The Book Chain Project

# ENVIRONMENT REPORT 2020-2021

# INTRODUCTION



Climate change is a leading concern for all businesses, including those in the publishing industry.

# WHAT IS THE BOOK CHAIN PROJECT?

The Book Chain Project (BCP) is a collaboration of over 25 publishers, 300 paper mills and 300 first-tier suppliers to make the supply chains of printed books and journals more sustainable. It started life in 2006, partly in response to the Greenpeace report *'The Paper Trail'* which shone a 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.
We also developed a risk tool and a grading system to assess deforestation risk.

Since then, our work has expanded into three workstreams:

**Chemicals & Materials**, where we gather and screen Bills of Materials against chemical safety legislation, support publishers to design for sustainability and make better material choices, including alternative inks and packaging materials.

**Forest Sourcing**, where we engage with paper mills around forest sources, environmental performance, and responsible sourcing, covering forestry, trade, biodiversity and species risks.

**Labour & Environment**, where we engage with tier 1 suppliers (mainly printers) around social audits, environmental performance, and specific topics such as responsible recruitment and Health & Safety.

Publishers use the Book Chain Project to make informed buying decisions.

# ENVIRONMENTAL QUESTIONNAIRE (EQ)

The EQ sits within the Forest Sourcing and Labour & Environment workstreams. It is a self-assessment questionnaire that mills and suppliers complete on the BCP system. It asks questions to establish their environmental performance, in terms of policies, management systems, energy use, greenhouse gas emissions, water use, wastewater treatment, and material use and disposal.
It allows mills and suppliers to provide information to all publishers that they are working with, or who are interested in working with them in the future, by answering a single questionnaire, thereby reducing the reporting burden.


## This report was written by

**Victoria Smith** - Junior Partner, Carnstone
**Sian Leake** - MBA Placement Intern, Carnstone
**Daniel Witte** - Partner Manager, Carnstone and Environmental Questionnaire Lead, Book Chain Project



## Produced by

The Book Chain Project, an initiative run by Carnstone Partners Ltd.

# WHY CLIMATE CHANGE IS IMPORTANT FOR THE PUBLISHING INDUSTRY

Climate change is a leading concern for all businesses, including those in the publishing industry. As Greenhouse Gas (GHG) emissions continue to rise, and our planet continues to warm, the negative environmental consequences are becoming increasingly clear. This is leading policymakers, investors, and consumers to act through enacting new policies such as the Taskforce for Climate-Related Financial Disclosures; setting increased expectations such as for businesses to have Science-Based Targets; and favouring more environmentally friendly products. Pulp & paper is an energy intensive industry. It is the fourth largest industrial energy user in the European Union (EU)[1] and because of this, it has been the focus of efforts to reduce GHG emissions. Aside from the publishing industry's impact on the climate, it is also heavily reliant on many of the earth's resources, including forests and water to produce paper and minerals for its inks. Their vulnerability to climate change highlights the importance for all those within publishing supply chains to reduce their GHG emissions.

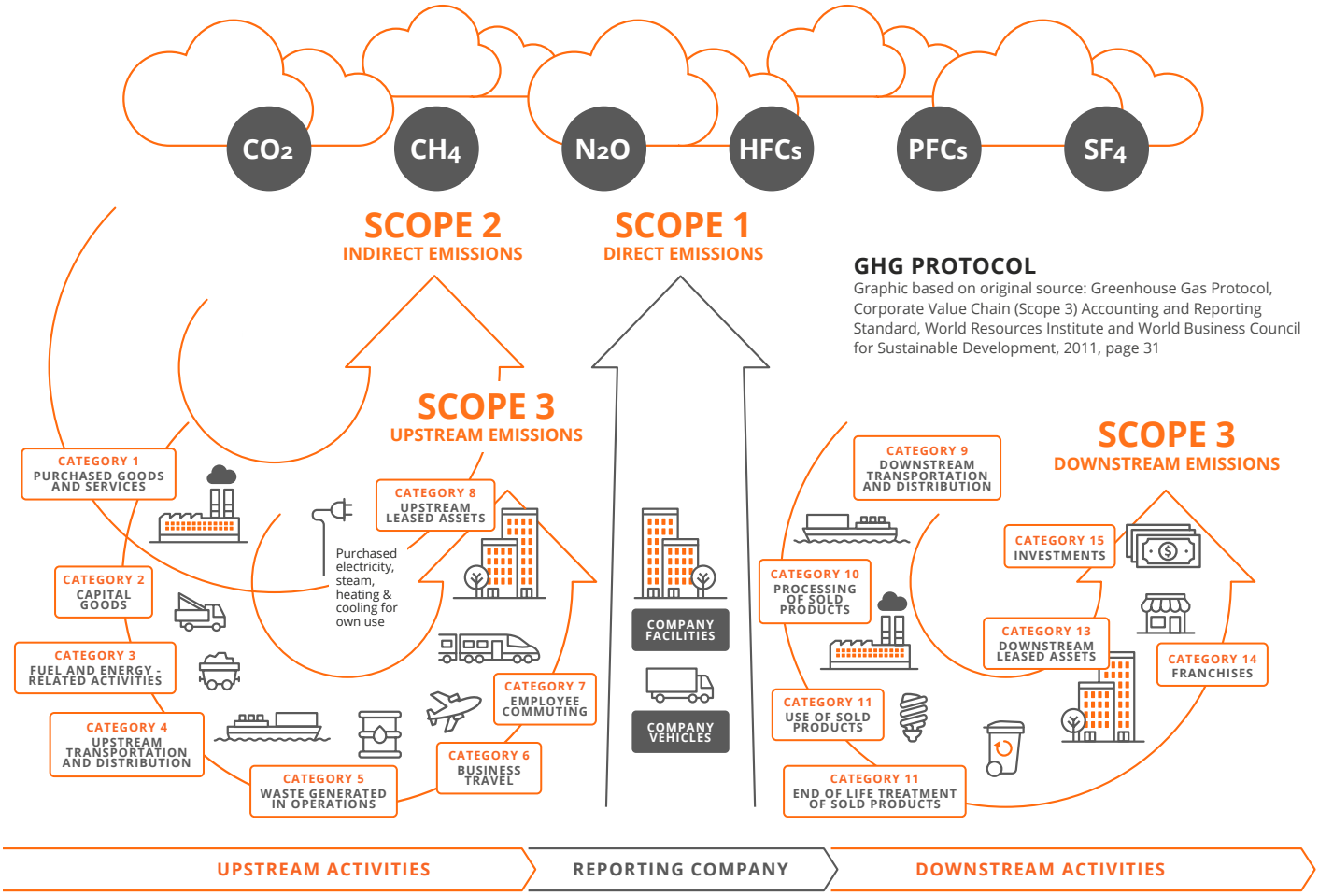
# WHY THIS REPORT

Many actors in the publishing industry are committed to measuring and reducing their impact on climate change. Measuring GHG emissions is done through Scopes 1, 2 and 3. Essentially, Scope 1 and 2 are those emissions that are owned or controlled by a company, whereas Scope 3 emissions are where a company is indirectly responsible and occur up and down its value chain (see figure below).

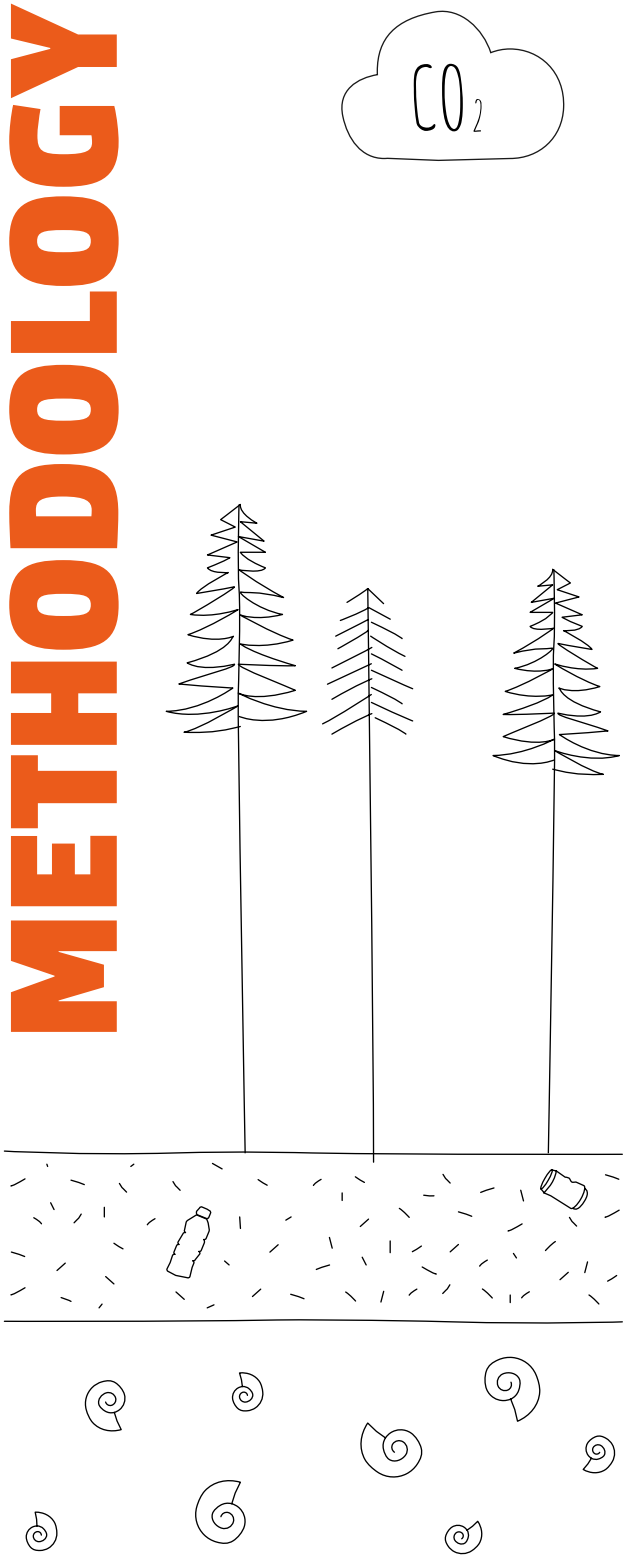
Having transparency over GHG emissions is a vital step in reducing these negative environmental impacts, however this can be challenging, particularly for Scope 3 emissions, as this relies on gathering data from those in the supply chain, including mills and suppliers. Mills and suppliers are at different maturity levels when it comes to gathering GHG data (particularly on Scope 3), and so it means that there are gaps in the data that is retrieved through the EQs.

This report has three aims: to enable publishers to calculate their Scope 3 emissions more accurately when using the EQs, by providing proxy emissions data; to enable publishers who do not have access to the Book Chain Project system to estimate their Scope 3 footprint; and to share best practices in environmental management across mills and suppliers.

[1] European Commission (2018) How EU pulp and paper industry can reduce greenhouse gas emissions



# METHODOLOGY




**The vulnerability of the forests and water used by the publishing industry to climate change highlights the importance for all those within publishing supply chains to reduce their GHG emissions.**

## DATA GATHERING PROCESS THROUGH THE EQ

For each reporting year, mills and suppliers are encouraged to submit an EQ onto the BCP system.

## CHECK AND REVIEW

The current format EQ was launched in 2020. There was an adaptation period, while mills and suppliers were getting used to the new EQs, when not all of the data being submitted was robust. In response, the BCP team has put a rigorous review process in place to check the data is robust and of good quality, consisting 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)
- **BCP admins** also sense-check the submitted questionnaires and follow a set list of questions for consistency. 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. If any issues are identified, the admins will contact the mill or supplier to check the data or get further information.
- Once the EQ has been accepted by the admin, it is **reviewed** by an experienced BCP colleague who has in-depth knowledge of environmental data. The EQ will then either be accepted on to the system or returned to the mill admin to follow up with further questions.

## GHG PROTOCOL AND CDP

The EQ was built in line with the GHG Protocol and Climate Disclosure Project (CDP) which offer best practice self-reporting guidance and standards, ensuring that the data collected within the EQs is suitable for reporting. The EQ was overhauled in 2020 to allow for more standardised reporting and to focus more on GHG emissions and climate impacts. We continue to identify emerging areas of focus in order to reduce the impact of the global paper and pulp industry.

