asia	0.32
Eastern Europe	0.05
Northern America	0.11
South-eastern Asia	-
Southern America	-
Southern Asia	0.08
Southern Europe	0.23
Sub-saharan Africa	-
Western Asia	-
Western Europe	0.05
Australia & New Zealand	-

Region tCO ₂ e / tPaper used	Print suppliers
Africa	-
Americas	0.11
Asia	0.27
Europe	0.13
Oceania	-

Global ² tCO ₂ e / tPaper used	Print suppliers
Global	0.17

Scope 1 & 2 Location-Based emissions:

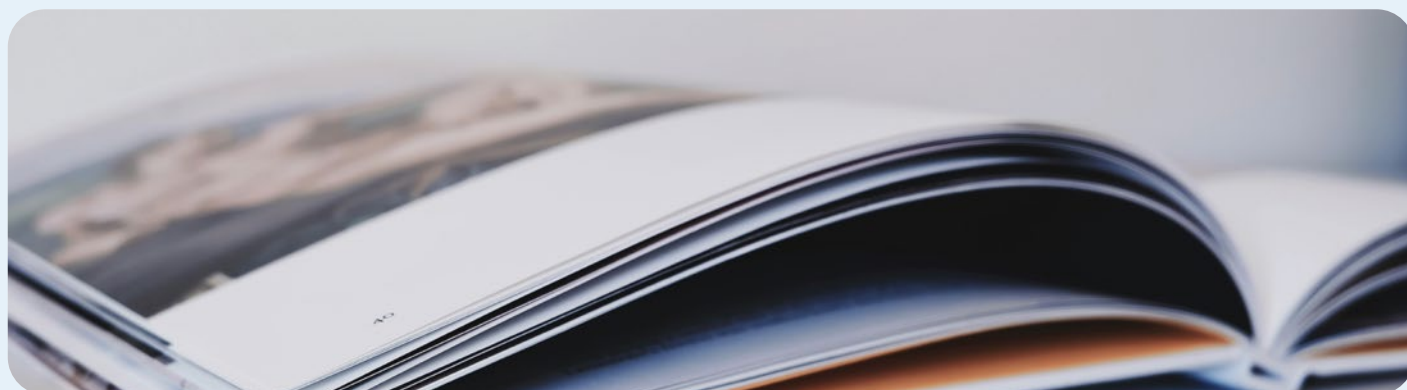
Country Tonnes CO ₂ equivalent (tCO ₂ e) per tonne paper produced (tPaper produced)	Print suppliers
Australia	0.36
Bosnia and Herzegovina	-
Brazil	-
Bulgaria	-
China	0.24
Colombia	-
Czech Republic	-
Germany	-
India	0.24
Italy	0.33
Latvia	-
Lithuania	-
Malaysia	0.36
Mexico	-
Netherlands	-
Peru	-
Poland	0.12
Singapore	-
South Africa	0.45
Spain	-
Turkey	-
United Arab Emirates	-
United Kingdom	0.08
United States	0.37
Vietnam	-

Sub-region tCO ₂ e / tPaper used	Print suppliers
Central America	-
Eastern Asia	0.24
Eastern Europe	0.19
Northern America	0.37
South-eastern Asia	0.35
Southern America	0.07
Southern Asia	0.24
Southern Europe	0.33
Sub-saharan Africa	0.45
Western Asia	0.22
Western Europe	0.09
Australia & New Zealand	0.36

Region tCO ₂ e / tPaper used	Print suppliers
Africa	0.45
Americas	0.29
Asia	0.25
Europe	0.22
Oceania	0.36

Global ² tCO ₂ e / tPaper used	Print suppliers
Global	0.25

Global Scope 3 as a share of total emissions (%)	Print suppliers
Global	84%



GHG Reduction targets

The majority of suppliers globally have set Scope 1 and 2 reductions targets. The data suggests that it is more common for Asian and European suppliers to set those reduction targets compared to suppliers in the Americas and Oceania. Suppliers are aiming to achieve their Scope 1 and 2 targets through switching to purchased renewable electricity, installing their own renewable electricity generation, transitioning to low-carbon heating and/or upgrading equipment to optimise production processes.

Scope 3 targets are less common; our global data suggests that less than 30% of suppliers have set reduction targets. Suppliers located in Africa, the Americas and Asia are the least likely to have set Scope 3 reduction targets. Suppliers located in Europe and Oceania are most likely to have set Scope 3 reduction targets, with almost half of the suppliers in these regions setting Scope 3 targets. This trend is similar to that observed among mills, and is likely due to a lower share of suppliers having calculated Scope 3 emissions.

SBTi uptake

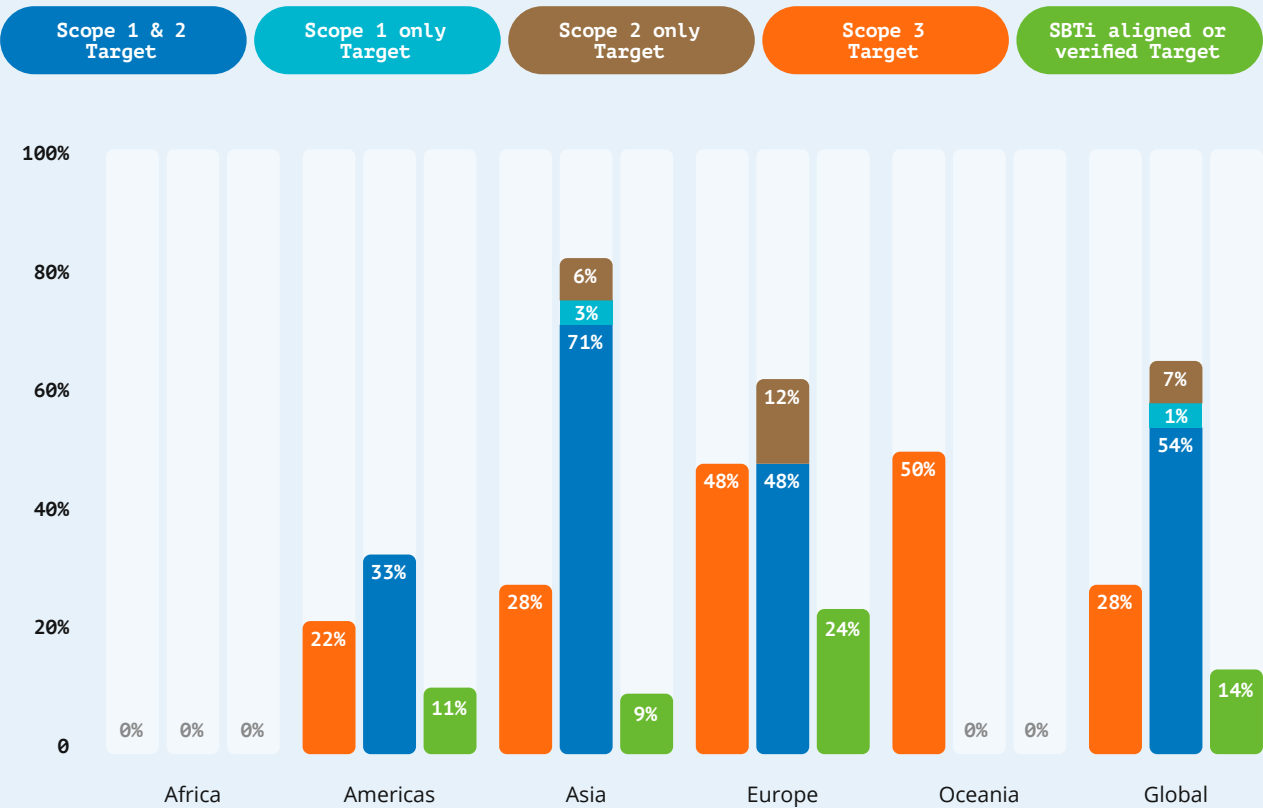
Science-Based Targets are still a minority practice, with 14% of suppliers globally having set aligned or verified targets. It is encouraging, however, to see that at least a few sites in most regions have aligned their targets with global climate science.



14%

of suppliers have set Science-Based aligned or verified targets globally

Suppliers Emission Reduction Targets 2024



Energy

Energy Intensity per tonne of pulp, paper and paperboard produced

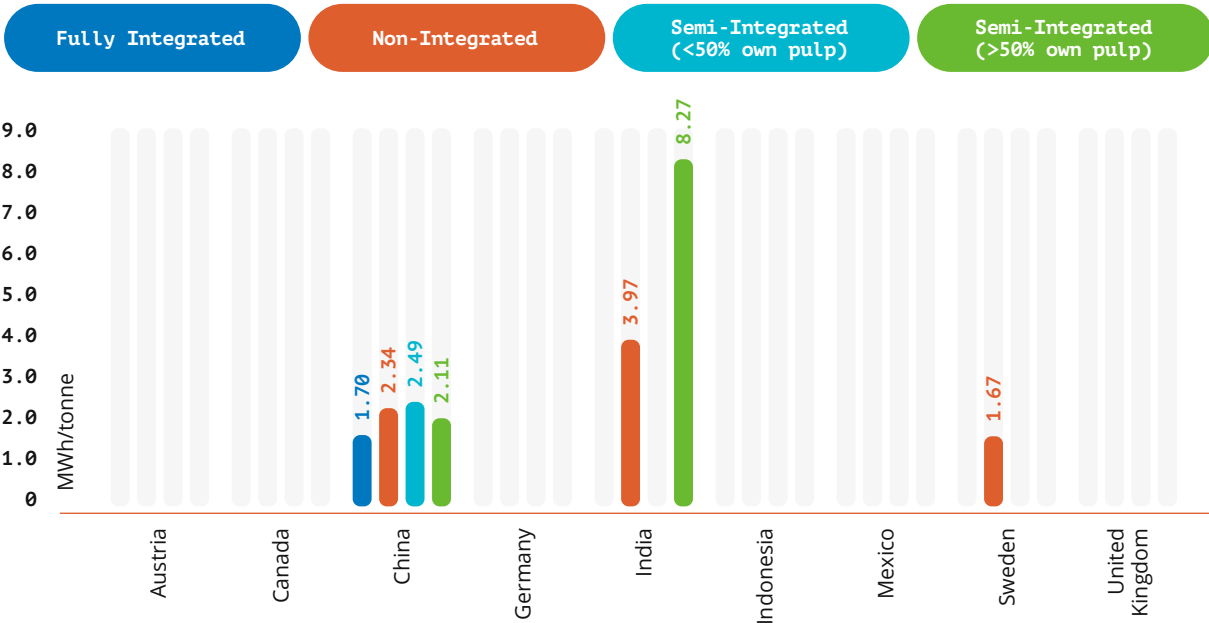
Mills

Energy Intensity across Mills

Across most regions, fully integrated mills have a higher energy intensity than non-integrated mills. This is to be expected, as fully integrated mills consume energy for the energy-intensive pulp-making process, while non-integrated mills do not produce the pulp they use themselves.

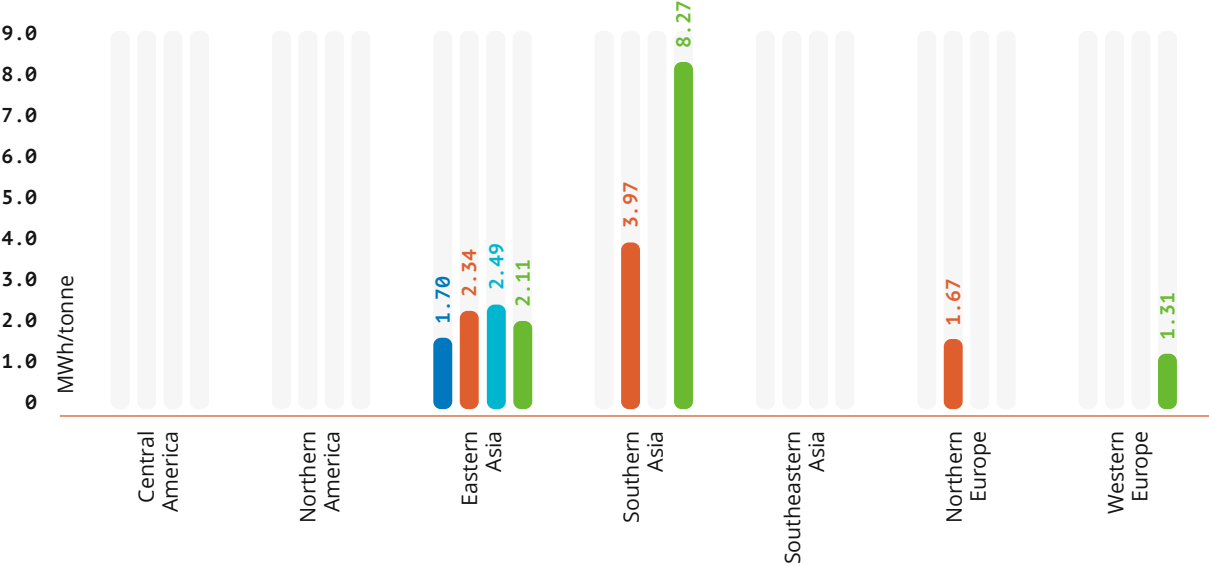
Country

Energy used (MWh)/per tonne paper produced (tPaper produced)