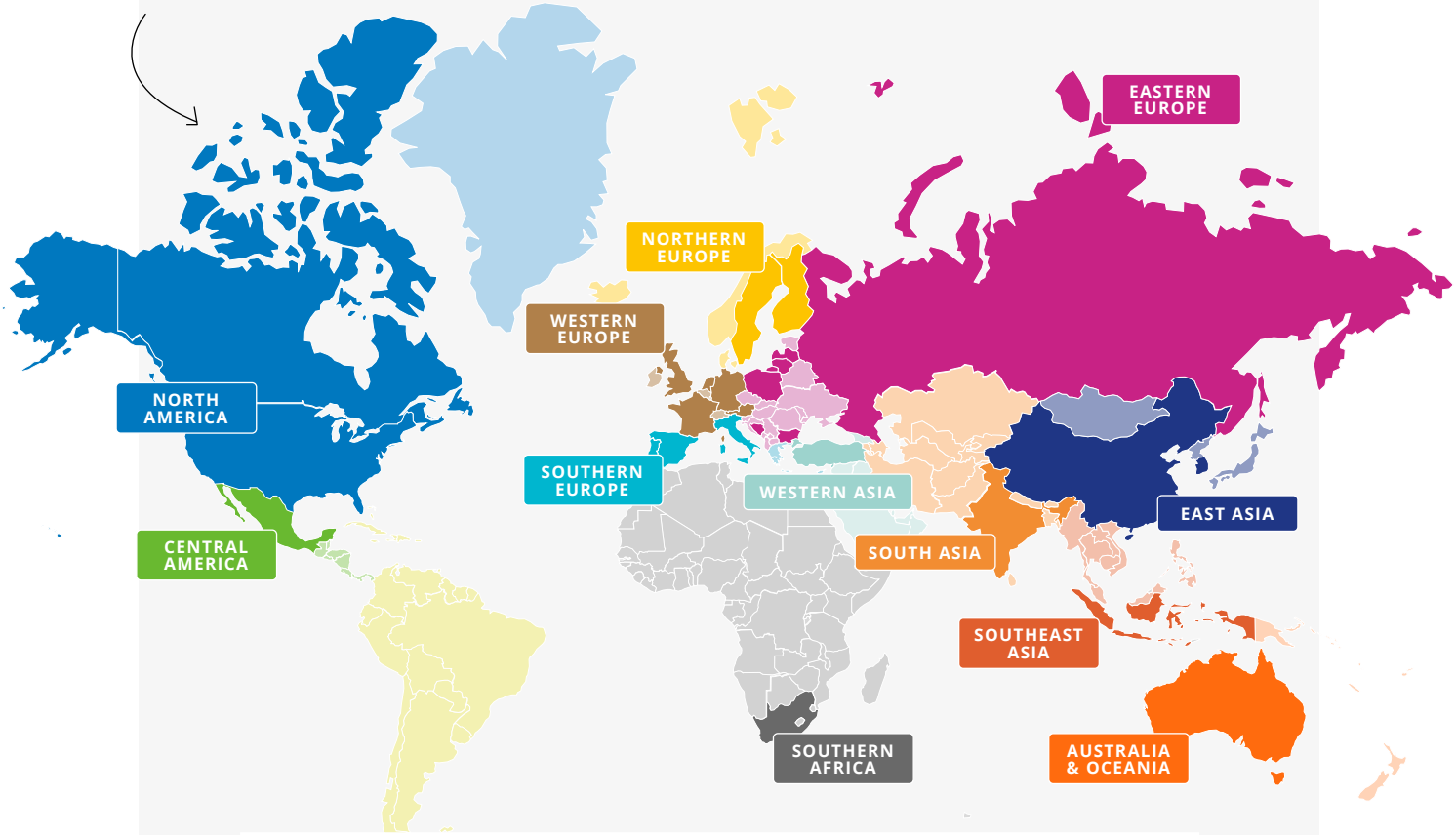
# THIS REPORT

This report includes data from the following reporting periods:

- **2020** (EQs covering the period **01/07/2019 – 30/06/2020**) As this period contains EQs from before the new checking processing was in place, the data from these EQs has been checked manually with any anomalies excluded from the analysis.
- **2021** (EQs covering the period **01/07/2020 – 30/06/2021**)

Any EQ data that was submitted after 04/07/22 has not been included within this report. The emissions data has been provided at three levels: country, sub-region (see map below) and region. There is currently no data covering South America, North Africa and the Middle East and therefore, these regions have not been included. We provide a data point if there are at least two EQs for that geography in that year (exceptions apply, see page 31). More information on the data points can be found in the Appendix on page 31. There are still some countries, sub-regions, and regions where we do not have enough data, particularly for 2021, to include them in the analysis. In this case, they have been marked with an asterisk* throughout the report. This will help us to identify which areas to target for EQ submission over the next BCP year. It's also important to note that the sample of mills and suppliers included in the 2020 and 2021 datasets are not the same, and therefore year-on-year comparisons should not be made. Such comparisons can only be made by looking at a specific site's data over time which is available on the BCP system.

**The emissions data has been provided at three levels: country, sub-region and region.**



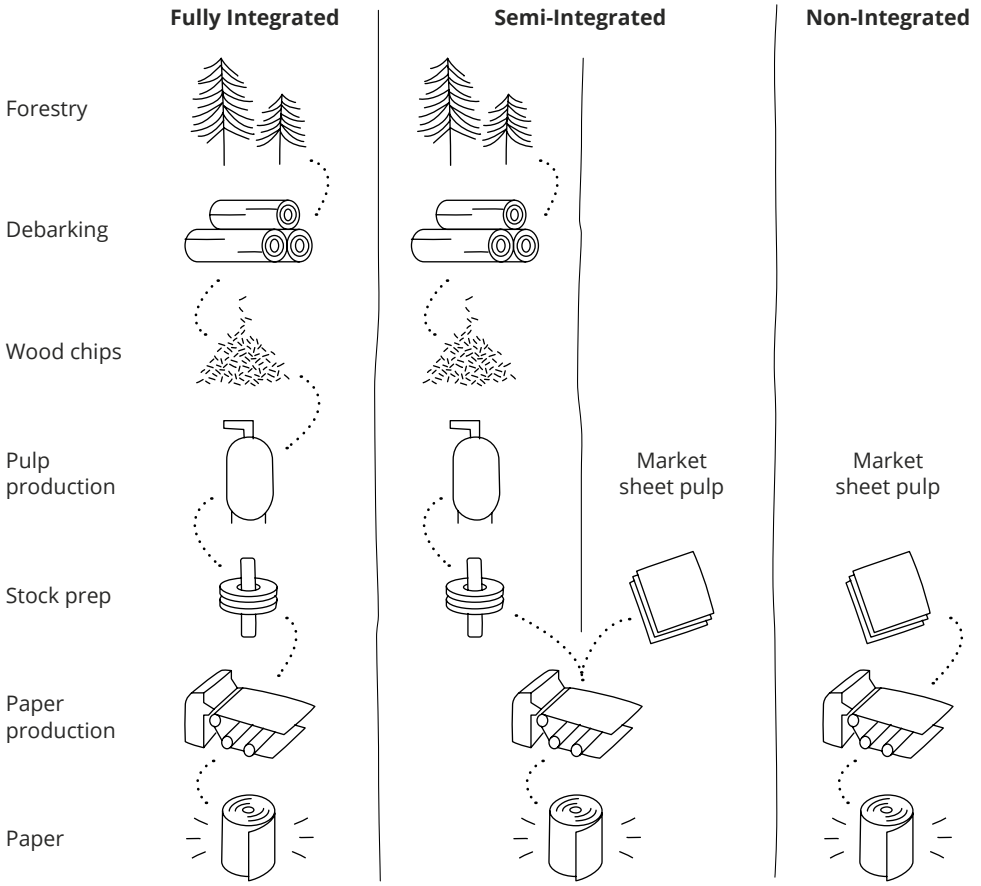

The bold colours signify that a country's data has been used to inform the sub-regional averages. The transparent colours indicate the countries that are included within the sub-regions but have not provided data. For those countries that are greyed out, there is no sub-regional data available.

# GHG EMISSION FACTORS FOR THE PUBLISHING INDUSTRY

## MILLS

### Scope 1 and 2 emission factors for mills

Through the EQ, mills are asked to share information on their emissions. This data is broken down into the fossil-fuels used in direct operations (Scope 1), purchased or generated electricity/renewable electricity (Scope 2) and activities in the supply chain (Scope 3). Based on the levels of Scope 3 data provided by mills, only Scope 1 and 2 emissions have been calculated. However, we have been able to calculate the global average for Scope 3 as a share of total emissions (%), which can be used to help estimate a Scope 3 figure.




We would expect to see fully integrated mills to have higher direct (Scope 1 and 2) emissions, as they are accounting for the pulp production process, whereas those emissions would (partially) sit in Scope 3 for semi- and non-integrated mills.
There are some instances where the emission factors are higher for non-integrated or semi-integrated mills. There could be various explanations for this; for example, the semi- or fully-integrated mills could have already invested more in energy efficiency or emission reduction; or are more GHG efficient due to a higher % of bioenergy used in the pulping process.

#### SCOPE 3 AS A SHARE OF TOTAL EMISSIONS

A small number of mills have reported a full Scope 3 footprint, according to the 15 categories of the Greenhouse Gas Protocol. Therefore, we have calculated the global average share that Scope 3 represents. This number 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 we have calculated for different geographies. For example, for a fully integrated mill from North America, the total Scope 1, 2 & 3 intensity would be calculated as follows: x/(1-y) whereby x is the Scope 1 and 2 intensity factor and y is the Scope 3 share of the total carbon footprint: 0.49/(1-0.73)=1.81 tonnes $CO_2e$ per tonne of paper produced. The Scope 1 & 2 intensity would be 0.49 tonnes $CO_2e$ per tonne of paper produced. The Scope 3 intensity would be 1.81- 0.49 = 1.32 tonnes $CO_2e$.

# GHG emissions

Benchmarked against the carbon intensity per year under a Below 2 Degrees scenario, from the Transition Pathway Initiative, Paper Industry Pathways

| **COUNTRY** tonnes CO2-equivalent (tCO2e) per tonne paper produced (tPaper produced) | **Fully Integrated** | | **Semi-integrated** (> 50% own pulp) | | **Non-Integrated** | |
|---|---|---|---|---|---|---|
| | 2020 | 2021 | 2020 | 2021 | 2020 | 2021 |
| **Canada** | 0.22 | - | - | - | - | - |
| **China** | 0.54 | - | - | - | 0.82 | - |
| **Finland** | - | - | - | - | 0.06 | 0.19 |
| **India** | 1.18 | - | - | - | 1.70 | 1.83 |
| **Portugal** | 0.32 | - | - | - | - | - |
| **United Kingdom** | - | - | 0.10 | - | - | - |
| **United States** | 0.78 | - | - | - | - | - |

* There is currently limited data available for the following countries: Austria, France, Germany, Indonesia, Italy, Korea (Republic), Mexico, Netherlands, Russia, Slovakia, and Sweden.

| **REGION** tCO2e / tPaper produced | **Fully Integrated** | | **Semi-integrated** (> 50% own pulp) | | **Non-Integrated** | |
|---|---|---|---|---|---|---|
| | 2020 | 2021 | 2020 | 2021 | 2020 | 2021 |
| **Asia** | 0.57 | - | - | - | 1.11 | 1.79 |
| **Europe** | 0.49 | 0.64 | 0.19 | - | 0.18 | 0.37 |
| **North & Central America** | 0.49 | - | - | - | - | - |

* There is currently limited data available for Africa

| **SUB-REGION** tCO2e / tPaper produced | **Fully Integrated** | | **Semi-integrated** (> 50% own pulp) | | **Non-Integrated** | |
|---|---|---|---|---|---|---|
| | 2020 | 2021 | 2020 | 2021 | 2020 | 2021 |
| **North America** | 0.49 | - | - | - | - | - |
| **East Asia** | - | - | - | - | 0.78 | - |
| **South Asia** | 1.18 | - | - | - | 1.70 | 1.83 |
| **Eastern Europe** | - | 0.64 | - | - | - | - |
| **Northern Europe** | - | - | - | - | 0.12 | 0.19 |
| **Southern Europe** | 0.32 | - | - | - | - | - |
| **Western Europe** | - | - | 0.29 | - | 0.22 | 0.64 |

* There is currently limited data available for Central America and Southeast Asia and no data for Western Asia and Southern Africa.

| **GLOBAL** tCO2e / tPaper produced | **Fully Integrated** | | **Semi-integrated** (> 50% own pulp) | | **Non-Integrated** | |
|---|---|---|---|---|---|---|
| | 2020 | 2021 | 2020 | 2021 | 2020 | 2021 |
| **Global** | 0.51 | - | 0.79 | - | 0.64 | 0.66 |

| **GLOBAL SCOPE 3 AS SHARE OF TOTAL EMISSIONS (%)** | **Fully Integrated** | **Non-Integrated** |
|---|---|---|
| **Global** | 73% | 54% |

# SUPPLIERS

## Scope 1 and 2 emission factors for suppliers

Suppliers are also asked questions about their emissions. Suppliers are categorised as either a print or non-print supplier. Print suppliers are responsible for putting the words onto the paper. Non-print suppliers, which are broken down into different types, including assembler, audio, binary, novelty components etc, cover the additional aspects that may be included as part of a book, such as a soft toy or a CD-ROM.