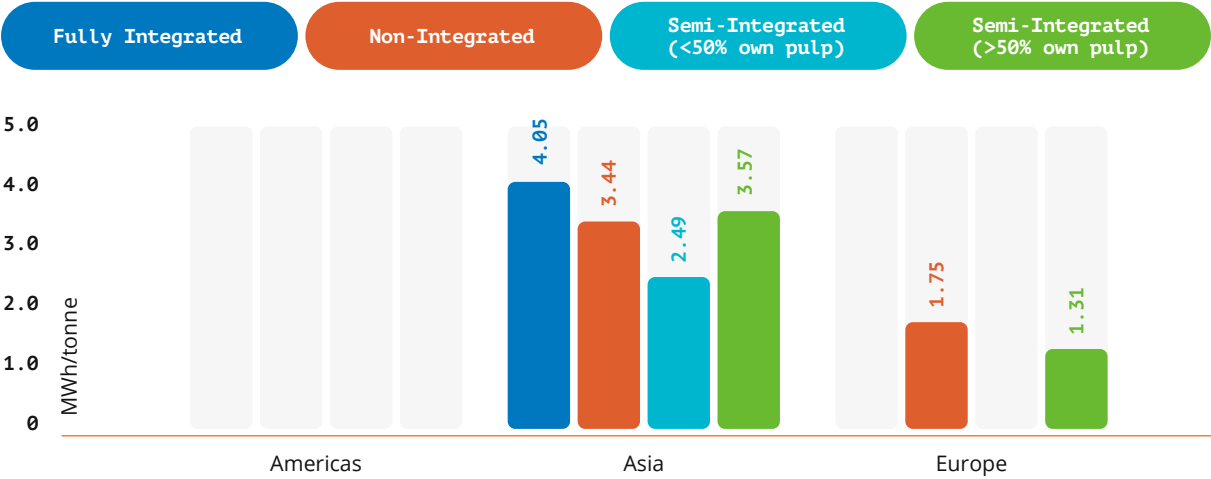
Sub Region

Energy used (MWh)/per tonne paper produced (tPaper produced)



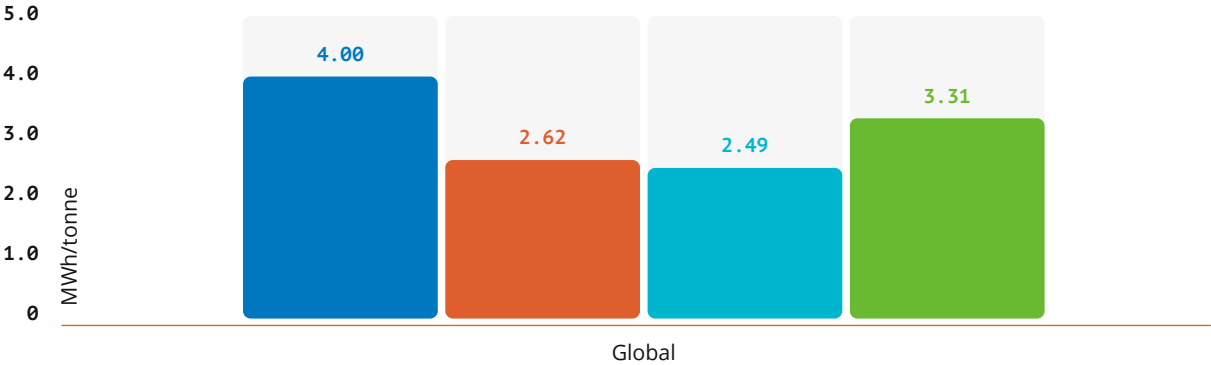
Region

Energy used (MWh)/per tonne paper produced (tPaper produced)



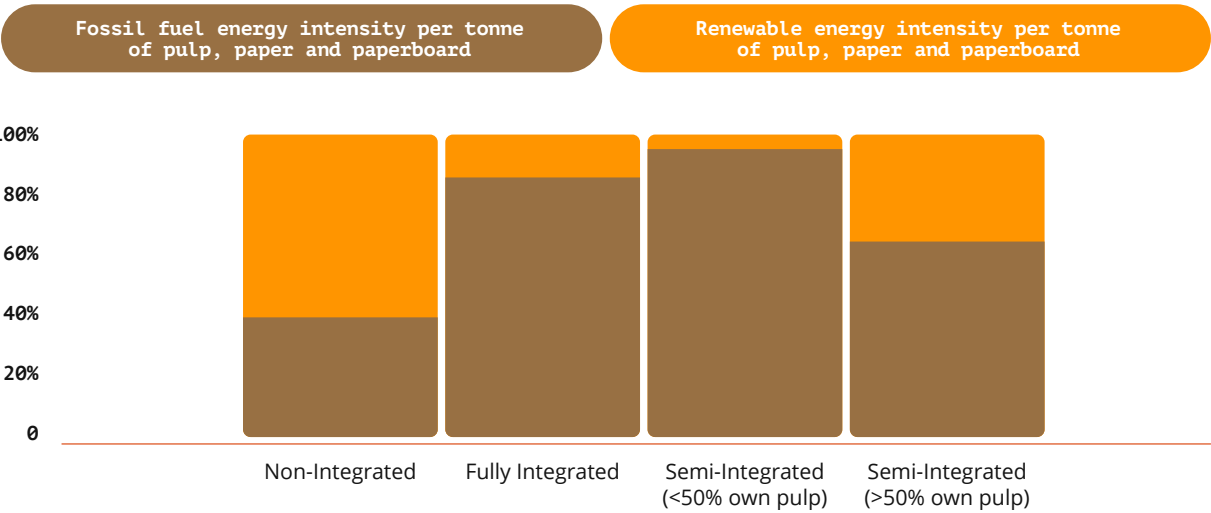
Global

Energy used (MWh)/per tonne paper produced (tPaper produced)



Global

Mills Global Energy Intensities (Fossil Fuel & Renewable)



Energy Intensity per tonne of paper used in the production of books, journals and/or other paper products

Suppliers

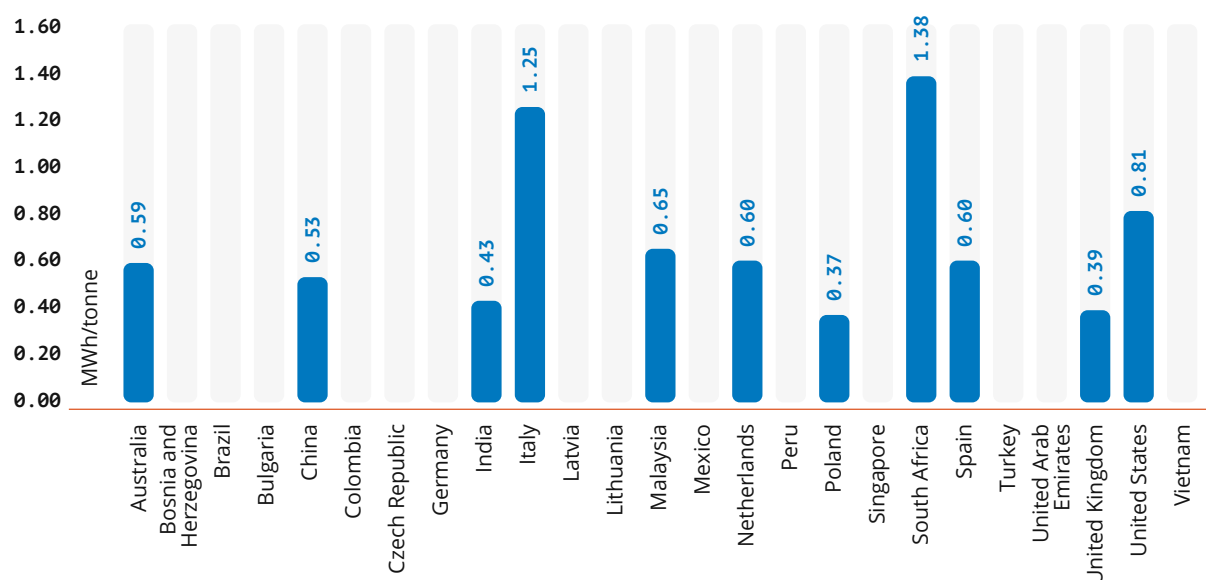


Energy intensity across suppliers

In this report, the energy intensity per tonne of paper used ranges from 0.43 MWh per tonne for Western Europe and Southern Asia to 1.38 MWh per tonne for Sub-saharan Africa. Around 75% of energy use by printers remains from fossil fuels, with the remaining 25% coming from renewables.

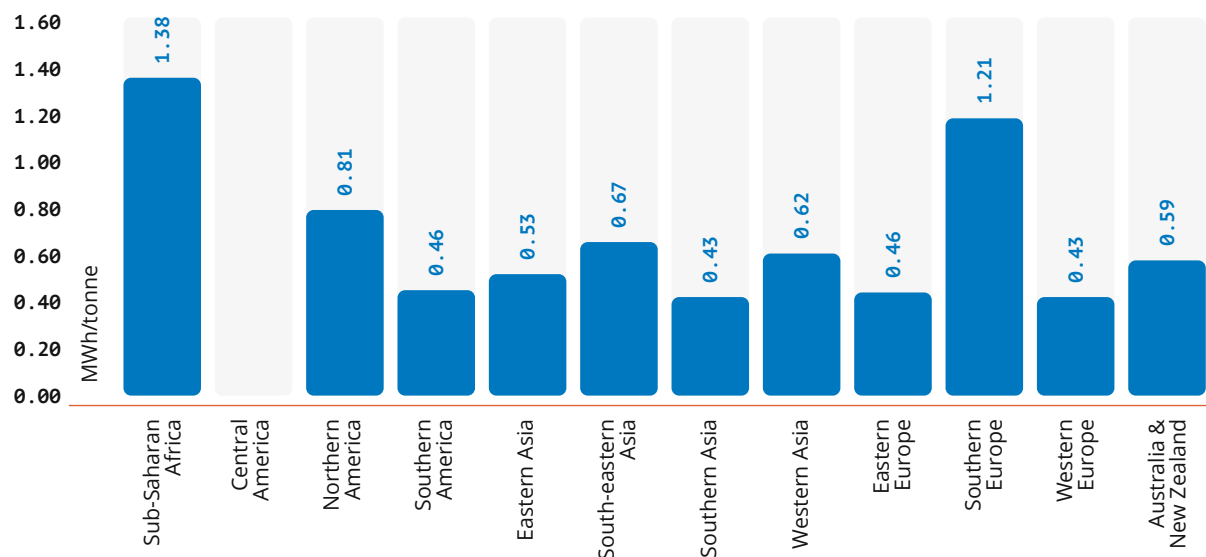
Country

Energy used (MWh)/per tonne paper produced (tPaper produced)



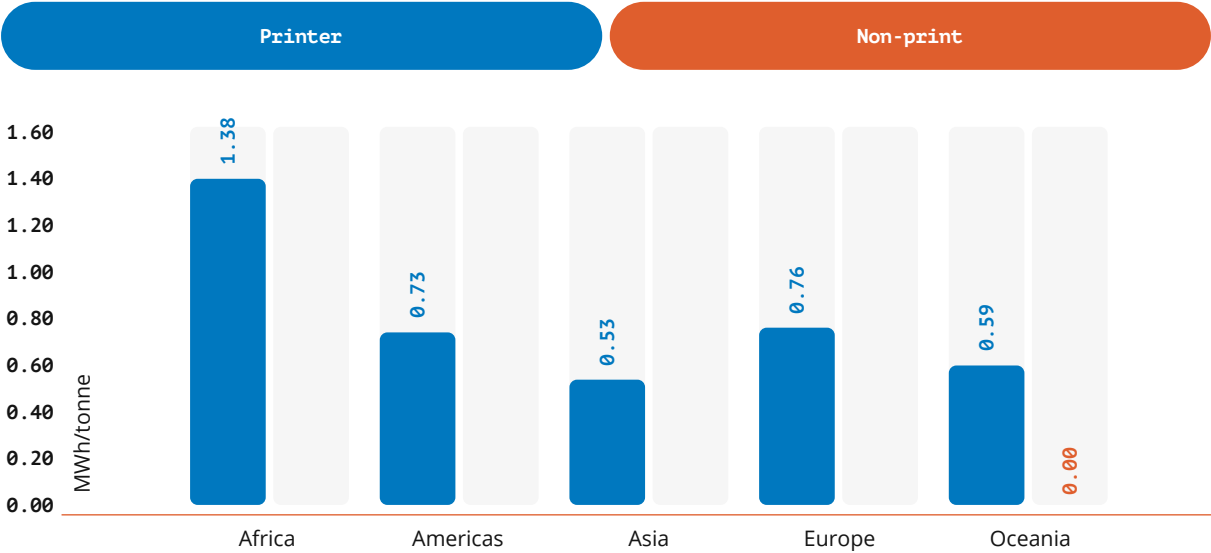
Sub Region

Energy used (MWh)/per tonne paper produced (tPaper produced)



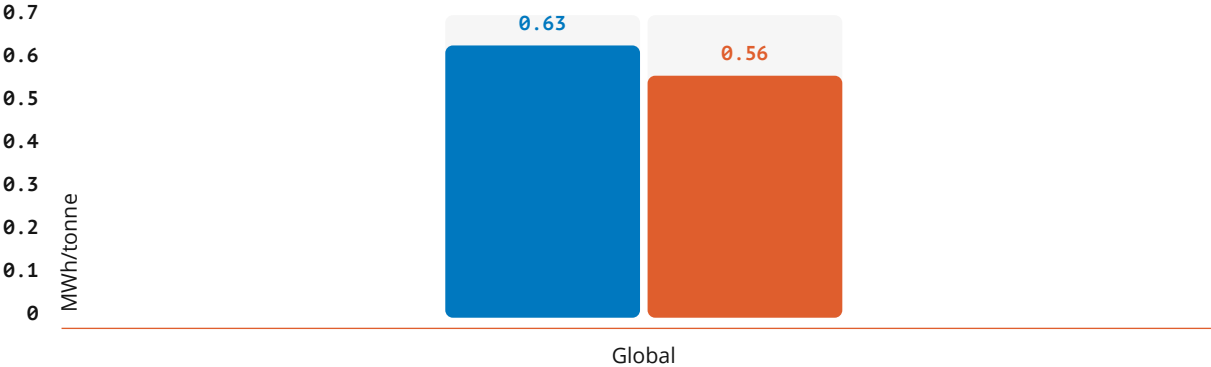
Region

Energy used (MWh)/per tonne paper produced (tPaper produced)