The emissions for each of these suppliers are calculated slightly differently to take into account the different products produced. 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.

There is currently not enough data to be able to calculate emission factors for non-print suppliers. From the data that is available for print suppliers, only Scope 1 and 2 emissions factors have been calculated. However, we have been able to calculate the global average for Scope 3 as a share of total emissions (%) for print suppliers, which can be used to estimate a Scope 3 figure.

The emissions for each of these suppliers are calculated slightly differently to take into account the different products produced.

# GHG emissions

Green = $CO_2e$ intensity is below the weighted average across similar sites on the BCP system.

Red = $CO_2e$ intensity is above the weighted average across similar sites on the BCP system.

Weighted average for paper products:
**2020:** 0.34 tCO2e per tonne paper used
**2021:** 0.23 tCO2e per tonne paper used

| **COUNTRY** tonnes CO2-equivalent (tCO2e) per tonne paper used (tPaper used) | Print suppliers | |
|---|---|---|
| | 2020 | 2021 |
| **Australia** | 0.37 | - |
| **Bulgaria** | 0.40 | - |
| **China** | 0.48 | 0.37 |
| **Italy** | 0.23 | - |
| **United Kingdom** | 0.09 | - |

* There is currently limited data available for the following countries: Canada, Germany, India, Kenya, Latvia, Lithuania, Malaysia, Mexico, Netherlands, Poland, Singapore, Slovakia, Spain, South Africa, and Turkey.

| **SUB-REGION** tCO2e / tPaper used | Print suppliers | |
|---|---|---|
| | 2020 | 2021 |
| **Australia & Oceania** | 0.37 | - |
| **East Asia** | 0.48 | 0.37 |
| **Southeast Asia** | 0.56 | - |
| **Eastern Europe** | 0.22 | - |
| **Southern Europe** | 0.25 | - |
| **Western Europe** | 0.15 | 0.10 |

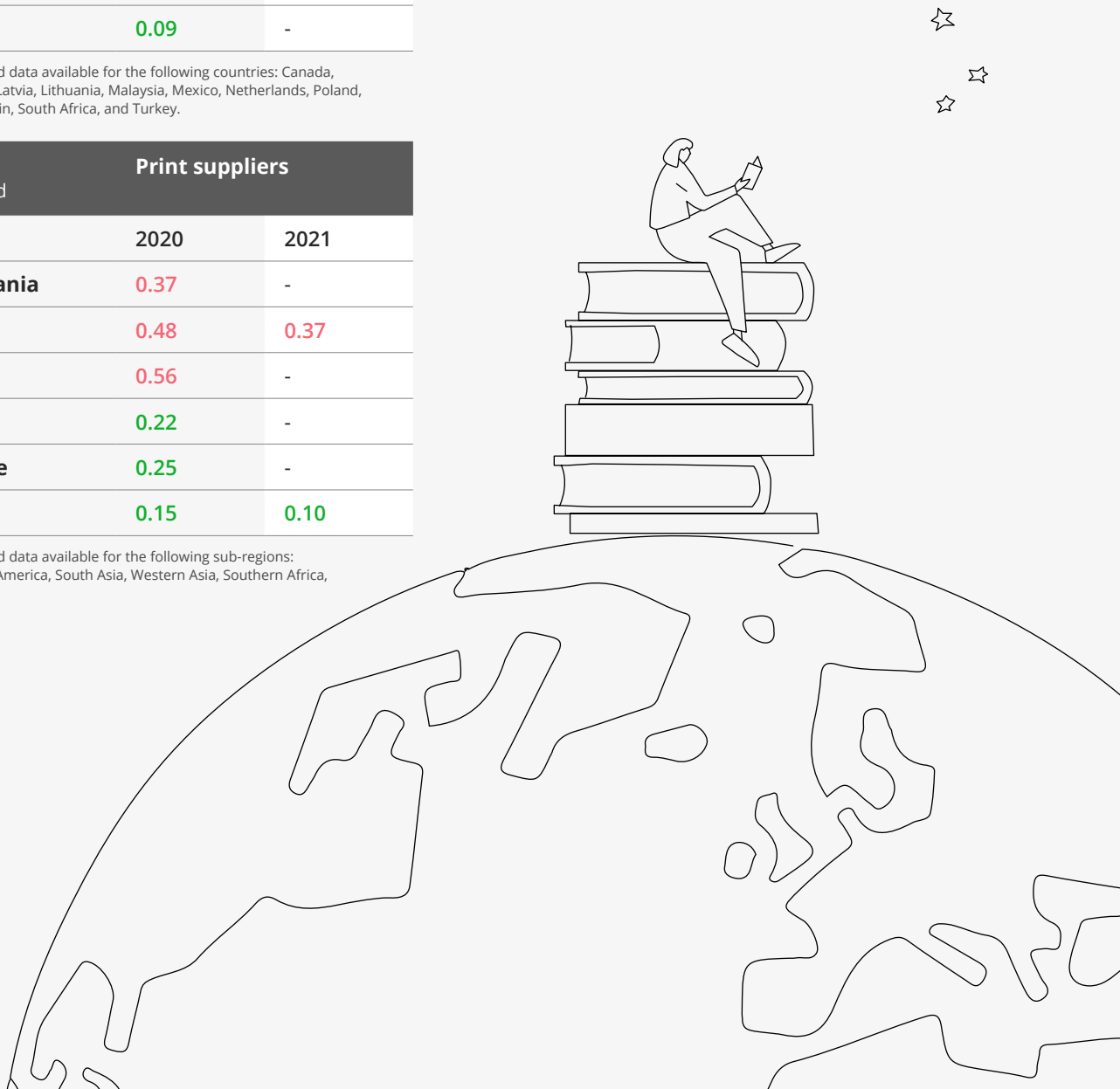
* There is currently limited data available for the following sub-regions: North America, Central America, South Asia, Western Asia, Southern Africa, and East Africa.

| **REGION** tCO2e / tPaper used | Print suppliers | |
|---|---|---|
| | 2020 | 2021 |
| **Asia** | 0.49 | 0.25 |
| **Australia & Oceania** | 0.37 | - |
| **Europe** | 0.17 | 0.14 |
| **North & Central America** | 0.12 | - |

* There is currently limited data available for Africa.

| **GLOBAL** tCO2e / tPaper used | Print suppliers | |
|---|---|---|
| | 2020 | 2021 |
| **Global** | 0.30 | 0.37 |

| **GLOBAL SCOPE 3 AS SHARE OF TOTAL EMISSIONS (%)** | Print suppliers |
|---|---|
| **Global** | 79% |

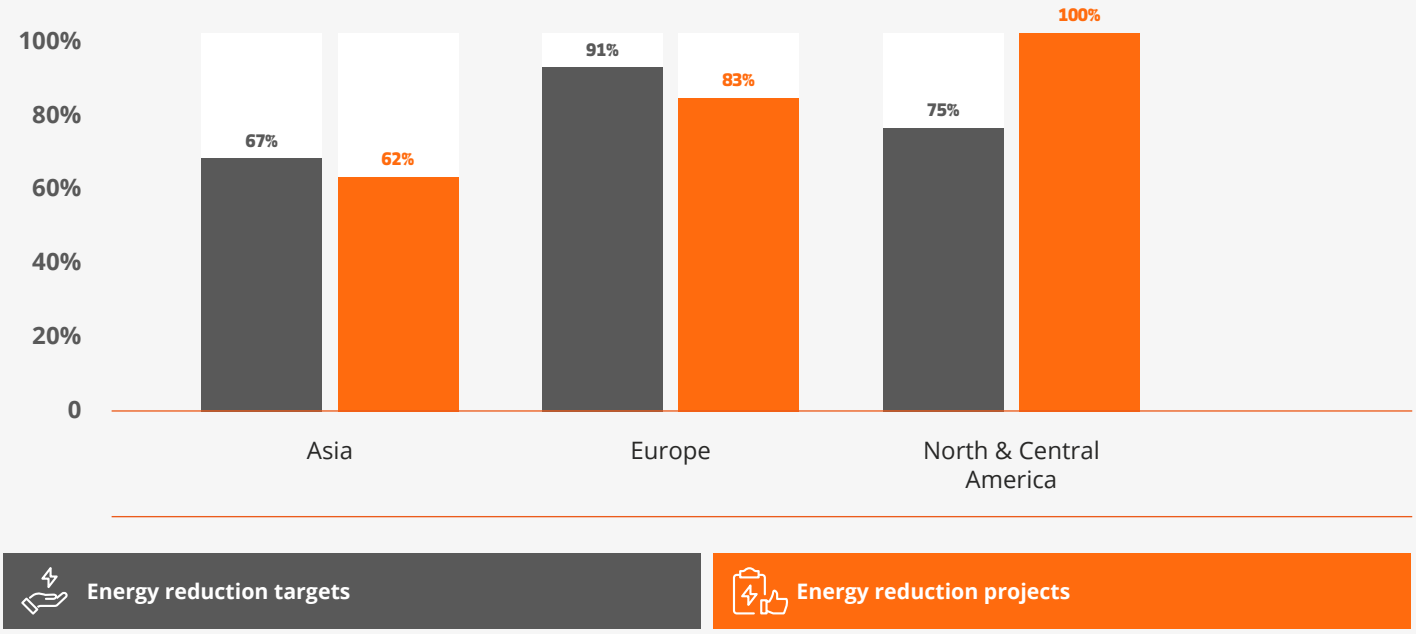


# Energy reduction measures and GHG Emission reduction targets across mills

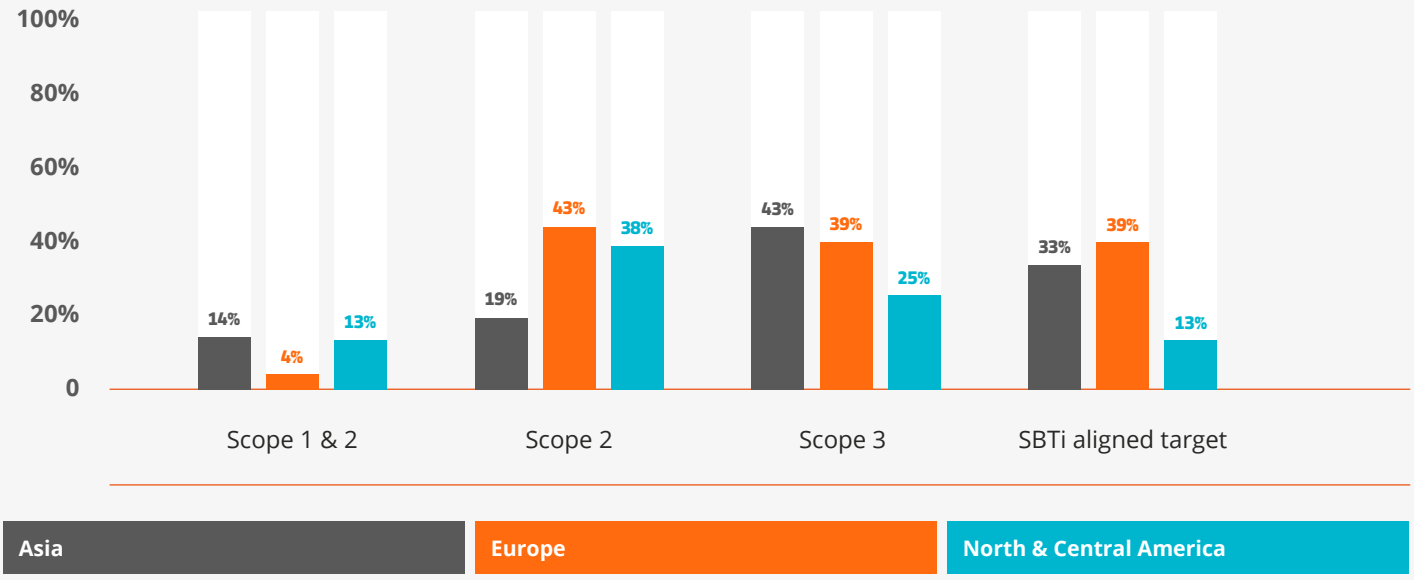
Mills across all regions have started to implement energy reduction targets and energy reduction projects. Many of these projects are focused on increasing energy efficiency and increasing optimisation of equipment.