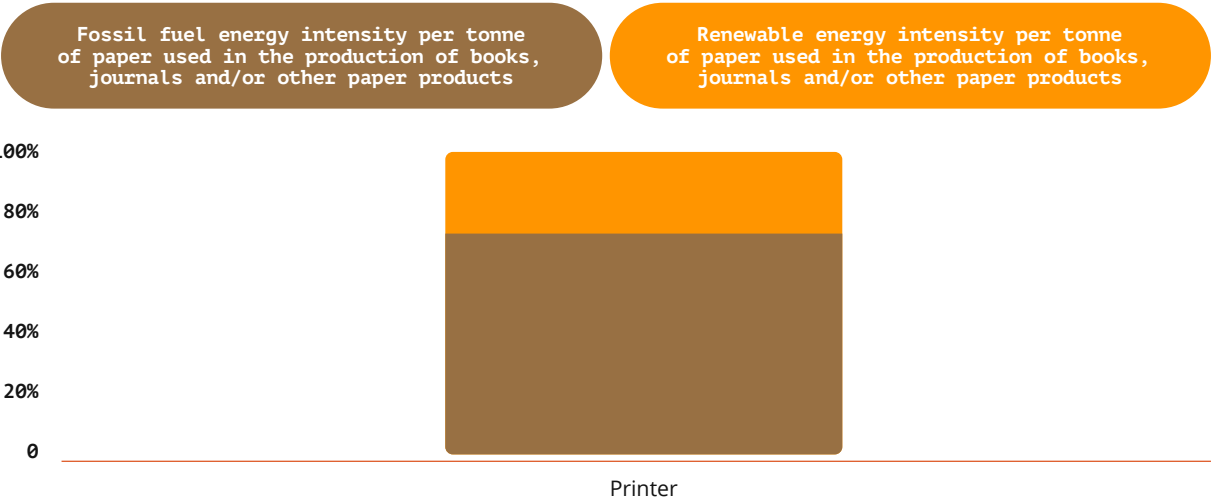
Global

Energy used (MWh)/per tonne paper produced (tPaper produced)



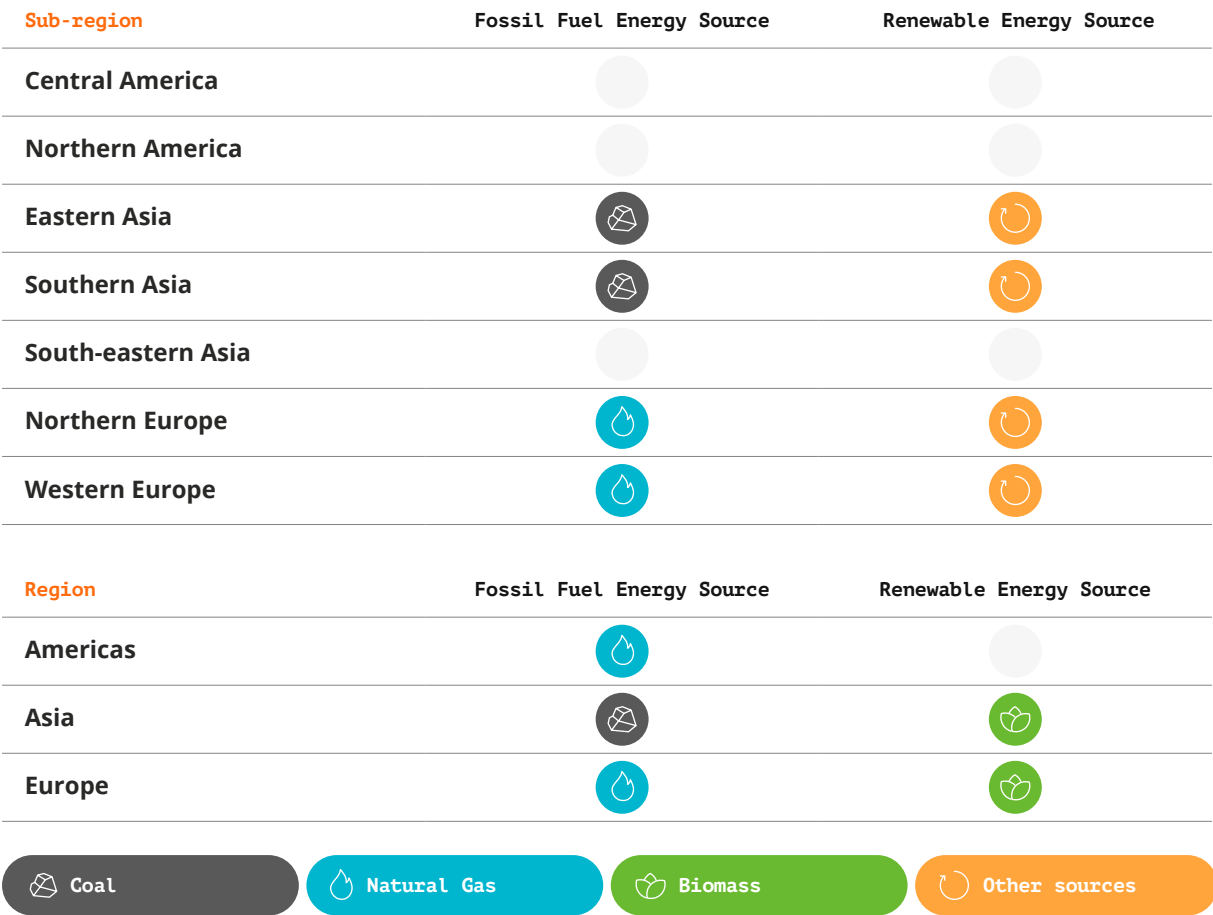
Global

Printers Global Energy Intensities (Fossil Fuel & Renewable)



Largest fossil fuel and renewable energy source

Mills



Energy sources across mills

Natural gas is the primary fossil fuel used across mills in most regions, with the exception of Asia, where coal remains the dominant source of fossil fuel energy.

Across regions, biomass is the main source of renewable energy used by mills. This is largely due to its availability as a by-product of the pulping process and its suitability for generating heat, which is required for pulp and paper production. Other renewable energy sources include solar, wind and hydroelectricity.

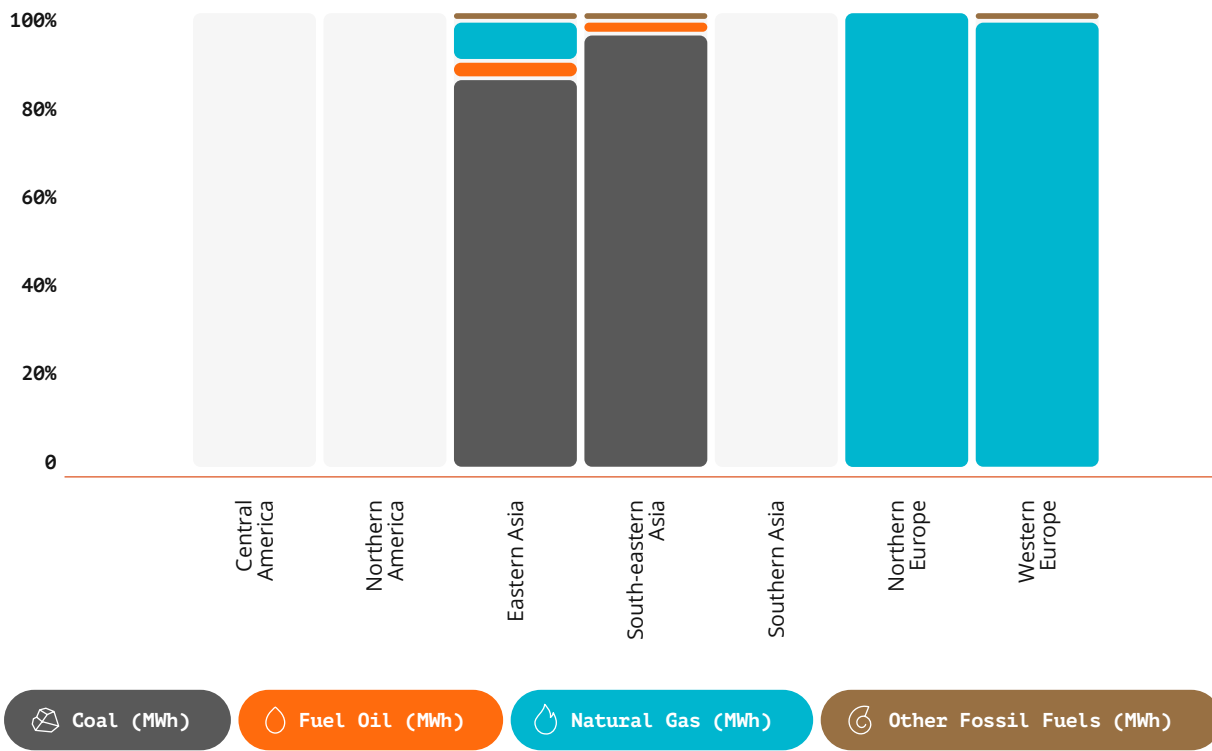


Fuel mix across mills

The western hemisphere is almost entirely dependent on one form of fossil fuel, natural gas. Conversely, Eastern and South-eastern Asia are characterised by heavy coal use. Most regions use more than one type of fossil fuel, although secondary fuels are only used in very small amounts.

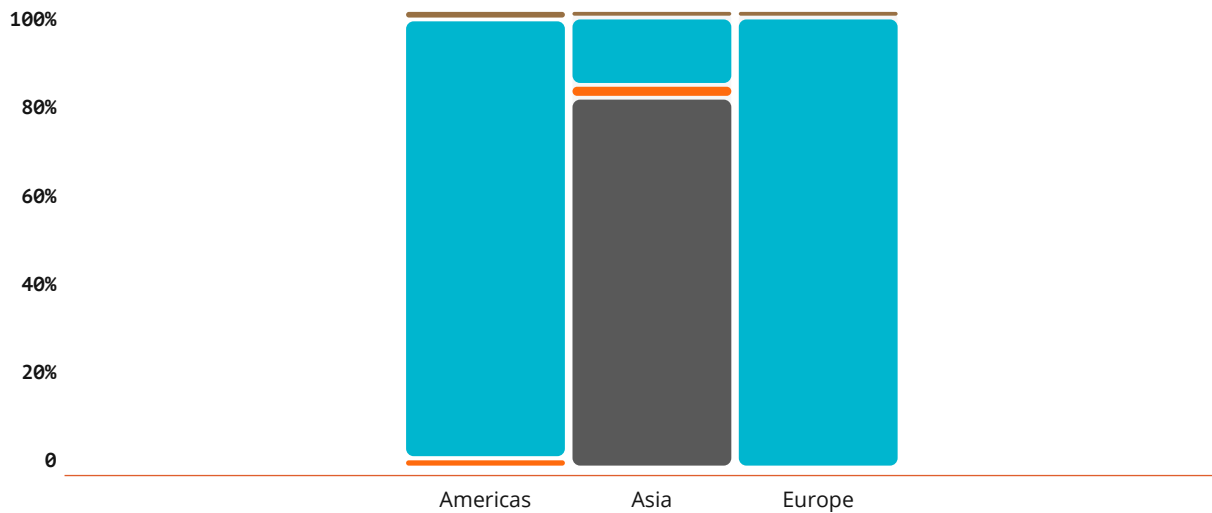
Mills sub-regional fuel mix

Fossil fuels



Mills regional fuel mix

Fossil fuels



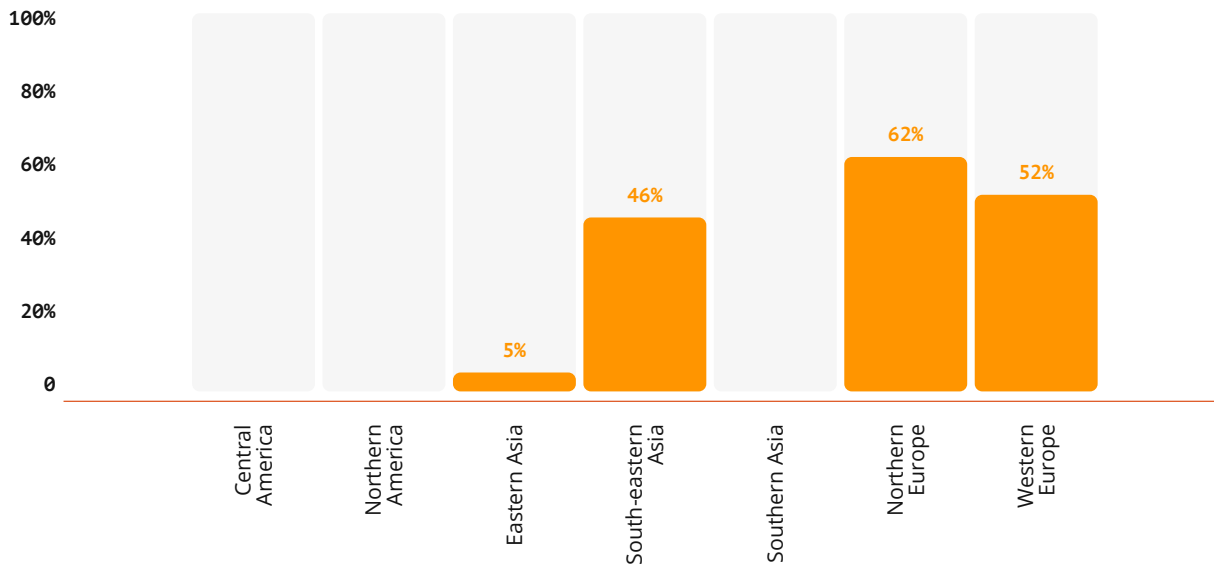
Renewable energy consumption across mills

There is slight regional variation in renewable energy use across mills. At a regional level, Europe reports the highest share of renewable energy (59%), followed by the Americas (52%) and Asia (50%), indicating stronger progress towards decarbonisation in Europe.

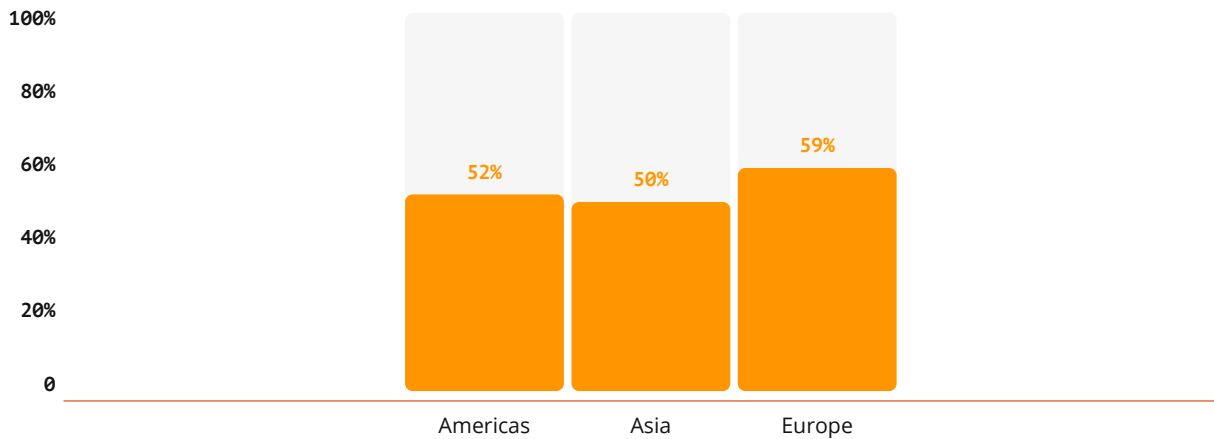
At a sub-regional level, this picture is more uneven. Northern Europe (62%), Western Europe (52%) and South-eastern Asia (46%) show high renewable energy uptake, while Eastern Asia (5%), Southern Asia, Northern America and Central America remain heavily reliant on non-renewable sources.

Overall, while some regions and sub-regions demonstrate strong adoption of renewables, progress is inconsistent, highlighting the importance of localised factors such as infrastructure and policy in driving energy transitions.

Mills sub-regional renewable energy consumption as percentage of total energy consumption



Mills regional renewable energy consumption as percentage of total energy consumption



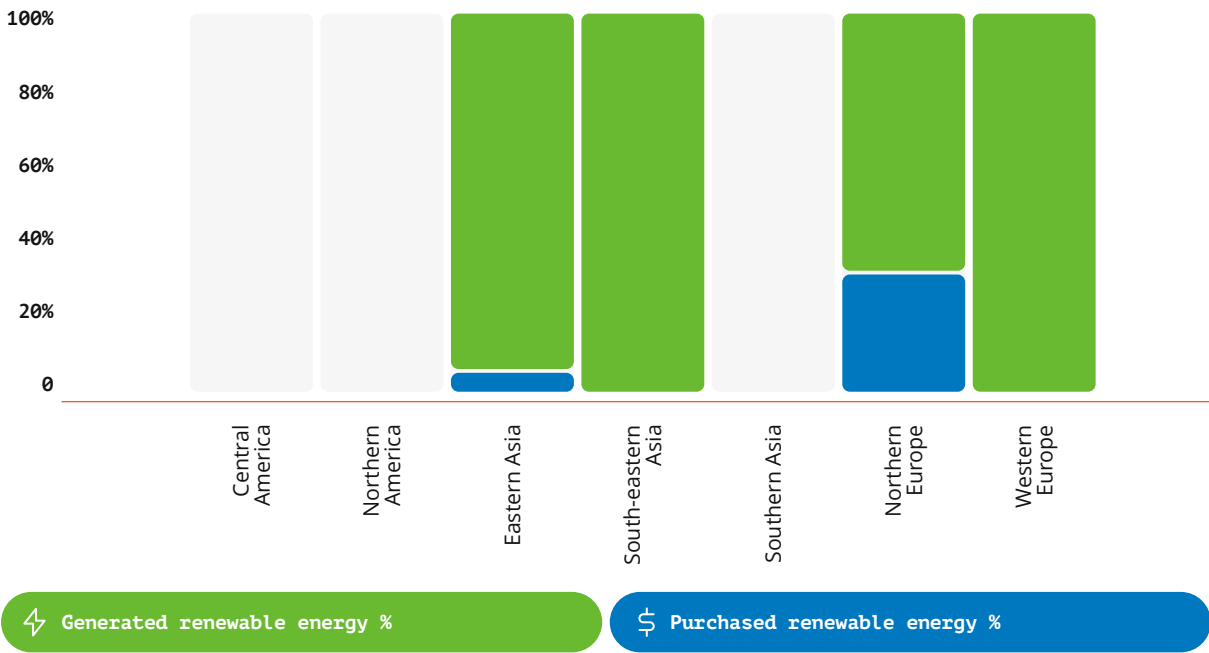
Mix between purchased and generated renewable energy across mills

The split between purchased and generated renewable energy is strongly weighted towards onsite generation across all regions and sub-regions. Most mills report almost all renewable energy as generated rather than purchased, with only limited use of purchased energy in Northern Europe (around 20%). This is explained by heat driving the largest share of energy demand in mills, which is typically generated on-site, with electricity use playing a much smaller role.

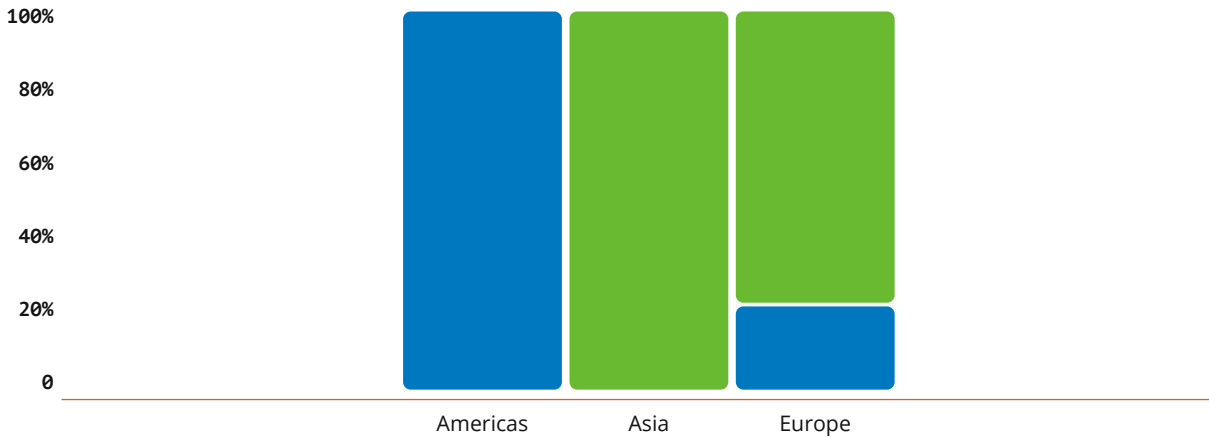
At a regional level, Asia relies almost entirely on onsite generation, while Europe also predominantly generates renewable energy but supplements this with a small share of purchased energy.

This pattern reflects that renewable energy uptake in Asia is largely driven by biomass-based onsite generation, while in other regions onsite generation includes a broader mix of renewable electricity sources (e.g. solar, wind or hydro), depending on local climatic conditions and resource availability.

Mill sub-region renewable energy split



Mill region renewable energy split



Largest fossil fuel and renewable energy source

Suppliers

Sub-region	Fossil Fuel Energy Source	Renewable Energy Source
Sub-saharan Africa		
Central America		
Northern America		
Southern America		
Eastern Asia		
South-eastern Asia		
Southern Asia		
Western Asia		
Eastern Europe		
Northern Europe		
Southern Europe		
Western Europe		
Australia & New Zealand		
Region	Fossil Fuel Energy Source	Renewable Energy Source
Africa		
Americas		
Asia		
Europe		
Oceania		

 Natural Gas

 Other Fossil Fuels

 Solar

Energy sources across suppliers

Natural gas is the predominant fossil fuel energy source used by suppliers globally, however suppliers in some parts of Southern and South-eastern Asia and Southern America heavily rely on other fossil fuels such as diesel.

Solar is the predominant source of renewable energy used across the global supplier base. Biomass is the only other renewable energy source being used by suppliers.

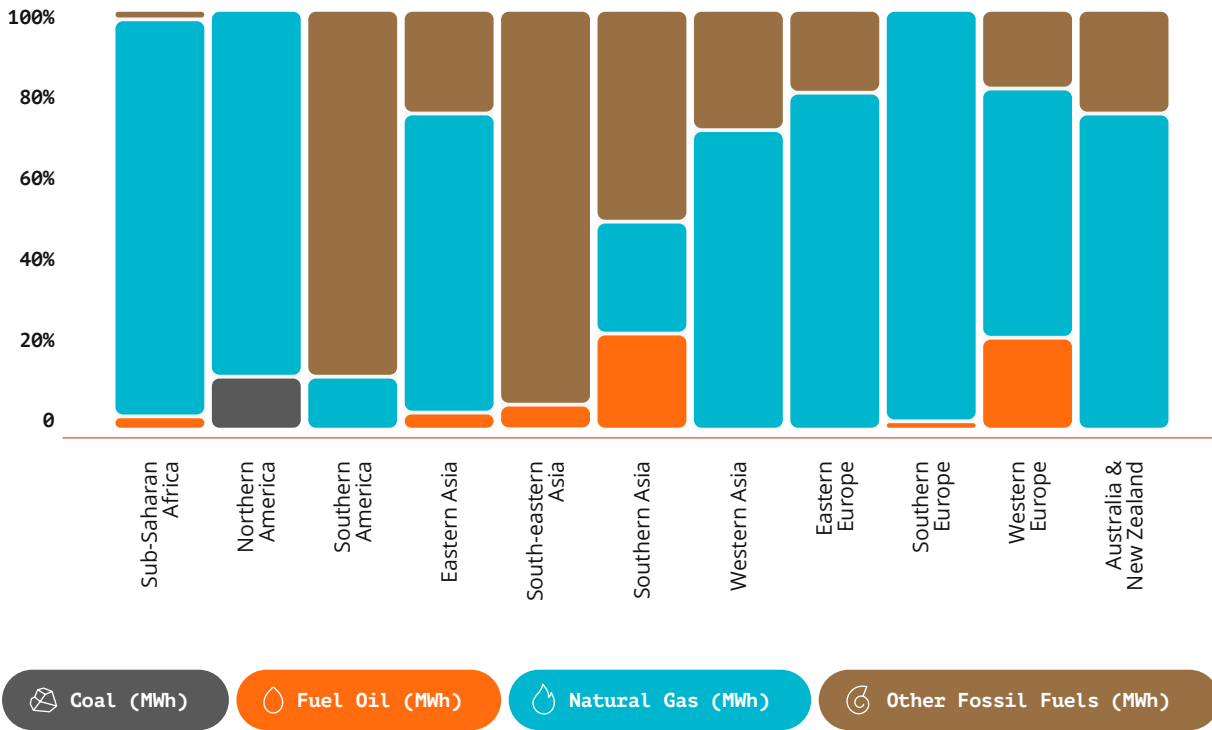


Fuel mix across suppliers

Most of Europe, the Americas region and Africa are dependent on natural gas as the predominant form of fuel. Suppliers in Oceania and Asia primarily use natural gas.