Mills are also beginning to set a range of GHG emission reduction targets, with some being aligned with the Science Based Target initiative (SBTi). Plans to achieve these targets include increasing energy efficiency and increasing the purchase of renewable energy.

## ENERGY REDUCTION MEASURES




## GHG EMISSION REDUCTION TARGETS

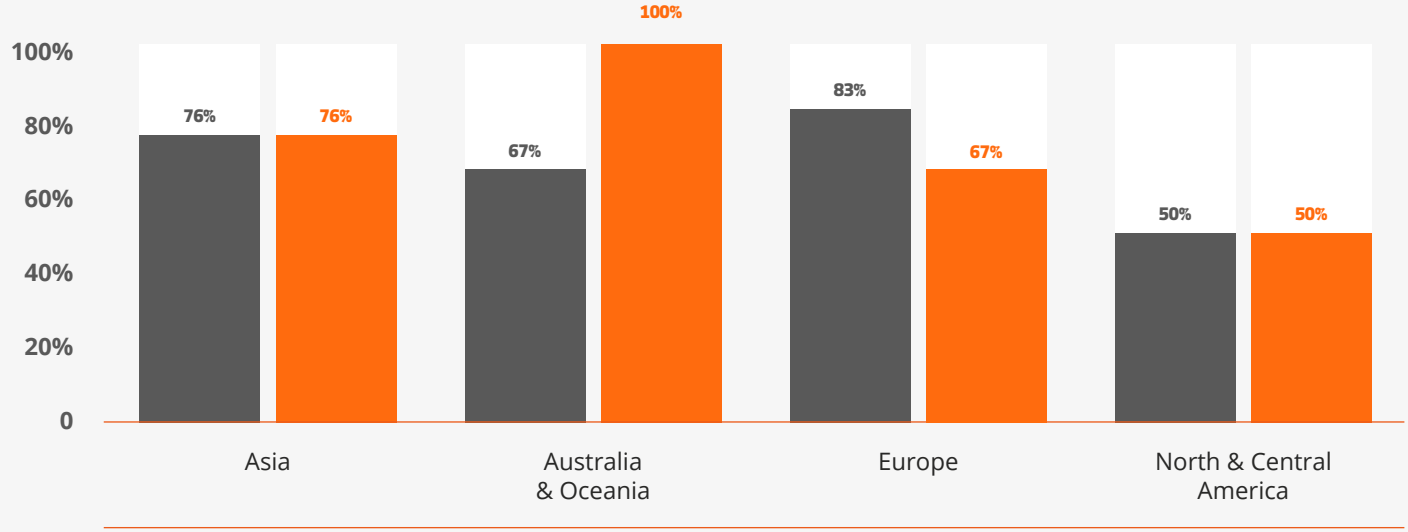


# Energy reduction measures and GHG Emission reduction targets across suppliers

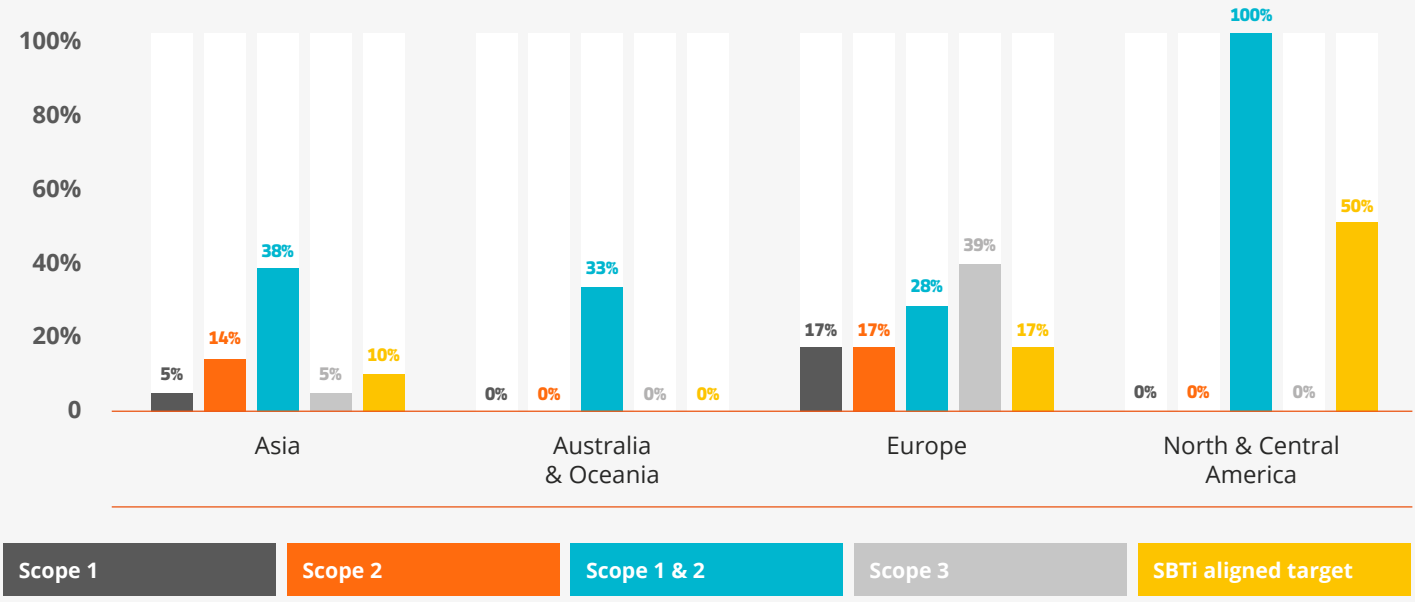
Suppliers across all regions, apart from Africa, have energy reduction measures in place. Energy projects include switching to electric machinery, replacing halogen lighting to LEDs and upgrading to more energy efficient equipment.

Sites in Europe and Asia are beginning to set GHG emission reduction targets, with the majority being Scope 1 and 2 targets. Suppliers are looking to reduce their use of non-renewable electricity, optimise their equipment and implement energy-saving projects to help achieve these targets.

## ENERGY REDUCTION MEASURES




## GHG EMISSION REDUCTION TARGETS

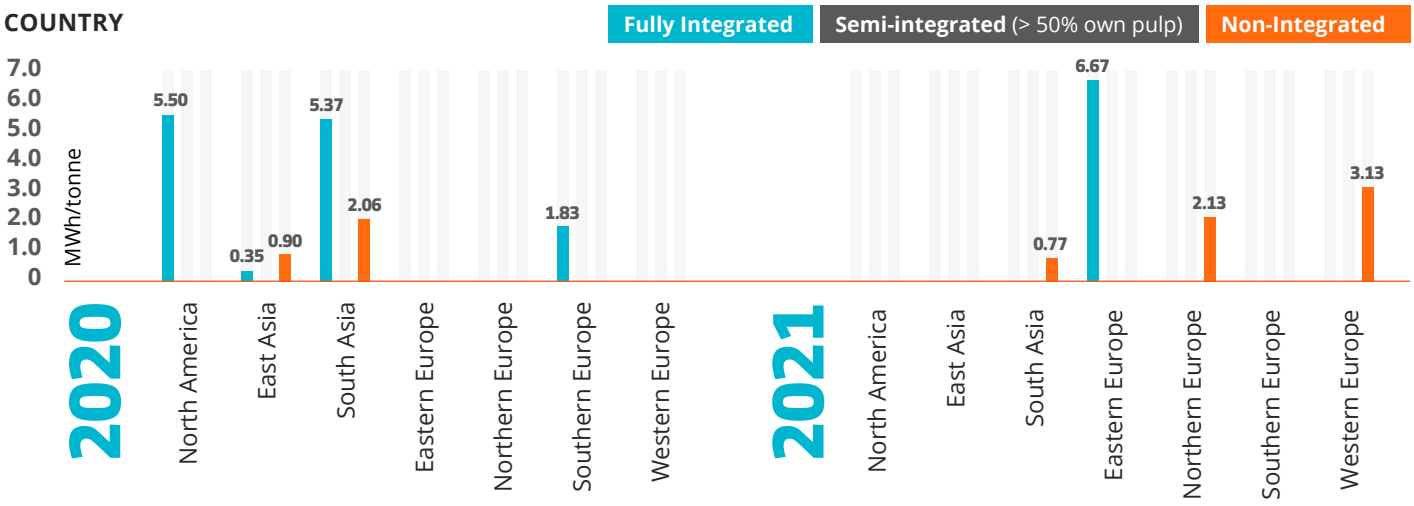


# TRENDS & GOOD PRACTICES

## ENERGY INTENSITY PER TONNE OF PULP, PAPER AND PAPERBOARD PRODUCED

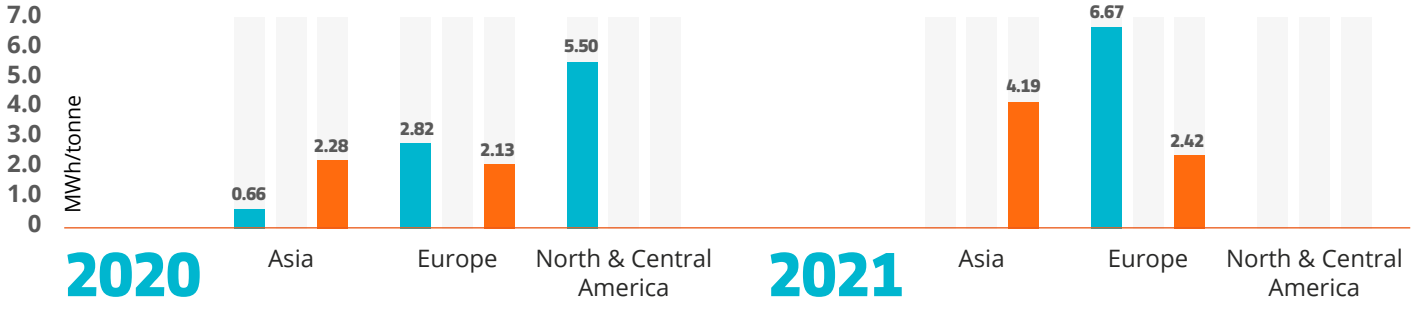
### MILLS

**COUNTRY**



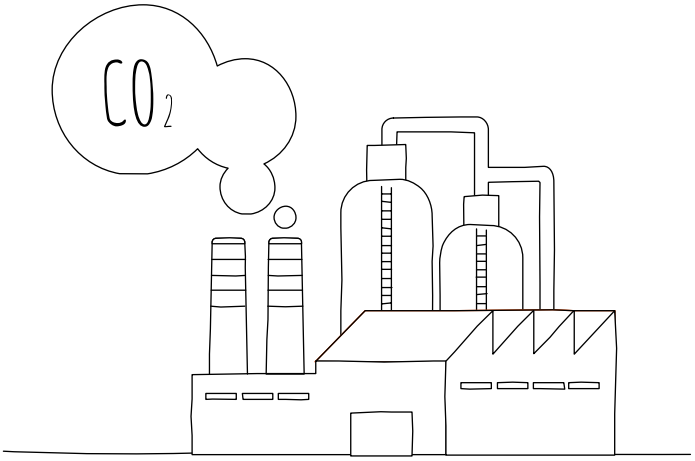

* There is currently no data available for the following sub-regions: Central America and Southeast Asia

**REGION**




## 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. In some cases (East Asia and Asia) this trend is not upheld. We suspect that is due to some particularly energy efficient mills pulling down the average energy intensity factor for fully integrated Asian mills.



BEST PRACTICE EXAMPLE

## Metsä Board

Metsä Board's target is to reduce fossil-based carbon dioxide emissions to zero by phasing out fossil-based energy sources and improving energy efficiency. Metsä Board has laid out a fossil free roadmap for all its mills and has set a Science Based Target to help achieve its climate goals. Examples of how Metsä Board is achieving this as well as how it plans to achieve its future goals are outlined below:

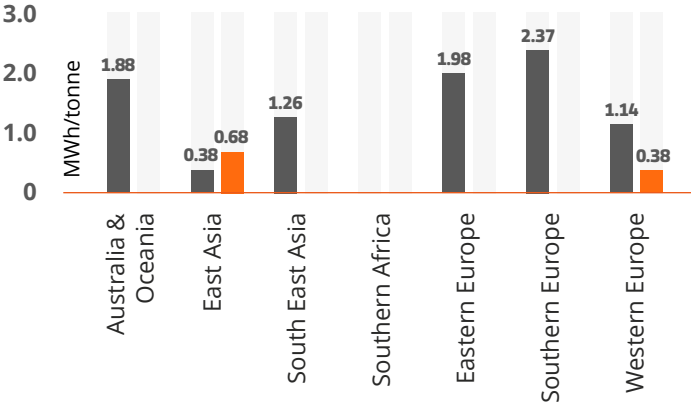
**Kyro Mill**
Metsä Board Kyro has replaced peat with renewable energy in its energy generation. The Kyro power plant aims to use primarily wood-based fuels – such as chips, bark, and sawdust – generated alongside Metsä Group's production and wood supply. This transition away from the burning of peat reduced the share of fossil fuel by a tenth.