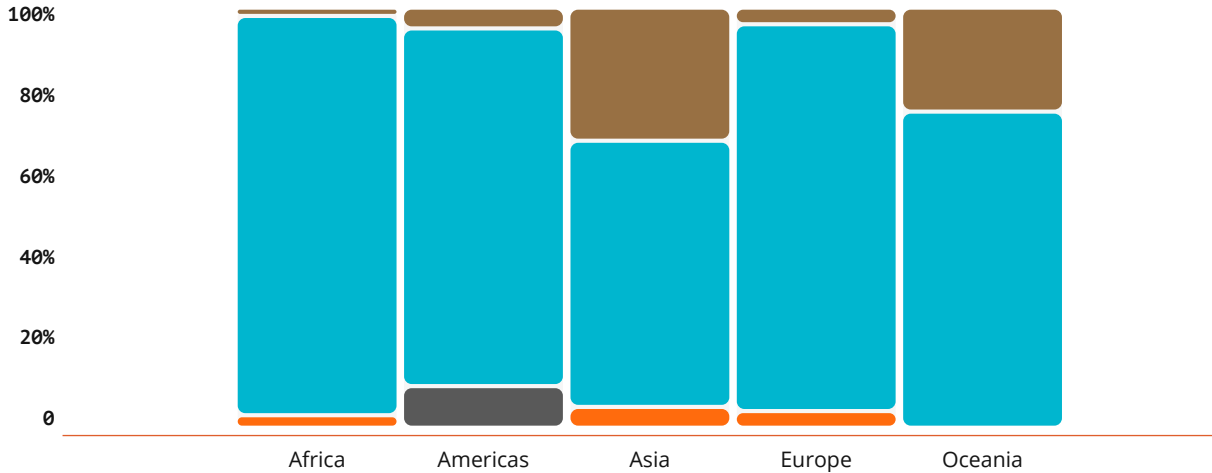
Supplier Sub-regional fuel mix

Fossil fuels



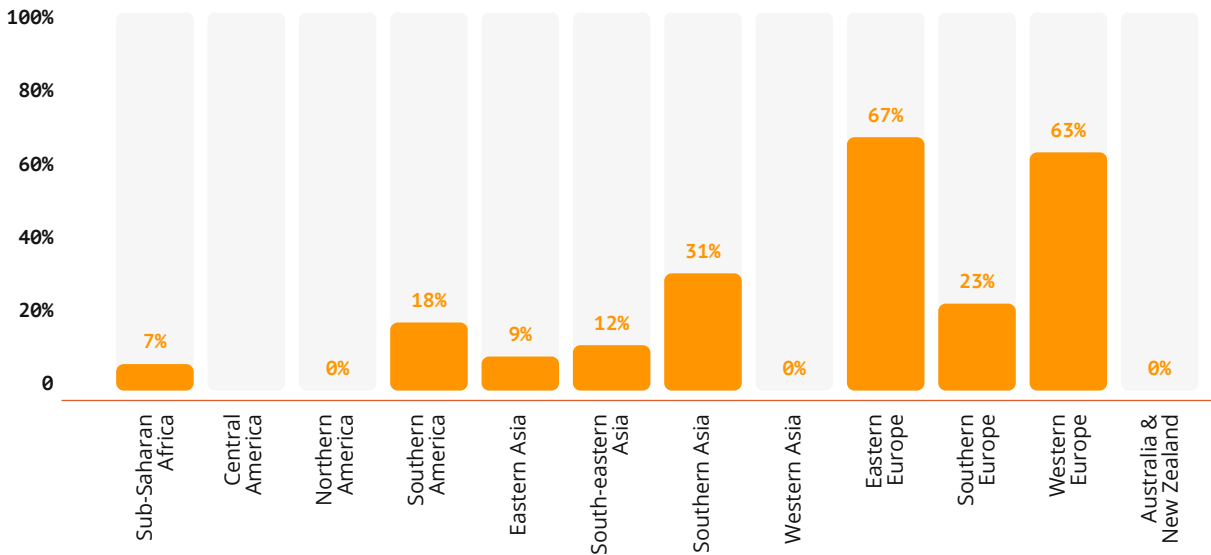
Supplier Regional fuel mix

Fossil fuels



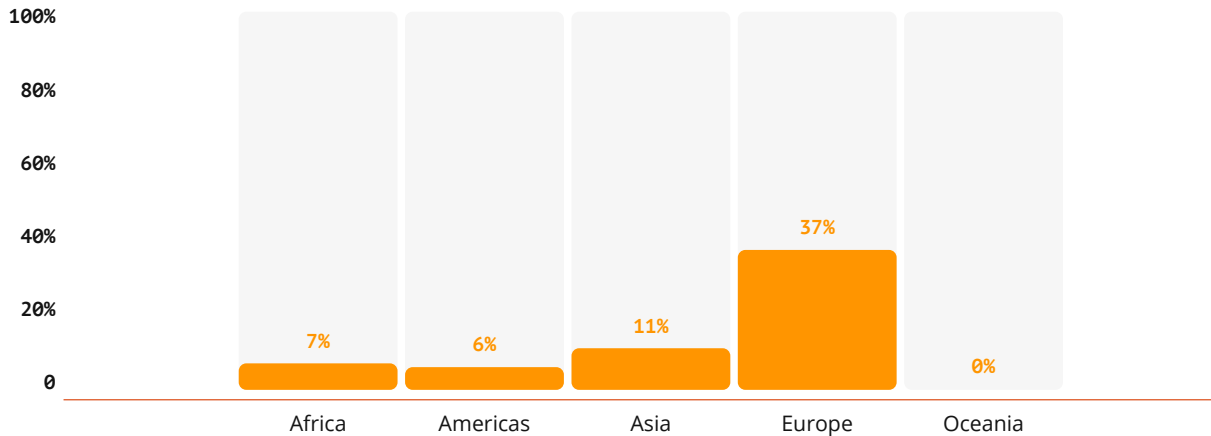
Renewable energy consumption across suppliers

Supplier sub-regional renewable energy consumption as percentage of total energy consumption



Europe has the highest renewable energy consumption, with Eastern and Western Europe sourcing around two thirds of their energy from renewables.

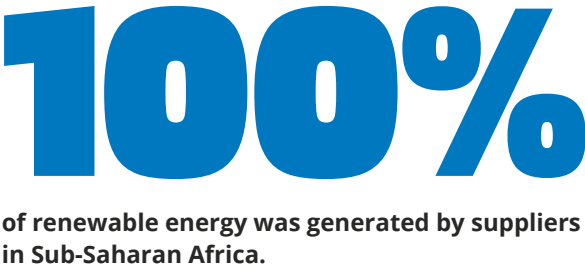
Supplier regional renewable energy consumption as percentage of total energy consumption



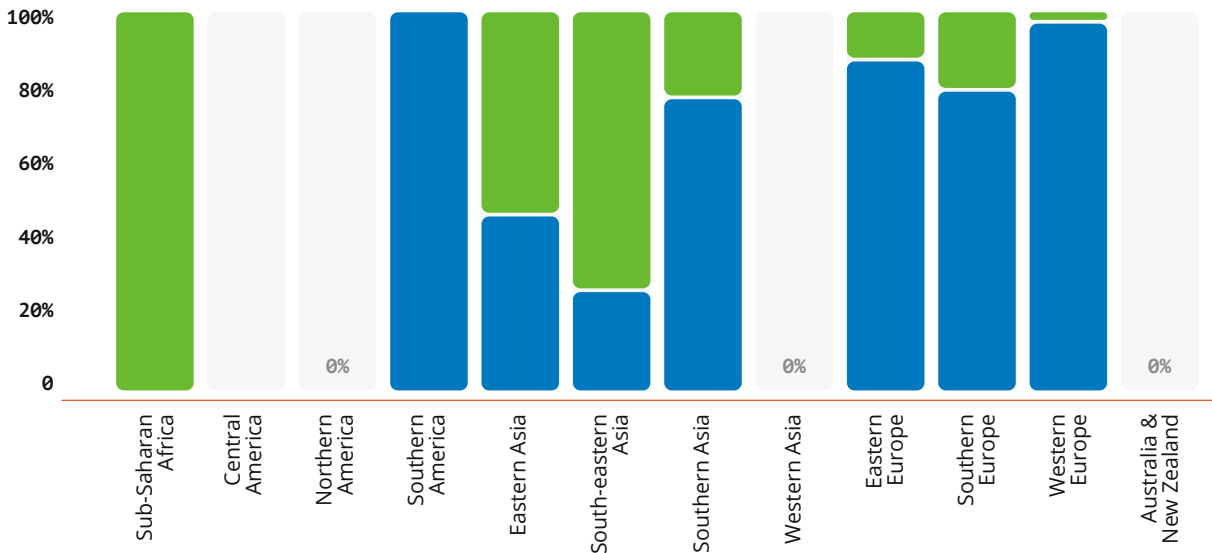
Europe demonstrates the highest integration of renewable energy. That said, the continued dominance of fossil fuels across most regions indicates that decarbonisation of energy sources remains a key opportunity for reducing emissions across print suppliers. The share of renewable energy consumption as a percentage of total energy consumption is trending upwards in most Asian regions, and it is encouraging that this will only continue to increase in the coming years.

Mix between purchased and generated renewable energy across suppliers

The majority of suppliers who submitted an EQ in 2024 purchase their renewable energy rather than generating it themselves, with the exception of Sub-saharan Africa and South-eastern Asia. In Southern America suppliers purchased 100% of their renewable energy, whilst in Sub-Saharan Africa suppliers generated 100% of their renewable energy.

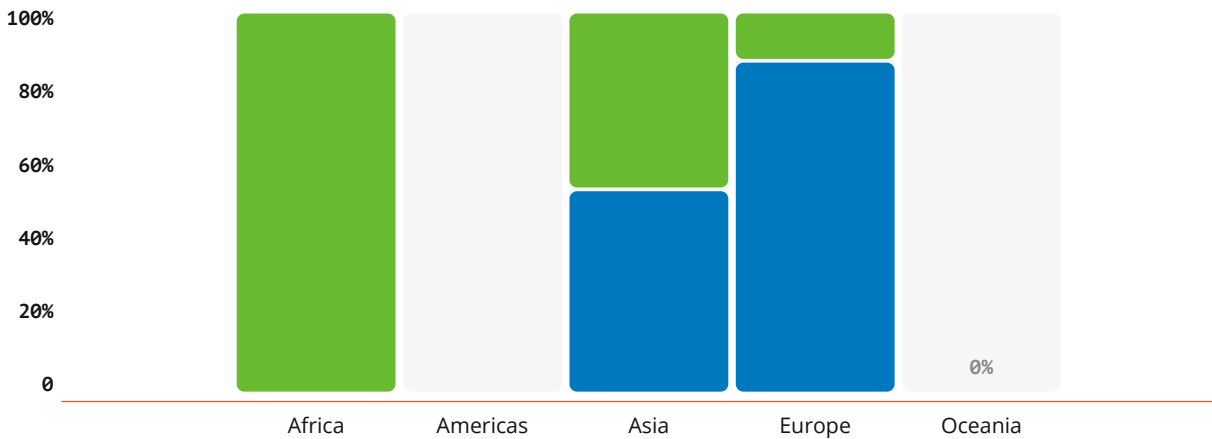


Supplier sub-regional renewable energy consumption as percentage of total energy consumption



Supplier Regional fuel mix

Fossil fuels



Water

Water intensity per tonne of pulp, paper and paper board produced

Water plays a crucial role in forestry and the production of pulp and paper. According to the [UN World Water Development Report](#), Industry, which includes the pulp and paper industry, is responsible for just under 20 percent of global water withdrawals. With global temperatures rising and water scarcity increasing, attention on water withdrawal and usage is increasing.

Mills

Water intensity across mills

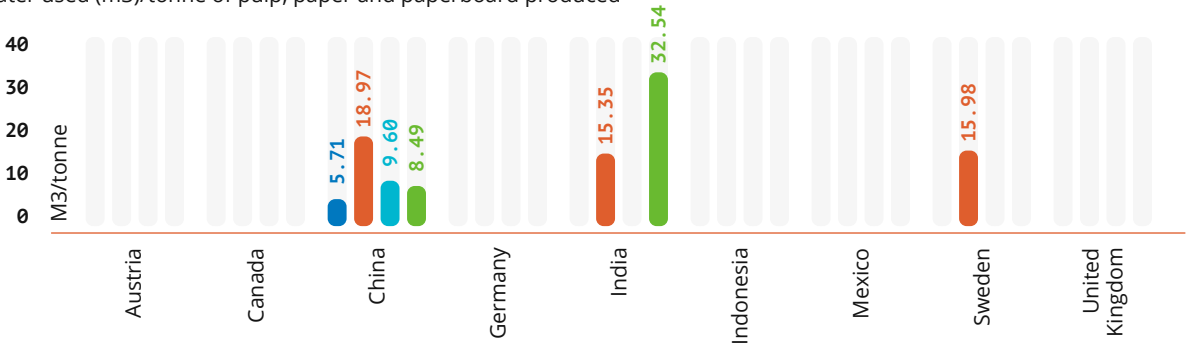
As expected, fully integrated mills generally report higher water intensity than non-integrated mills, with the exception of sites in Asia. This regional variation is largely influenced by a number of Chinese mills reporting significantly lower water intensities compared to those in other geographies.

Several factors may contribute to these lower intensities. Many of these mills have implemented water reduction initiatives, including water recycling and reuse mechanisms, which may be driving improved performance. However, differences in methodology may also play a role, as there appears to be less consistency in the scope and boundary of water consumption metrics compared to more standardised indicators such as greenhouse gas emissions.



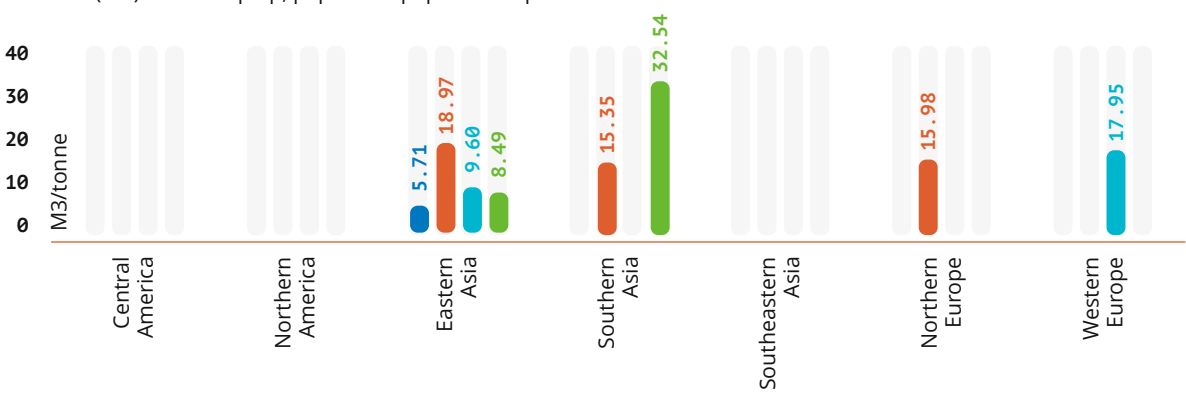
Country

Water used (m3)/tonne of pulp, paper and paperboard produced



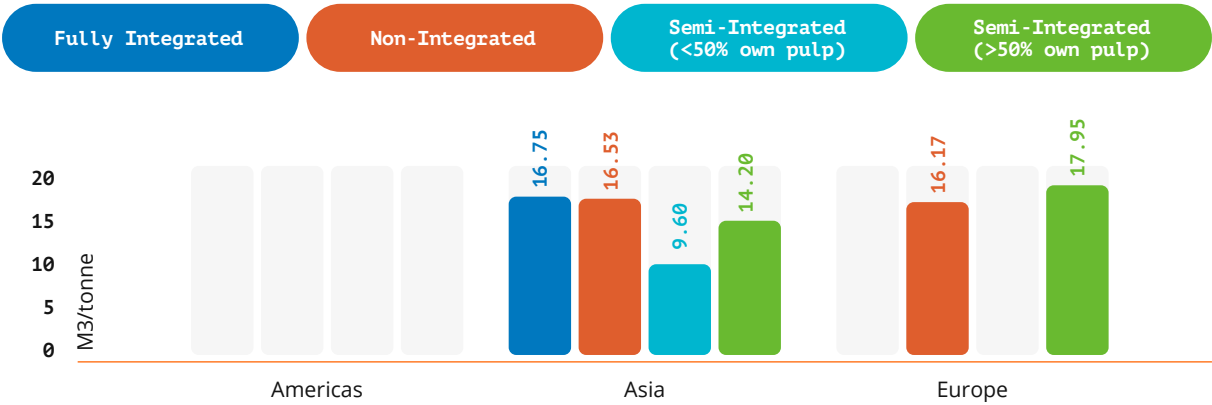
Sub Region

Water used (m3)/tonne of pulp, paper and paperboard produced



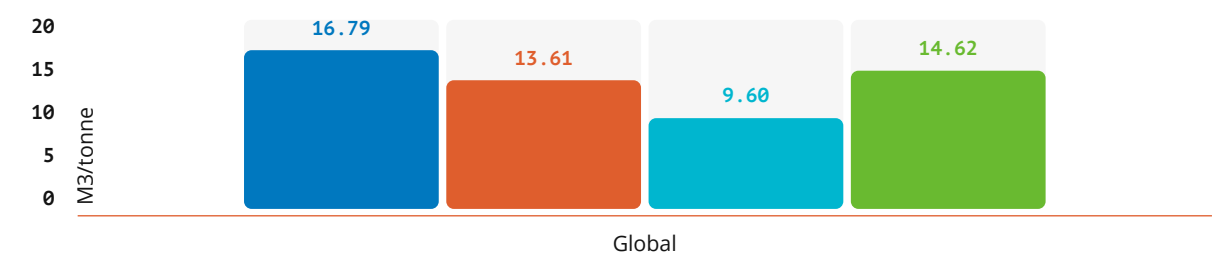
Region

Water used (m3)/tonne of pulp, paper and paperboard produced



Global

Water used (m3)/tonne of pulp, paper and paperboard produced



Mill water reduction measures

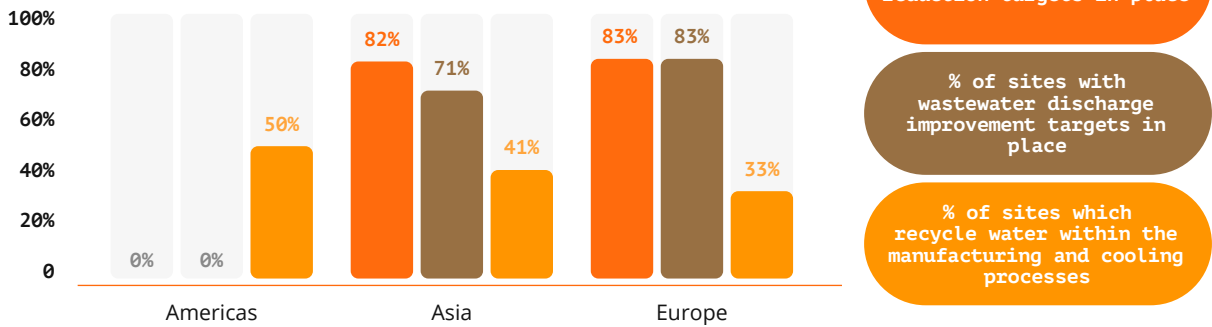
Water-related measures are being implemented by mills across all regions. Water reduction targets are widely established in Europe and Asia, with a primary focus on reducing freshwater use through the implementation of water reuse and recycling initiatives.

Water reduction is closely linked to the extent of water recycling within production and cooling processes. Mills in Europe (33%), Asia (41%) and the Americas (50%) report recycling water within these processes, contributing to comparatively higher levels of water efficiency.

Improving the quality of wastewater discharge remains a key area of focus. Over half of mills across Europe and Asia have established targets in this area within the dataset of this report, supported by actions such as the adoption of advanced treatment technologies and upgrades to wastewater treatment infrastructure. Notably, no mills in the Americas report having wastewater discharge improvement targets in place.

Global

Water measures across supplier sites



Water Intensity per tonne of paper used in the production of books, journals and/or other paper products

Suppliers

Water intensity across suppliers

There is minimal variation in water intensity across regions, although the previously observed trend of Asia having the highest water intensity does not persist in the 2024 data in this report. Instead, Africa (8.52 m³/tonne) report the highest water intensities among print suppliers, followed by Asia (4.12m³/tonne).

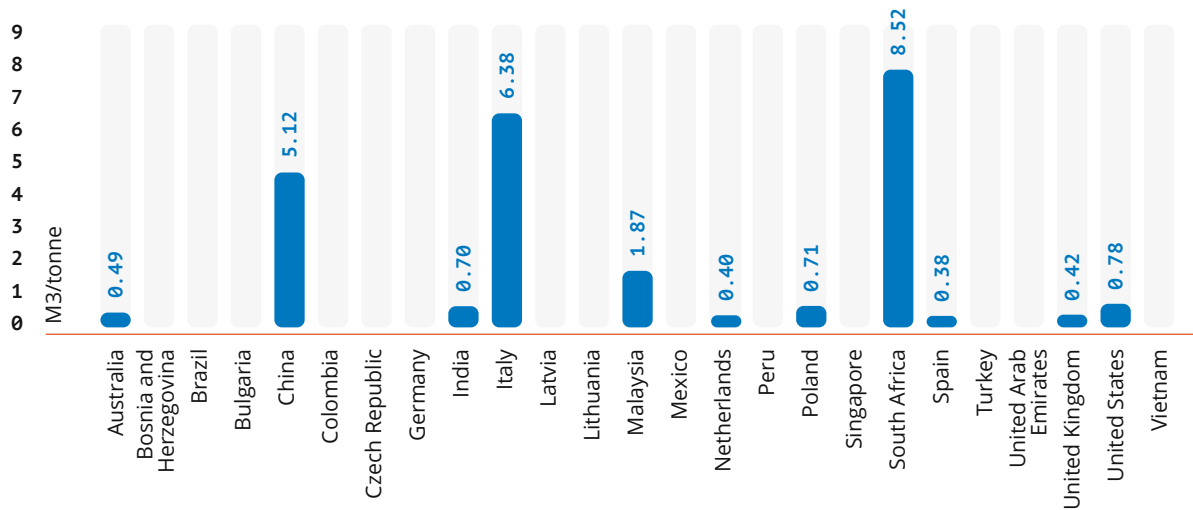
Europe reports a comparatively lower water intensity (2.79m³/tonne) than in previous findings,

suggesting the continued implementation of water reduction targets and efficiency measures observed across the region is bearing fruit.

Oceania and the Americas stands out as a clear outlier, with significantly lower water intensity (0.49 m³/tonne) and (0.63m³/tonne) compared to all other regions. This may indicate more efficient water management practices or differences in production processes, although the extent of this variance suggests that further investigation into methodology and reporting scope may be required to ensure comparability.

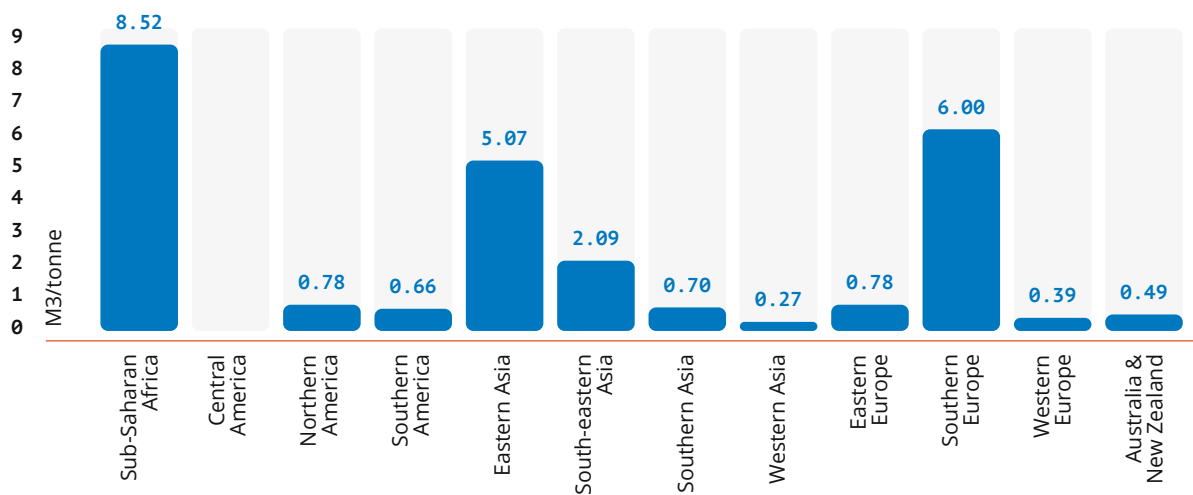
Country

Water used (m3)/tonne of pulp, paper and paperboard produced



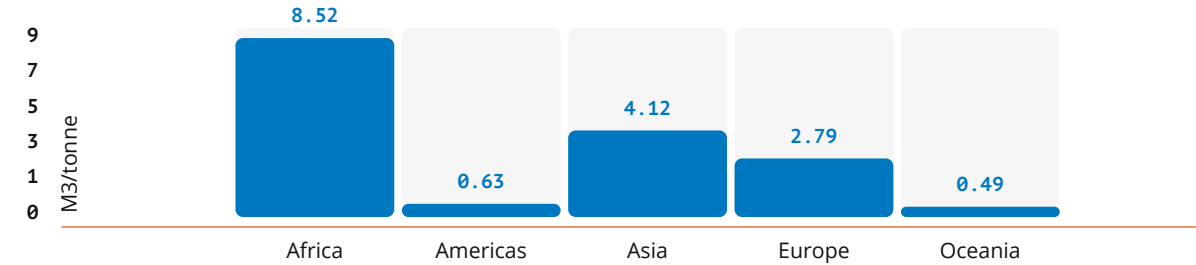
Sub Region

Water used (m3)/tonne of pulp, paper and paperboard produced



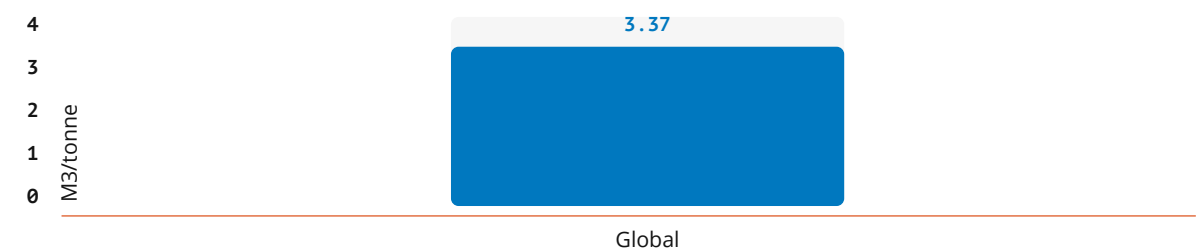
Region

Water used (m3)/tonne of pulp, paper and paperboard produced



Global

Water used (m3)/tonne of pulp, paper and paperboard produced



Suppliers water reduction measures

Water measures continue to be implemented across all regions in 2024, although clear regional differences remain. Suppliers in Asia continue to demonstrate the highest uptake of both water reduction targets (74%) and wastewater discharge improvement targets (60%), indicating a sustained focus on managing water use and discharge quality.

Suppliers in Europe show more moderate uptake of water reduction targets (24% respectively), with limited adoption of wastewater discharge targets—particularly in Europe, where only 12% are reported, and the Americas where no wastewater discharge targets are reported. This suggests slower progress in more advanced water management practices compared to Asia and Oceania.

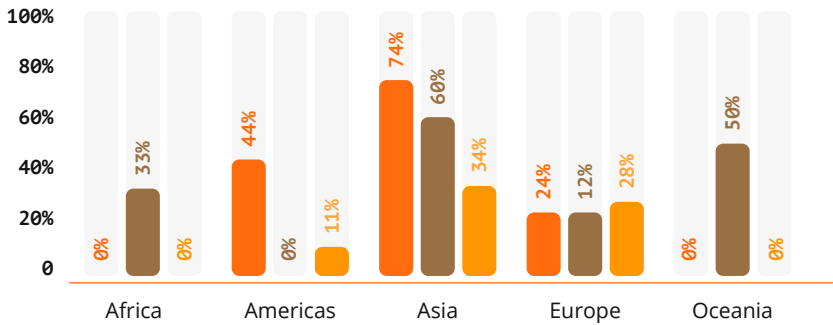
Oceania presents a different approach, with no suppliers reporting water reduction targets but 50% setting wastewater discharge improvement targets. This indicates a more targeted focus on water quality rather than overall reduction.

Water recycling remains less widely adopted. While uptake is present in Asia (34%) and Europe (28%), it is minimal in the Americas (11%) and absent in Africa and Oceania. This highlights a gap between target-setting and the implementation of operational water efficiency measures.

Overall, while engagement with water targets—particularly in Asia—is strong, the uptake of more practical measures such as recycling remains uneven, suggesting further progress is needed to move towards more integrated water management.