**Husum Pulp Mill**
Husum mill is currently undergoing a renewal of its recovery boiler turbine, which will increase the mill's generation of renewable energy, and increase its self-sufficiency in electricity from approximately 40% to around 80%.

# ENERGY INTENSITY PER TONNE OF PAPER USED IN THE PRODUCTION OF BOOKS, JOURNALS AND/OR OTHER PAPER PRODUCTS

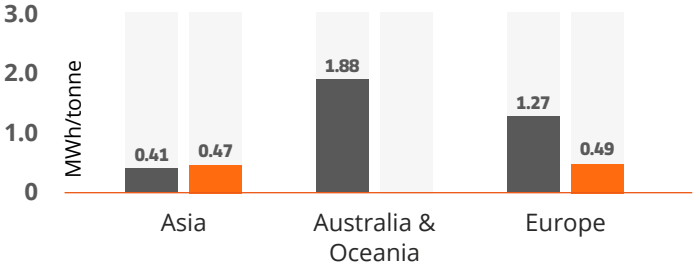
# SUPPLIERS

**SUB-REGION - PRINT SUPPLIERS** 2020 2021




* There is currently no data available for the following sub-regions: North America, Central America, South Asia, Southern Africa and Western Asia.

**REGION - PRINT SUPPLIERS** 2020 2021




* There is currently no data available for the following regions: North & Central America and Africa.

## Energy intensity across suppliers

In 2020, the energy intensity per tonne of paper used ranges from 1.14 MWh per tonne for Western Europe to 2.37 MWh per tonne for Southern Europe. East Asia is an outlier, with a much lower intensity of 0.38 MWh per tonne. Going forward, as more data is reported we hope to better understand the drivers of the differences between sub-regions.

For 2021, there was unfortunately less data meaning that we were only able to report an energy intensity for East Asia and Western Europe.

Various European and Asian suppliers have implemented energy efficiency measures, such as shorter air compressor circuits and deploying new printing machines with reduced energy consumption.

BEST PRACTICE EXAMPLE

## Supplier energy intensity

**European supplier**
A European supplier has constructed an Organic Rankine Cycle (ORC) system which enables waste heat to be captured and recovered. The system provides the supplier with approximately 200MWh of energy per year.

**South East Asian supplier**
A South East Asian supplier has implemented a new air compressor system which has provided significant electricity and $CO_2$ savings.

Trends & good practices

# LARGEST FOSSIL FUEL AND RENEWABLE ENERGY SOURCE

# MILLS

| COUNTRY | Fossil Fuel Energy Source | | Renewable Energy Source | |
|---|---|---|---|---|
| | 2020 | 2021 | 2020 | 2021 |
| North America | | - | | - |
| East Asia | | | | |
| South Asia | | | | Not used |
| Eastern Europe | - | | - | |
| Northern Europe | - | | - | |
| Southern Europe | | - | | - |
| Western Europe | | | Not used | |

* There is currently no data available for the following sub-regions: South East Asia and Central America.

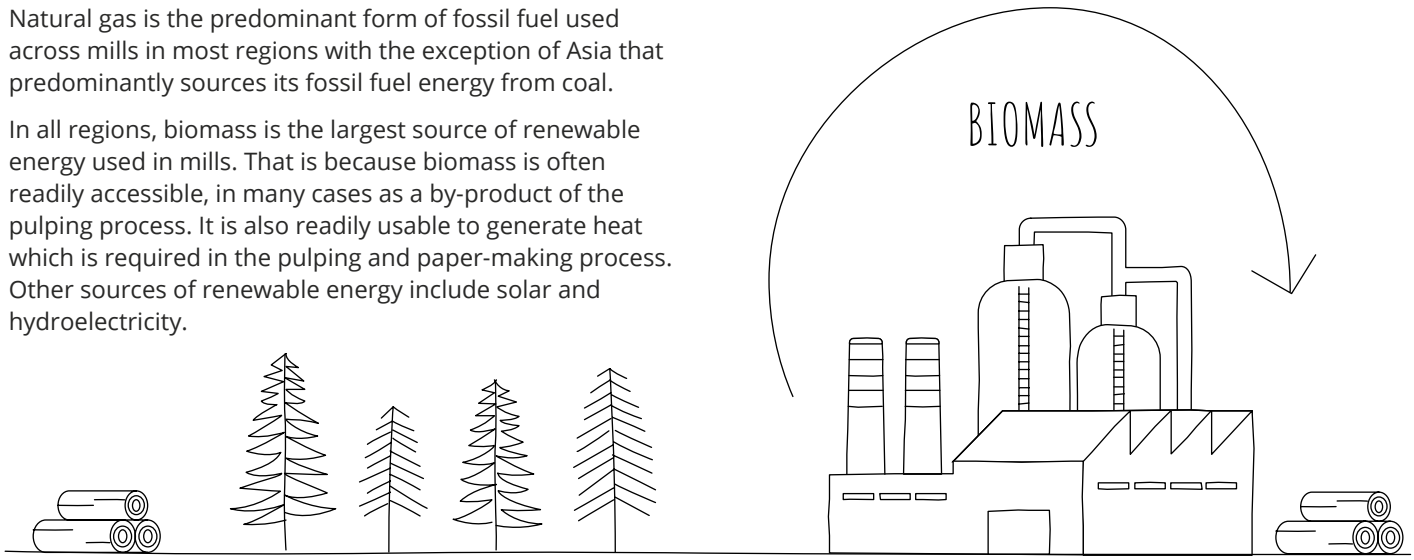
Coal | Biomass | Natural Gas | Other Fossil Fuels

| REGION | Fossil Fuel Energy Source | | Renewable Energy Source | |
|---|---|---|---|---|
| | 2020 | 2021 | 2020 | 2021 |
| Asia | | | | |
| Europe | | | | |
| North & Central America | | - | | - |

## Energy sources across mills

Natural gas is the predominant form of fossil fuel used across mills in most regions with the exception of Asia that predominantly sources its fossil fuel energy from coal.

In all regions, biomass is the largest source of renewable energy used in mills. That is because biomass is often readily accessible, in many cases as a by-product of the pulping process. It is also readily usable to generate heat which is required in the pulping and paper-making process. Other sources of renewable energy include solar and hydroelectricity.



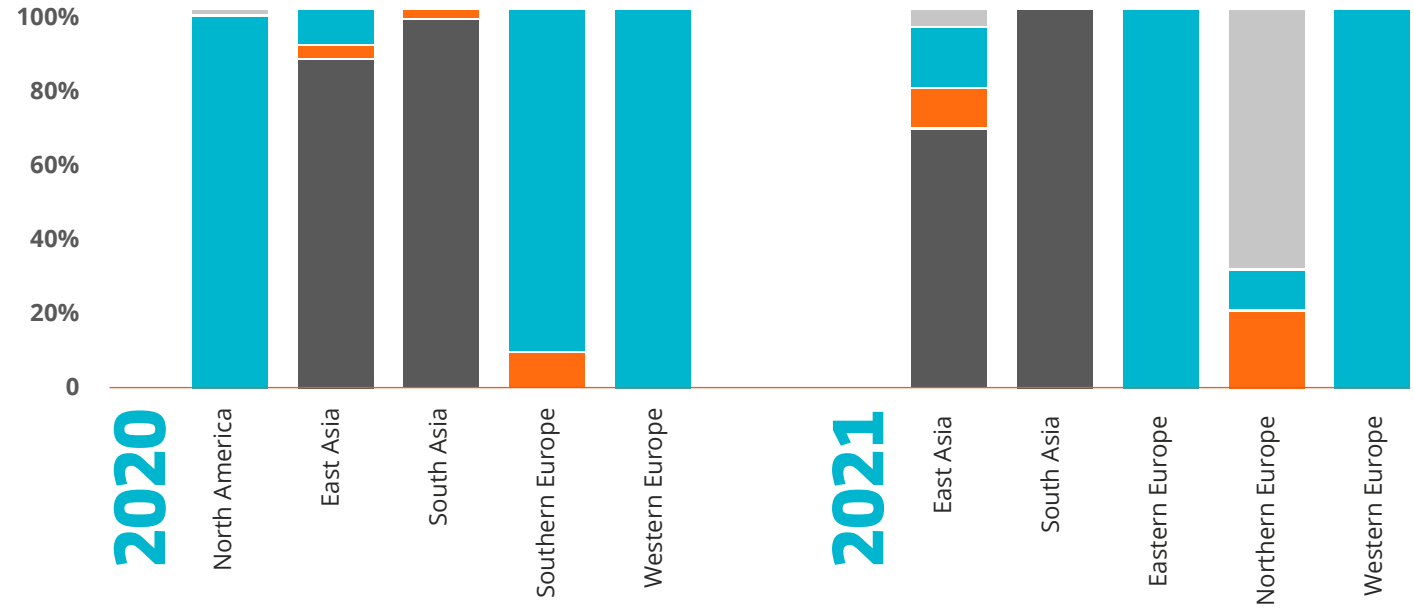
# Fuel mix across mills

The western hemisphere is almost entirely dependent on one form of fossil fuel, natural gas. Southern and Northern Europe utilise additional forms of fuel including fuel oil.

For 2021, there was unfortunately less data meaning that we were only able to report on fuel mix across mills in Asia and Europe.

Most regions are using more than one type of fossil fuel, however natural gas and coal are the most predominant fuels, with only a small amount of fuel oil being used.

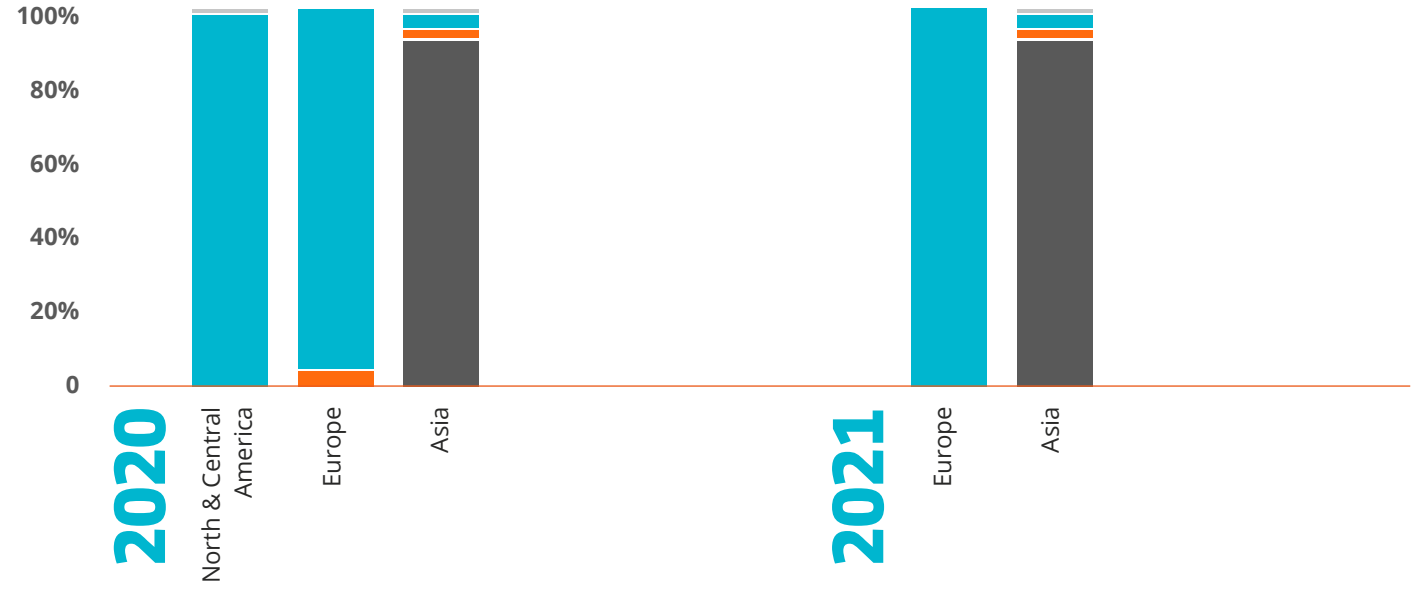
### MILLS SUB-REGIONAL FUEL MIX




* There is currently no data available for the following sub-regions in 2020 South East Asia, Eastern Europe, Northern Europe, and Central America. In 2021, no data is available for Southeast Asia, Southern Europe, Central America and North America.

Coal (MWh) | Fuel Oil (MWh) | Natural Gas (MWh) | Other Fossil Fuels (MWh)

### MILLS REGIONAL FUEL MIX




* There is currently no data available for the following region in 2021: North & Central America.


# THE EUROPEAN ENERGY CRISIS

Since 2021, European economies have been facing an energy crisis that stems from global supply disruptions, high energy prices and geopolitical turmoil. As a result, mills are implementing surcharges after spiralling energy prices have made operations uneconomical. Temporary downtime has also been implemented in some mills in 2022 due to the unaffordability of operations in the current circumstances (Francis, 2022).

The soaring gas prices in particular have caused paper makers Norske Skog ASA and Pro-Gest SpA to halt production entirely in Austria and Italy in 2022. ProGest stated that the selling price of a tonne of paper was lower than the cost of energy required in production (Morison et al., 2022).

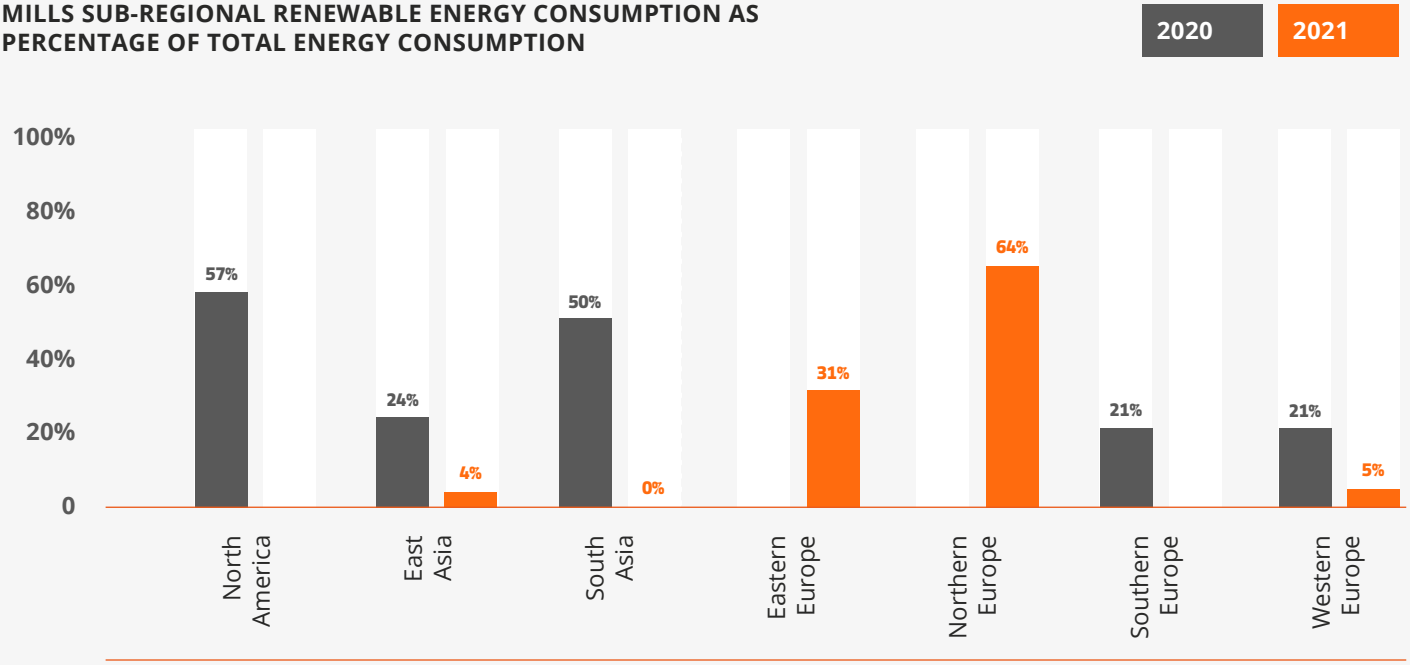
# Renewable energy consumption across mills

North & Central America and Europe source a high percentage of mill energy from renewables but this is mainly driven by specific regions including North America and Northern Europe.

The consumption of renewable energy in European mills is helping them work towards their energy efficiency targets where some mills are seeking to reduce energy consumption by a specified percentage by 2030.

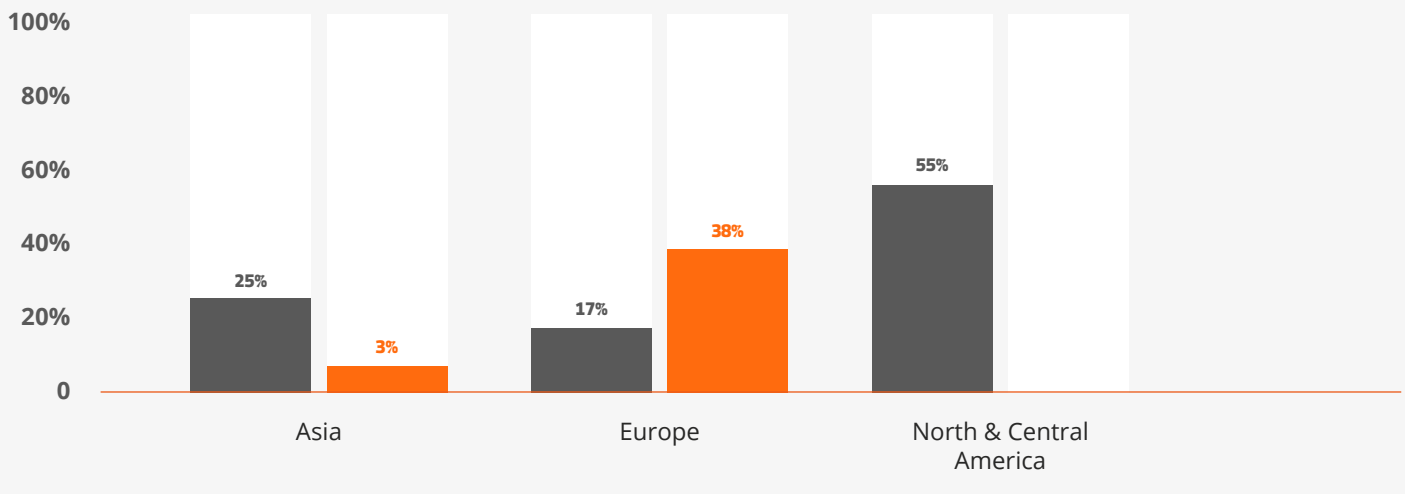
Renewable energy consumption across East Asia remains low which accounts for the lower average across Asia.

## MILLS SUB-REGIONAL RENEWABLE ENERGY CONSUMPTION AS PERCENTAGE OF TOTAL ENERGY CONSUMPTION




*There is currently no data available for the following sub-regions in 2020: Southeast Asia, Northern Europe, Eastern Europe and Central America. No data is available for North America, Central America, Southern Europe, Southeast Asia and South Asia in 2021.

## MILLS REGIONAL RENEWABLE ENERGY CONSUMPTION AS PERCENTAGE OF TOTAL ENERGY CONSUMPTION




*There is currently no data available for the following region in 2021: North & Central America.

Trends & good practices

# LARGEST FOSSIL FUEL AND RENEWABLE ENERGY SOURCE SUPPLIERS

| SUB-REGION | Fossil Fuel Energy Source | | Renewable Energy Source | |
|---|---|---|---|---|
| | 2020 | 2021 | 2020 | 2021 |
| **Australia & Oceania** | | - | Not stated | - |
| **East Asia** | | | | |
| **Southeast Asia** | | - | | - |
| **Eastern Europe** | | | Not stated | |
| **Southern Europe** | | - | | |
| **Western Europe** | | | | Not stated |

* There is currently no data available for the following sub-regions: North America, Central America, South Asia, Southern Africa, Western Asia and Northern Europe.

Coal | Fuel Oil | Biomass | Solar | Natural Gas | Other Fossil Fuels

| REGION | Fossil Fuel Energy Source | | Renewable Energy Source | |
|---|---|---|---|---|
| | 2020 | 2021 | 2020 | 2021 |
| **Asia** | | | | |
| **Australia & Oceania** | | - | Not stated | - |
| **Europe** | | | | |

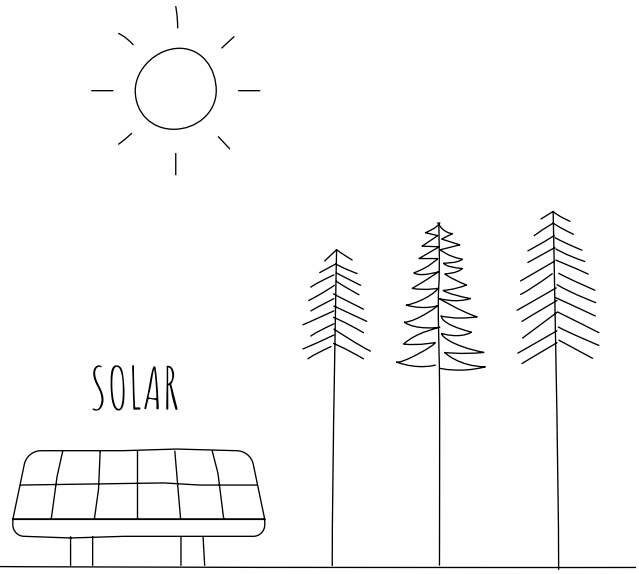
* There is currently no data available for the following region: North & Central America and Africa.

## Energy sources across suppliers

Natural gas is the predominant form of fossil fuel used by suppliers in most regions with the exception of Southern Europe and East Asia that rely on coal, fuel oil or other fossil fuels.

Solar is the predominant form of renewable energy with the exception of Europe that predominantly sources its energy from Biomass, driven by greater usage in Southern Europe.

Solar and biomass are the only renewable energy sources being used by suppliers across 2020 and 2021.



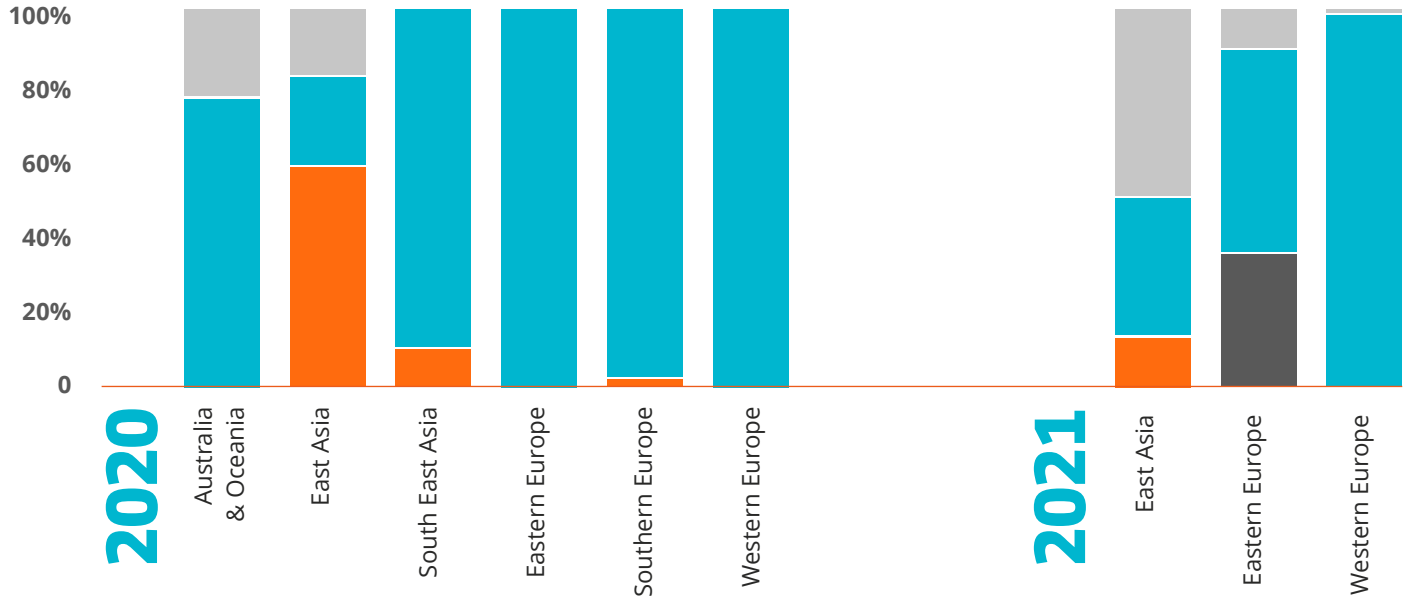
# Fuel mix across suppliers

Most of Europe is dependent on natural gas as the predominant form of fuel. Asia has a much more mixed fuel supply, utilising fuel oil, natural gas and other fossil fuels.