Global

Water measures across supplier sites



% of sites with water reduction targets in place

% of sites with wastewater discharge improvement targets in place

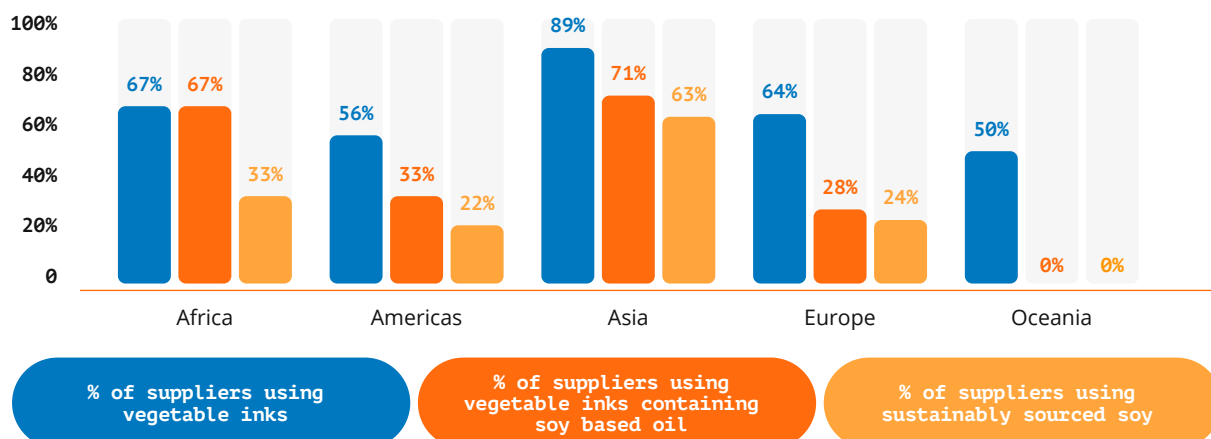
% of sites which recycle water within the manufacturing and cooling processes

Material use and waste

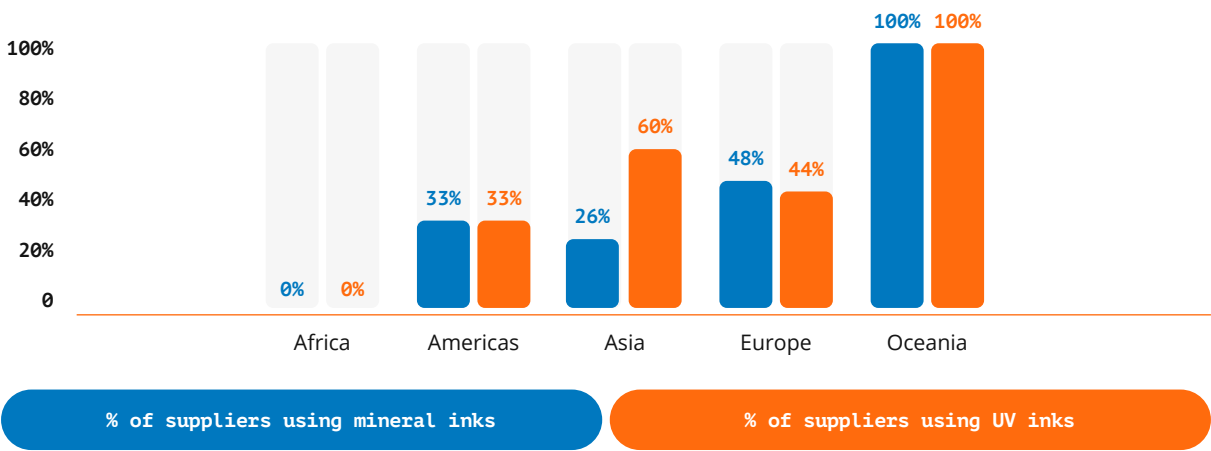
Ink

- Ink use remains a key material consideration for print suppliers, with notable regional variation in both ink types and associated environmental profiles. Mineral and UV inks continue to dominate globally, with particularly high usage of Ultra Violet (UV) inks across most regions. For example, UV ink use exceeds mineral ink use in Asia, while Europe, the Americas and Oceania reports broadly similar levels of both. Oceania demonstrates the highest overall uptake, with all suppliers reporting the use of mineral, UV and vegetable-based inks, suggesting a more diversified approach to ink selection, potentially driven by regulatory or customer requirements.
- From an environmental perspective, mineral (petroleum-based) inks are typically associated with higher impacts due to their reliance on non-renewable fossil fuels, higher Volatile Organic Compounds (VOC) emissions, and limited biodegradability. In contrast, vegetable-based inks—including soy-derived formulations—generally offer lower VOC emissions, improved recyclability through easier de-inking, and the use of renewable raw materials. However, their overall benefit is dependent on the sustainability and traceability of feedstocks, which remains inconsistent across regions.
- The transition towards vegetable-based inks is evident but uneven. Adoption is highest in Oceania, Asia and Europe and more moderate in The Americas and Africa, while remaining relatively limited in the Americas. A significant proportion of vegetable inks contain soy-based oil, particularly in Asia and Africa, although claims of sustainable sourcing are largely self-declared and not yet supported by consistent verification. This highlights a current limitation in supply chain transparency and comparability.
- UV inks present a more mixed environmental profile. While they largely eliminate VOC emissions due to their solvent-free formulation and rapid curing process, they can be energy-intensive and are not inherently biodegradable. As a result, their overall environmental performance depends on production processes and application context.
- Overall, while there is some diversification in ink use—notably in regions such as Oceania—the continued dominance of mineral and UV inks suggests that lower-impact alternatives are not yet consistently adopted. The environmental advantages of vegetable-based inks are clear in principle but remain dependent on improved sourcing transparency and a more consistent, lifecycle-based approach to ink selection.

% of suppliers using vegetable ink



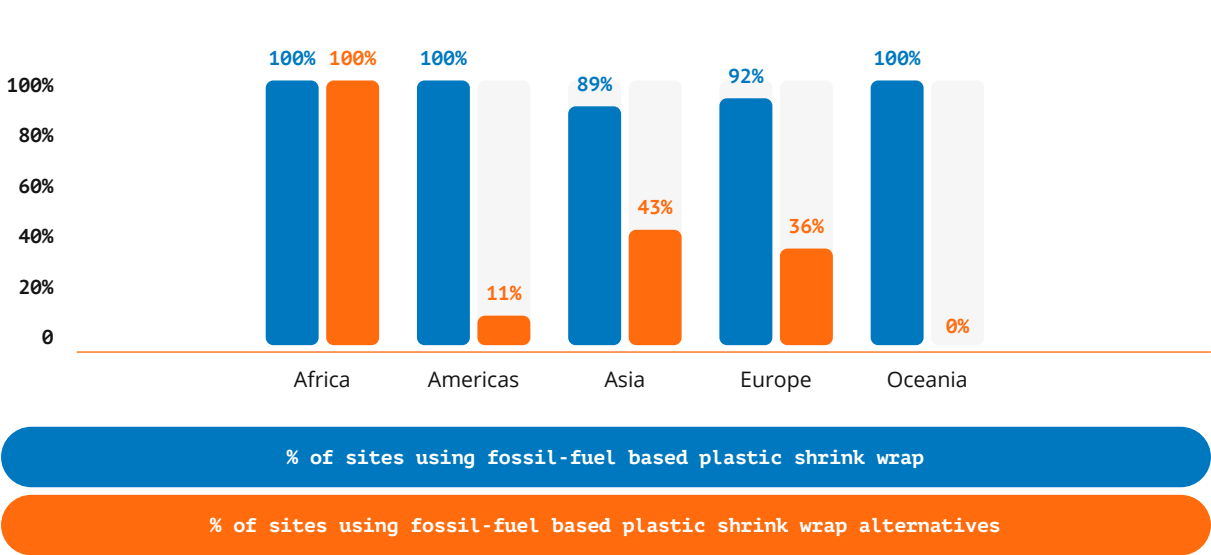
% of suppliers using mineral & UV inks



Shrink wrap

- Shrink wrap is widely used throughout the publishing industry. The most common form is fossil fuel-based single-use plastic, which contributes to the plastic pollution problem.
- Suppliers across all regions continue to rely heavily on fossil fuel-based single-use plastic, with usage levels remaining above 85% in all regions.
- Some print suppliers are adopting alternatives to fossil fuel-based plastic shrink wrap, such as kraft paper, cardboard, and bio-based plastic shrink wrap. For further detail on the associated trade-offs, refer to the [Plastics Guide for the Publishing Industry](#).
- The Africa region shows the highest uptake of alternatives to fossil fuel-based shrink wrap, followed by Asia and Europe. In contrast, no alternatives are reported in Oceania, and adoption remains limited in the Americas.

% of suppliers using fossil fuel based and fossil fuel based alternative shrink wrap



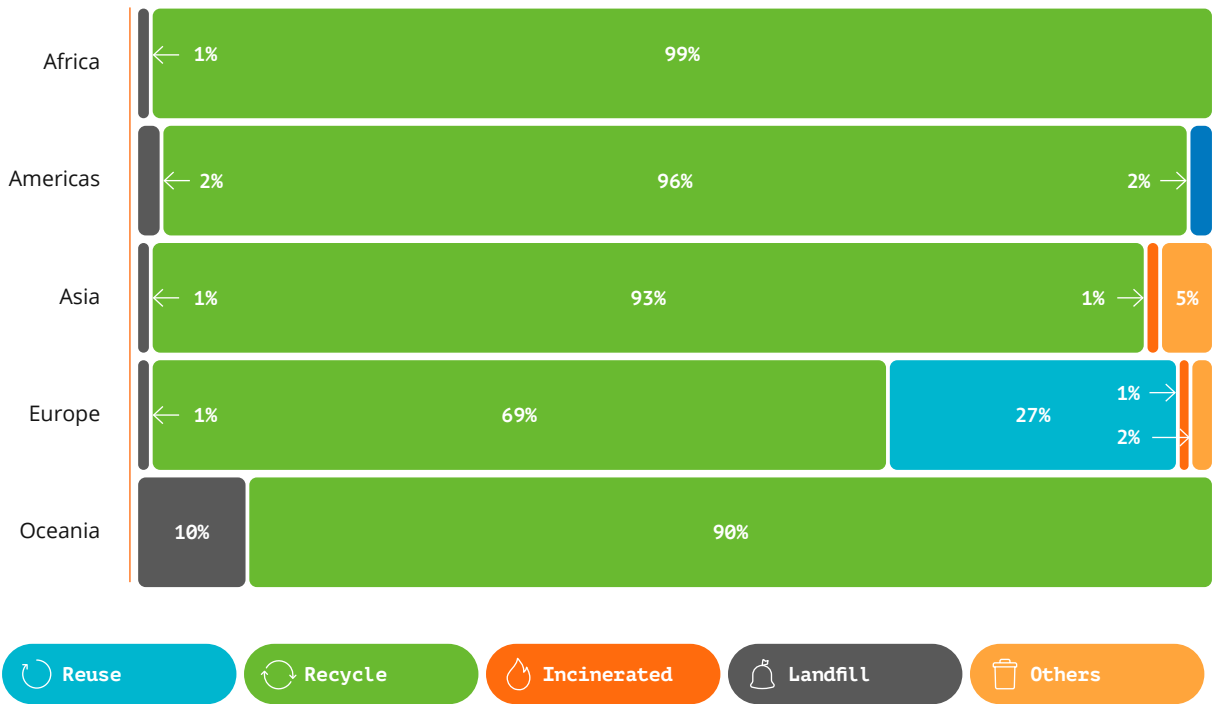
Waste

Non-hazardous waste

- The treatment and disposal of waste plays a key role in the environmental impact of paper products. Across all regions, the majority of non-hazardous waste is recycled.
- Suppliers in Africa (99%) and Oceania (90%) report particularly high recycling rates, for Oceania the remaining 10% of non-hazardous waste sent to landfill.
- In this report, a new trend has emerged in Europe, where several printers report reusing a substantial proportion of their non-hazardous waste, indicating a shift towards higher-value circular practices beyond recycling.
- Where waste is managed through alternative routes, this commonly includes materials being bought back or resold, suggesting some level of resource recovery and secondary market integration.



Treatment of non-hazardous waste by region



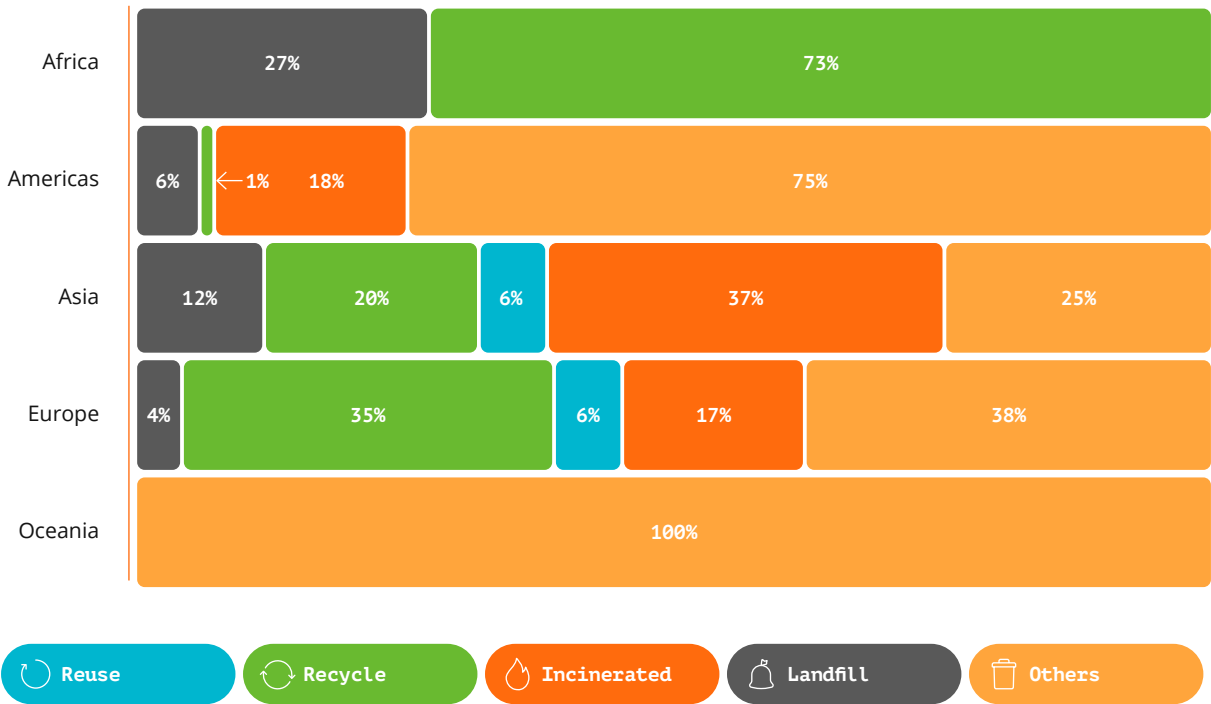
Hazardous waste

- Suppliers adopt a range of treatment methods for hazardous waste across regions, reflecting differing levels of infrastructure, regulation, and waste management practices. Hazardous waste is treated differently to non-hazardous waste, which is to be expected.
- Suppliers in Oceania report a singular approach, with all hazardous waste being managed through “other” treatment methods, likely indicating reliance on offsite specialist processing rather than in-house recycling or disposal routes.
- In contrast, suppliers in Africa predominantly recycle hazardous waste, with close to full reliance on this method. This suggests relatively strong recycling pathways for hazardous waste in this region compared to others.
- Asia and Europe demonstrate more diversified treatment approaches. In Asia, incinerated and landfill remains a significant pathway, but this is complemented by recycling, reuse, and other treatment methods, indicating a mixed level of waste management maturity. Europe shows a similarly varied distribution, with hazardous waste being managed across recycling, incineration, landfill, and external treatment routes, suggesting a more integrated and flexible waste management framework.



- Suppliers in the Americas also rely heavily on “other” treatment methods, alongside some landfill and reuse, but report limited use of recycling or incineration. This may indicate a preference for outsourcing hazardous waste management rather than internal treatment or recovery.
- Overall, while some regions are adopting a range of treatment methods, others remain reliant on single disposal pathways, particularly landfill or external processing, highlighting significant regional variation in hazardous waste management practices.

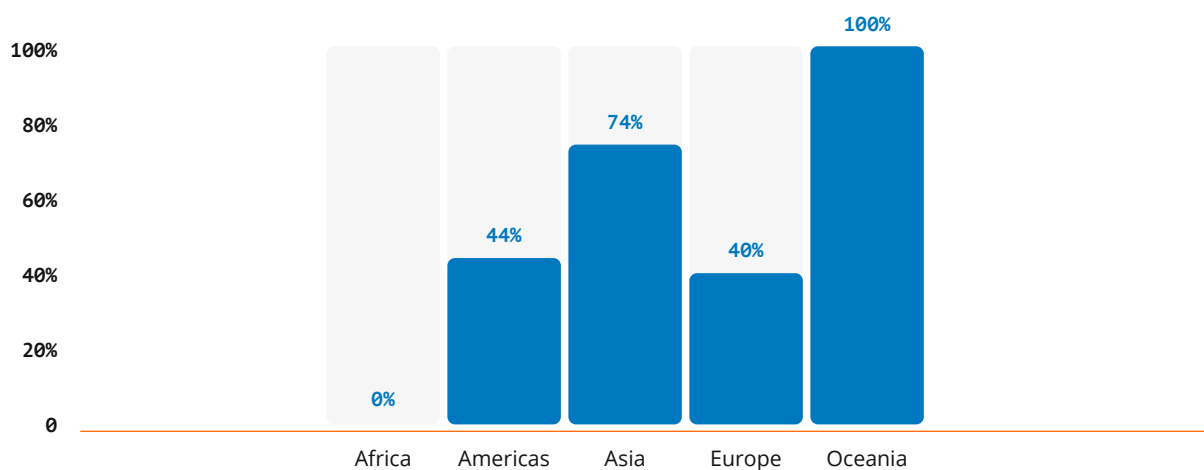
Treatment of hazardous waste by region



Waste reduction projects

- Over half of suppliers in all regions, except for Africa and Europe, have waste reduction projects in place.
- Projects include: the better sorting of recyclable materials, switching from plastic to other alternatives including paper, the reduction of hazardous waste, using more digital technology during production to improve material and process efficiency and buying back used materials.

% of suppliers with a waste reduction programme in place



100%

of suppliers in Oceania have a waste reduction programme in place



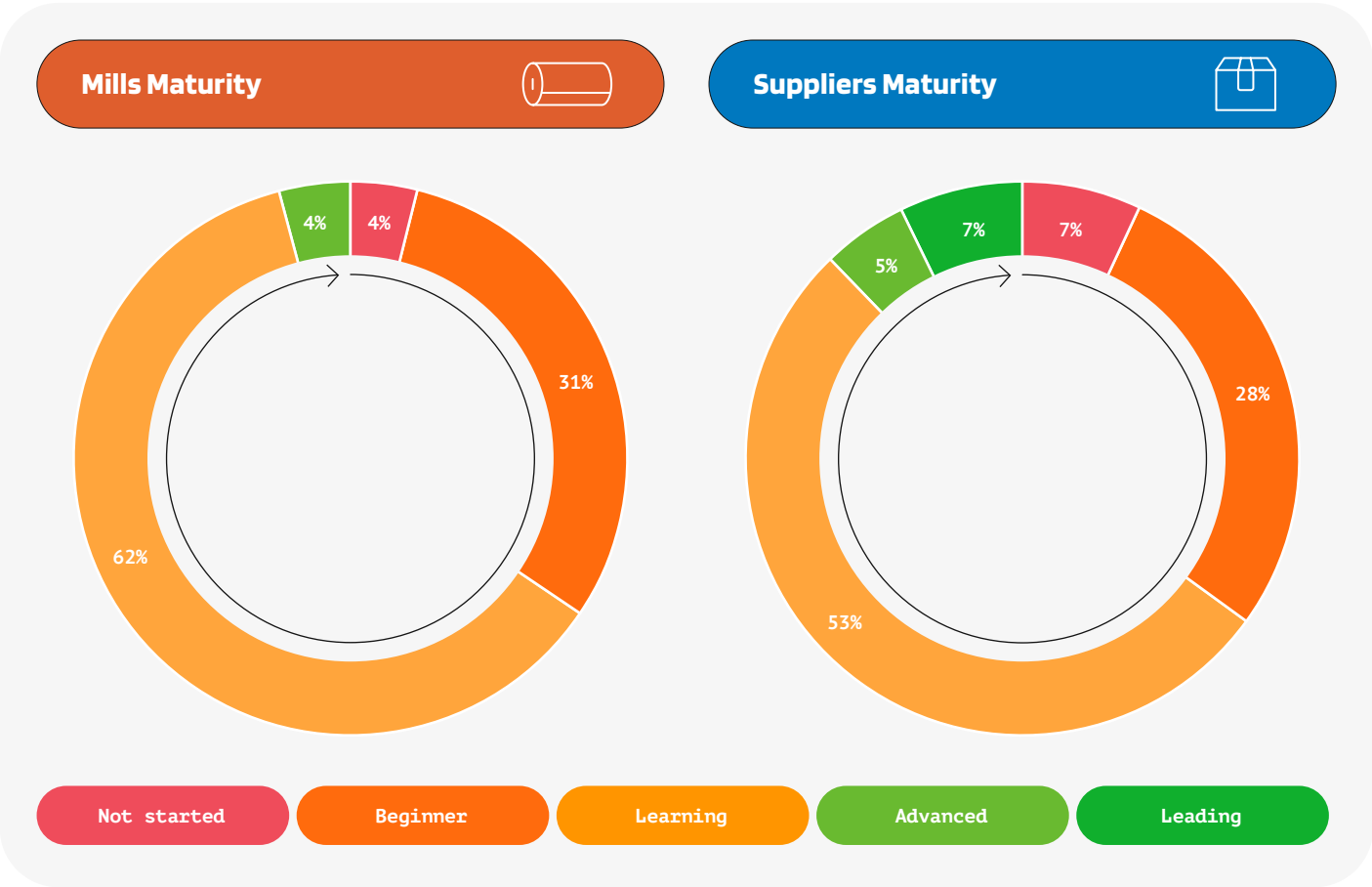
Maturity

The [BCP Maturity Model](#) seen below describes how mature a site is in tracking, reporting, and managing their GHG footprint through the BCP EQ. Each mill and supplier is assigned a maturity rating based on the information provided within the EQ.

This rating can be used by publishers to assess and compare environmental maturity of all mills and suppliers within the Book Chain database. It is also designed to be a pathway for mills and suppliers to develop their capabilities in how they measure and manage their environmental impacts and implement best practice.



Not started



The maturity profiles show some divergence between mill and supplier sites in 2024, although both groups continue to be concentrated in the early to mid-stages of the BCP maturity ladder.

For mill sites, the majority are positioned at the Learning stage (62%), with a further 31% at Beginner level. This indicates that most mills have progressed beyond basic environmental data collection and are now reporting Scope 1 and 2 emissions and setting associated targets. However, only a small proportion of mills have advanced beyond this stage, with just 4% classified as Advanced and 4% as Not Started, suggesting relatively limited progress towards more comprehensive environmental management practices. No mills are classified as Leading. Measuring Scope 3 emissions, and setting targets to reduce those emissions, is the main blocker preventing mills from moving up the maturity ladder.

4%

of mill sites are classified as Advanced level maturity



Supplier sites show a slightly more distributed maturity profile. While Learning remains the largest category (53%), a lower proportion of suppliers remain at the Beginner stage (28%) compared to mills. Encouragingly, suppliers demonstrate a marginally greater presence at higher maturity levels, with 5% classified as Advanced and 7% as Leading. This is mainly explained by a higher share of suppliers measuring Scope 3 emissions and adopting Scope 3 reduction targets, although it is still a small minority of suppliers overall.

Conclusion

This third iteration of the BCP Environment Report builds on previous analyses to provide an overview of the state of environmental performance across the publishing supply chain. The findings highlight important regional and sub-regional variations across key indicators, including greenhouse gas emissions, energy use, water intensity, material choices and waste management practices. While progress is evident in areas such as renewable energy adoption, improved wastewater management, and increasing engagement with environmental target-setting, the data also shows that performance and maturity remain uneven. In particular, differences in access to infrastructure, resource availability, and regulatory drivers continue to shape how mills and suppliers manage their environmental impacts across geographies.

Encouragingly, the report also demonstrates that action is being taken across the industry. Increasing uptake of renewable energy—particularly biomass and onsite generation—alongside emerging shifts towards more circular practices such as water reuse and waste diversion, indicate that environmental considerations are becoming more embedded within operational decision-making. At the same time, greater transparency on Scope 1, 2 and 3 emissions, driven in part by evolving regulatory expectations, is supporting more robust carbon accounting and highlighting priority areas for decarbonisation. However, challenges remain, particularly in relation to Scope 3 measurement and the implementation of more advanced practices such as water recycling, low-impact material substitution, and energy diversification.

Looking ahead, there is a clear opportunity to build on this progress. As demonstrated throughout the report, improving environmental performance will depend on greater collaboration across the value chain, continued investment in low-carbon technologies, and more consistent adoption of best practices. The BCP platform remains uniquely placed to support this transition by providing a robust dataset for benchmarking and enabling suppliers and publishers to identify where improvements can have the greatest impact. Strengthening data quality and closing existing gaps will be critical to this effort, ensuring that the industry can both track progress and accelerate the shift towards more sustainable and resilient supply chains.

Increasing uptake of renewable energy alongside emerging shifts towards more circular practices indicate that environmental considerations are becoming more embedded within operational decision-making



Appendix



Links to further resources

The Book Chain Project GHG Emissions Calculation: Guidance for the Publishing Industry

<https://bookchainproject.com/resource?resource=525>

Book Chain Project Environment Report 2022-23

<https://bookchainproject.com/viewResource?resource=579>

Book Chain Project Home

<https://bookchainproject.com/home>

The GHG Protocol Corporate Accounting and Reporting Standard

<https://ghgprotocol.org/corporate-standard>

Confederation of European Paper Industries ten toes report

<https://www.cepi.org/wp-content/uploads/2021/02/ENV-17-035.pdf>

Science Based Targets Initiative Home

<https://sciencebasedtargets.org/>

Appendix

Data points for mills and suppliers

The number of data points used to inform the data for each country, sub-region and region are outlined in the tables below. The tables indicate how many sites have been used to inform the data that is presented in the report. As the cut off point for including the data was two sites, anything below that has been excluded the analysis to ensure that all averages were representative of a country, sub-region or region. However, where a data point has been included at one level (e.g. at country-level), it may have been included at a more aggregated level (e.g. at sub-region or region level). This was to ensure that the report made best use of the data.

Mills

Country	Fully Integrated	Semi-Integrated (> 50% own pulp)	Semi-Integrated (< 50% own pulp)	Non-Integrated
Austria	-	-	-	1
Canada	1	-	-	-
China	4	2	3	2
Germany	-	1	-	-
India	1	2	-	2
Indonesia	1	-	-	-
Mexico	-	-	-	1
Sweden	1	-	-	2
United Kingdom	-	1	-	-

Sub-region	Fully Integrated	Semi-Integrated (> 50% own pulp)	Semi-Integrated (< 50% own pulp)	Non-Integrated
Central America	-	-	-	1
Northern America	1	-	-	-
Eastern Asia	4	2	-	-
Southern Asia	1	2	-	2
South-eastern Asia	1	-	-	1
Northern Europe	1	-	-	2
Western Europe	-	2	-	1

Region	Fully Integrated	Semi-Integrated (> 50% own pulp)	Semi-Integrated (< 50% own pulp)	Non-Integrated
Americas	1	-	-	1
Asia	7	4	3	4
Europe	1	2	-	3

Suppliers

Country	Printer
Australia	2
Bosnia and Herzegovina	1
Brazil	1
Bulgaria	1
China	20
Colombia	1
Czech Republic	1
Germany	1
India	6
Italy	7
Latvia	1
Lithuania	1
Malaysia	4
Mexico	1
Netherlands	2
Peru	1
Poland	3
Singapore	1
South Africa	3
Spain	3
Turkey	1
United Arab Emirates	1
United Kingdom	4
United States	4
Vietnam	1

Sub-region	Printer
Sub-saharan Africa	3
Central America	1
Northern America	4
Southern America	3
Eastern Asia	21
South-eastern Asia	5
Southern Asia	6
Western Asia	2
Eastern Europe	8
Southern Europe	10
Western Europe	7
Australia & New Zealand	2

Region	Printer
Africa	3
Americas	2
Asia	25
Europe	29
Oceania	3





Get in touch with the team to find out more about the Book Chain Project.

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