Suppliers in Australia & Oceania primarily use natural gas, combined with varying amounts of other fossil fuels.

The energy mix in Europe is similar across mills and suppliers with the majority deriving from natural gas. Asian mills are much more dependent on coal due to the highest cost of switching to natural gas for their operations (Min, 2020). However, suppliers are more likely to utilise a variety of fuel

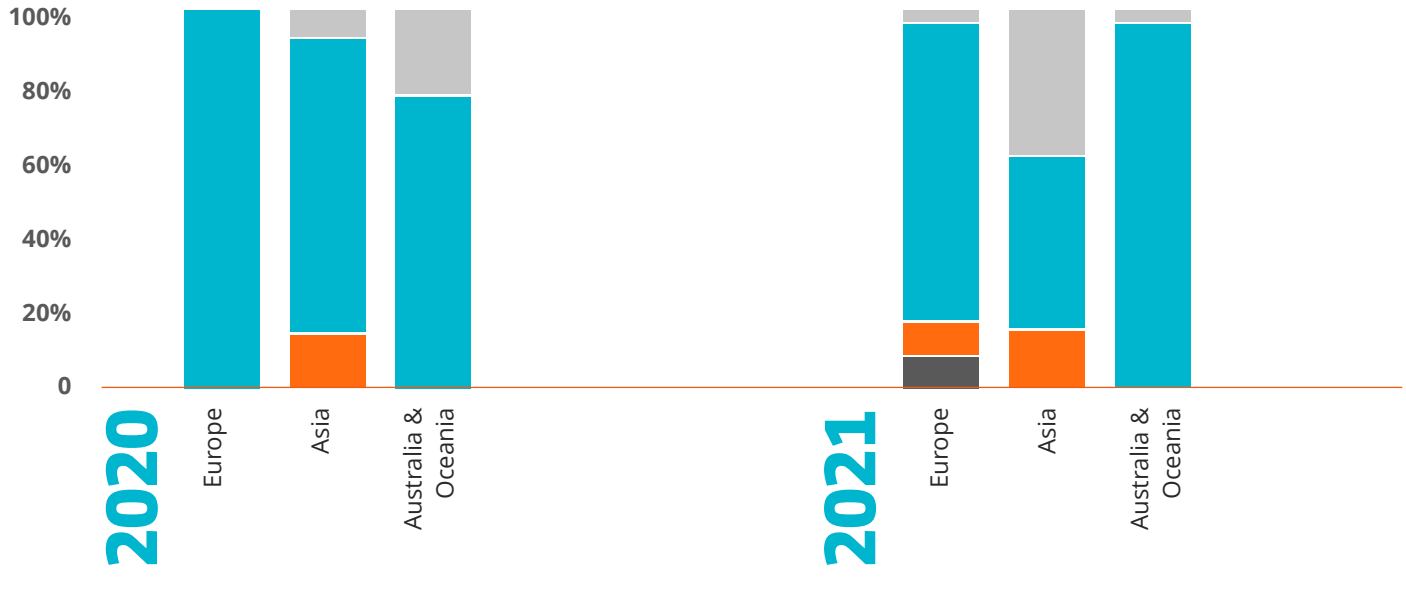
## SUPPLIERS SUB-REGIONAL FUEL MIX




* There is currently no data available for the following sub-regions in 2020: North America, Central America, South Asia, Southern Africa, Western Asia and Northern Europe. In 2021 data is unavailable for the following sub-regions: Australia & Oceania, North America, South Asia, Southern Europe, South East Asia, Central America, Southern Africa and Western Asia.

Coal (MWh) | Fuel Oil (MWh) | Natural Gas (MWh) | Other Fossil Fuels (MWh)

## SUPPLIERS REGIONAL FUEL MIX



# Renewable energy consumption across suppliers

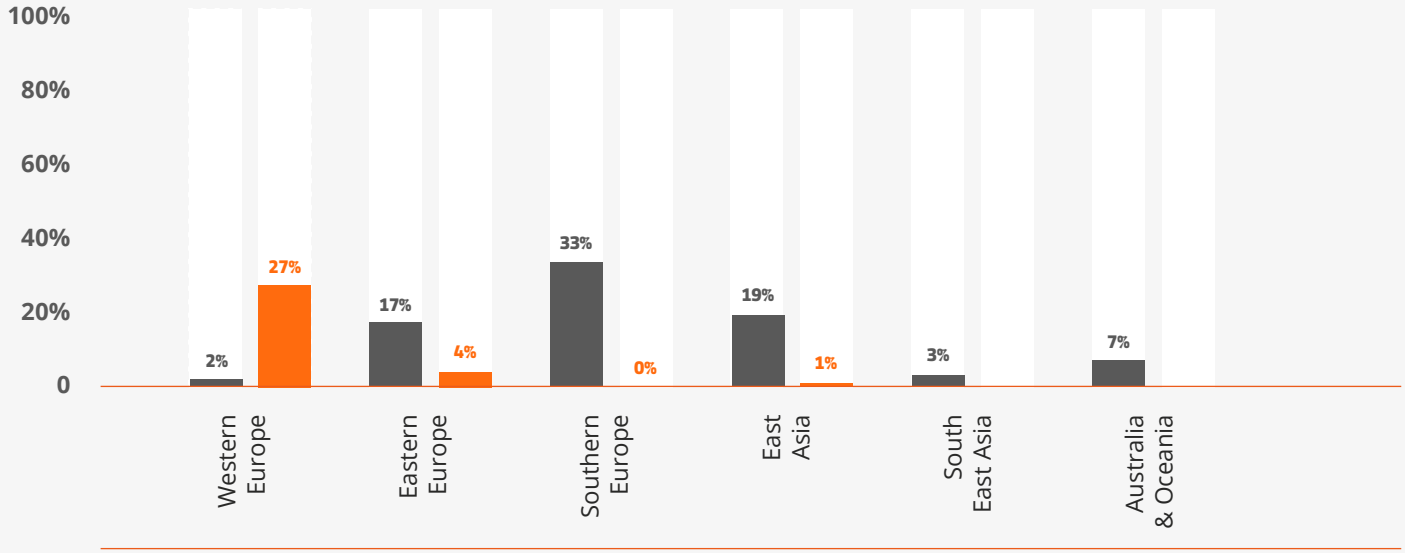
Europe has the highest renewable energy consumption with Southern Europe consuming more than other regions in Europe.

In Southern Europe, suppliers are purchasing large volumes of renewable energy rather than generating their own energy.

Asia has low renewable energy consumption driven by low consumption in East Asia.

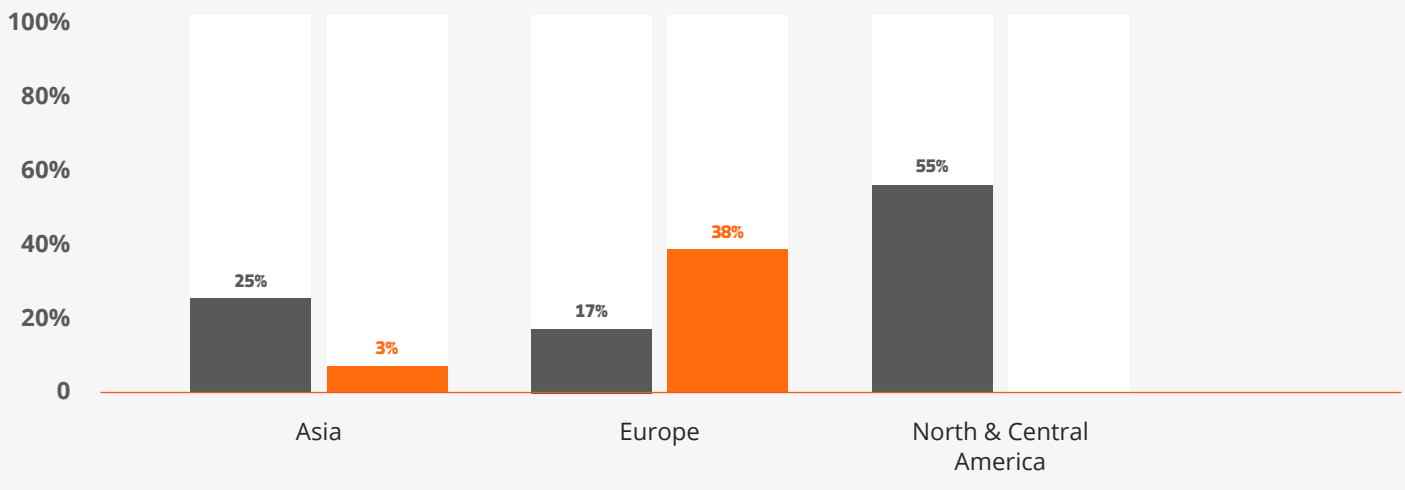
Suppliers tend to use less renewable energy than mills, as a percentage of total energy used. This might be the case because mills use more energy than suppliers (up to 6.67 MWh/tonne of paper produced versus up to 2.37 MWh/tonne of paper used). Therefore, we expect energy is a higher strategic priority for mills, as it will relate to a larger share of their total expenditure.

## SUPPLIERS SUB-REGIONAL RENEWABLE ENERGY CONSUMPTION AS PERCENTAGE OF TOTAL ENERGY CONSUMPTION




*There is currently no data available in 2020 and 2021 for the following sub-regions: North America, Central America, South Asia, Southern Africa and Northern Europe in 2020. Additionally in 2021, no data is available for Southern Europe, Southeast Asia and Australia & Ocean.

## SUPPLIERS REGIONAL RENEWABLE ENERGY CONSUMPTION AS PERCENTAGE OF TOTAL ENERGY CONSUMPTION




*There is currently no data available for North & Central America in 2020 and 2021, Africa in 2020 and Australia & Ocean in 2021. In 2021, Africa did not state use of renewable energy

BEST PRACTICE EXAMPLE

## Renewable energy targets

An Eastern European supplier is currently purchasing renewable energy that equates to over 50% of their supply of electricity. In addition, the supplier is in the planning stage of implementing a 300kW solar panel array on the production building rooftop. The array will help the supplier in meeting the requirements of Science Based Target Initiative and move beyond 56% renewable energy supply to 96% by 2029.

Trends & good practices

# WATER INTENSITY PER TONNE OF PULP, PAPER AND PAPERBOARD PRODUCED

## MILLS

| SUB-REGION<br>m3/ tonne of pulp, paper and paperboard produced | Fully Integrated | | Semi-integrated<br>(> 50% own pulp) | | Non-Integrated | |
|---|---|---|---|---|---|---|
| | 2020 | 2021 | 2020 | 2021 | 2020 | 2021 |
| **North America** | 31.74 | - | - | - | - | - |
| **East Asia** | 5.82 | - | - | - | 7.61 | - |
| **South Asia** | 35.37 | - | - | - | 18.28 | 13.78 |
| **Northern Europe** | - | - | - | - | 18.50 | 28.96 |
| **Southern Europe** | | - | - | - | - | - |
| **Western Europe** | - | - | 4.23 | - | 5.07 | 23.62 |

* There is currently no data available for the following sub-regions: Eastern Europe, Central America, and Southeast Asia.

| REGION<br>m3/ tonne of pulp, paper and paperboard produced | Fully Integrated | | Semi-integrated<br>(> 50% own pulp) | | Non-Integrated | |
|---|---|---|---|---|---|---|
| | 2020 | 2021 | 2020 | 2021 | 2020 | 2021 |
| **Asia** | 7.55 | - | - | - | 11.75 | 19.63 |
| **Europe** | 28.76 | - | 2.94 | - | 20.92 | 25.87 |
| **North & Central America** | 21.77 | - | - | - | - | - |

## Water intensity across mills

As would be expected, the fully integrated mills have a higher water intensity than the non-integrated mills with the exception of Asia.

It is difficult to explain the differences in water intensity across mill types and geographies. We suspect this might be due to differences in methodology, as we notice that there is less consistency in terms of the scope and boundaries of water consumption metrics when compared to energy or GHG emission metrics. This is something we will further investigate going forward.

Various Indian mills reported ongoing water reduction projects and targets to reduce water consumption year-on-year.

Europe and North & Central America have higher water intensities in fully-integrated mills however water reduction targets are also in place in almost all mills.

BEST PRACTICE EXAMPLE

## Mill water reduction measures

Targets are in place across non-integrated mills in Europe, including reducing water consumption by improvements in birch line washing at pulp mills, and through optimising fibre line washing at the maximum production level. Other mills have set targets to reduce water consumptions through improving paper machine runnability.

# WATER INTENSITY PER TONNE OF PAPER USED IN THE PRODUCTION OF BOOKS, JOURNALS AND/OR OTHER PAPER PRODUCTS

# SUPPLIERS

| SUB-REGION<br>m3/ tonne of paper used | Print suppliers | |
|---|---|---|
| | 2020 | 2021 |
| **Australia & Oceania** | 0.49 | - |
| **East Asia** | 7.78 | 6.80 |
| **Southeast Asia** | 2.51 | - |
| **Eastern Europe** | 0.50 | - |
| **Southern Europe** | 4.84 | - |
| **Western Europe** | 0.33 | 0.18 |

* There is currently no data available for the following sub-regions: Northern Europe, North America, Central America, Southern Africa, Western Asia and South Asia.

| REGION<br>m3/ tonne of paper used | Print suppliers | |
|---|---|---|
| | 2020 | 2021 |
| **Asia** | 7.31 | 8.04 |
| **Australia & Oceania** | 0.49 | - |
| **Europe** | 0.83 | 0.45 |

* There is currently no data available for the following regions: North & Central America and Africa.

## Water intensity across suppliers

Suppliers across Asia have a comparatively higher water intensity per tonne of paper used, compared to Europe and Australia & Oceania.

Interestingly, many Asian suppliers are implementing water reduction projects, suggesting that they have recognised the importance of managing this. It will be interesting to see whether this will translate into improvement across the industry in Asia over time.

Southern Europe has a comparatively higher water intensity than other European sub-regions. This could be due to higher average temperatures leading to higher water requirements for cooling, production processes and staff use. We also note a lack of water reduction targets in suppliers from this region that have submitted EQs so far.

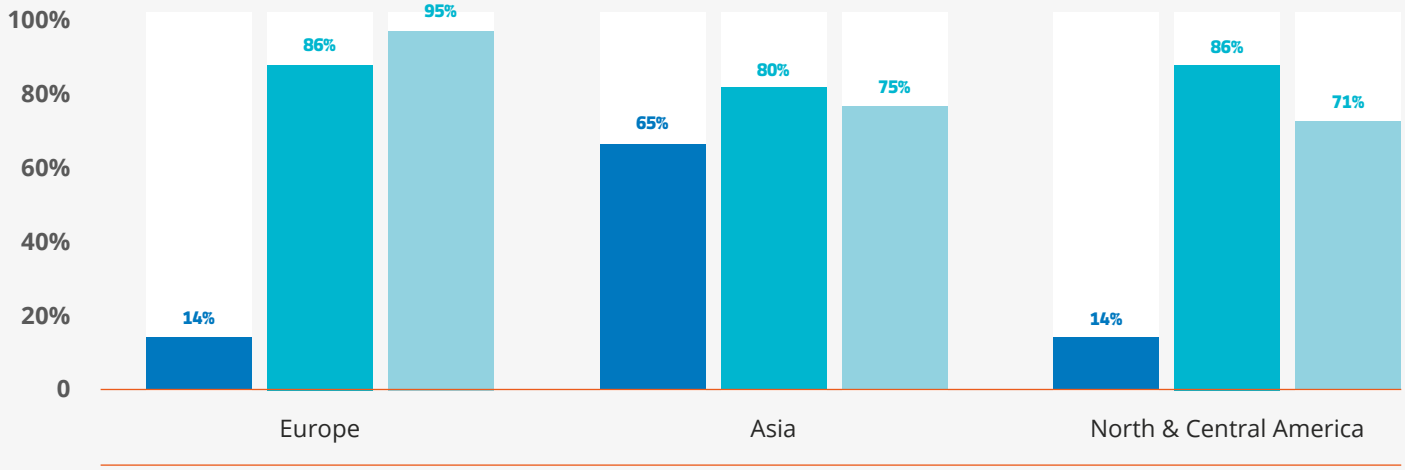
BEST PRACTICE EXAMPLE

### Supplier water reduction measures

An Eastern European supplier is gradually replacing the water pipes and basin batteries with a new high quality filter system to ensure more efficient usage of the dampening solution. The measures result in fewer complete refills in the printing system.

## Water measures across mills

- Mills in North & Central America, Europe and Asia have implemented water recycling activities but with varying levels of uptake. Asia imbeds a greater proportion of recycling activities compared to Europe.
- Sites across all regions have stated the introduction of water reduction targets including specific targets for reducing consumption per unit or per annum. It is encouraging to see that mills recognise the importance of good water management.
- There is good recognition of the need to improve the quality of wastewater discharge with over 80% of mills in North & Central America, Europe and Asia implementing steps to improve their wastewater quality.



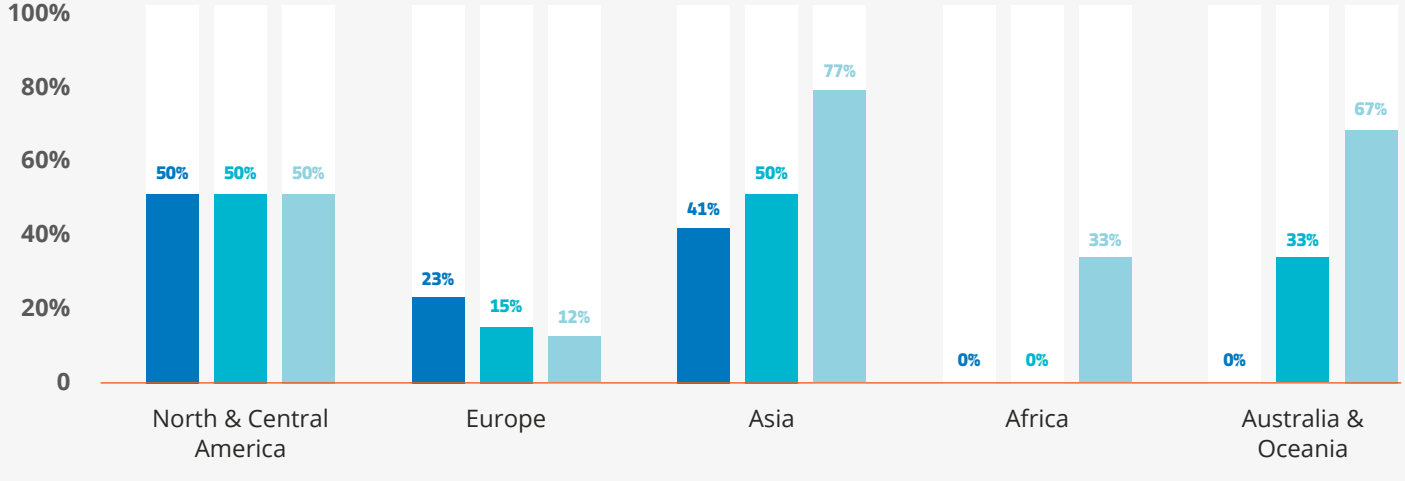

**% of sites which recycle water within the manufacturing and cooling processes**

**% of sites with wastewater discharge improvement targets in place**

**% of sites with water reduction targets in place**

## Water measures across suppliers

- Suppliers based in North & Central America, Europe and Asia are undertaking water recycling activities. Africa and Australia & Oceania are yet to state implementation of water recycling activities.
- Sites across all regions have introduced water reduction targets. The majority of suppliers in Asia have introduced targets including ensuring water consumption does not exceed a specified yearly average or seeking to reduce consumption by a specified percent year on year.
- Sites across most regions have introduced measures to improve the quality of wastewater discharge with the exception of Africa. Further improvement could be made to ensure that continuous improvement of wastewater quality practices becomes the norm across all regions.



BEST PRACTICE EXAMPLE

# BioPappel Scribe

Scribe is committed to efficient water use and have processes in place for their water use in the papermaking process, and for use of water for steam generation. Scribe consistently monitors water consumption and the team work to identify and correct water leaks, deviations in the water reuse cycle, open valves and more, to avoid excessive water consumption.

**Water use in the papermaking process**
From the 'fresh water' that is used in BioPappel's papermaking machines, they recover 75%, which is reused in two ways.

1. The water is sent to a recovery tank where the fibres and mineral loads are removed to transform it to clear water. This clear water is then used for a range of other processes including, sprinklers, feeding cooling towers and vacuum pumps pr used as back pressure water. The mill estimates that the clear water is recirculated approximately 7 times throughout the different transformation processes in the mill.
2. The second use is to reintegrate the water into the paste solution to help regulate the consistency of the mixture and to feed the sprinklers within the machine.

**Use of water for steam generation**
Another important use of water in the production process is the production of steam. For steam production, the mill has developed new initiatives that allow them to optimise water use. One of these projects consisted of reducing water consumption for each service and cleaning cycle of the water tanks. To achieve this objective, they changed the set point in the water tank from 70% to 95%, which reduces operating cycles. By reducing the operating cycles, the number of tank cleanings is also reduced, thus reducing water consumption.

Trends & good practices

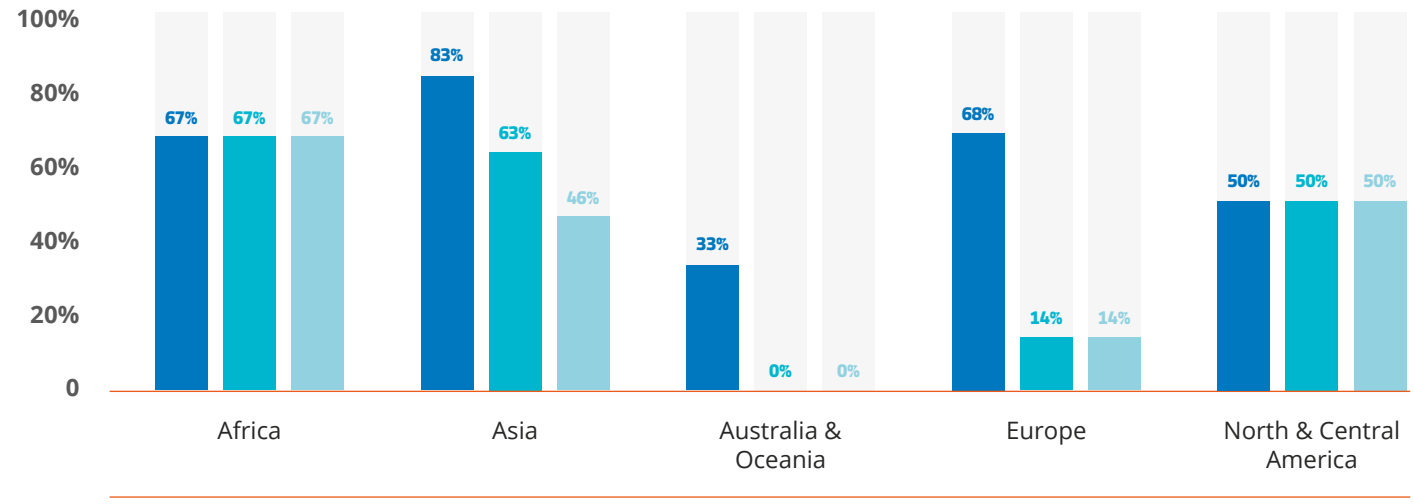
# MATERIAL USE & WASTE

# INK

- Next to paper, ink is a key material used by suppliers. Different types of inks exist, with vegetable, mineral and UV inks being the most common. Different ink types have different environmental impacts.
- Asia has the highest percentage of suppliers using vegetable inks across all regions, closely followed by suppliers in Europe and Africa.
- The majority of suppliers, apart from those in Asia, have stated in their EQs that when using vegetable inks containing soy-based oil, this soy is sourced sustainably. BCP has not defined what is classed as sustainably sourced soy, however suppliers have self-stated that either their suppliers have labelled the soy as sustainable, or they comment that soy is a renewable resource and is therefore sustainable. These claims have not yet been followed up by BCP as ink is currently not the highest priority.
- Mineral inks are still the main type of ink used globally. We are starting to see some suppliers shifting to vegetable inks instead. It will be interesting to better understand traceability of the raw materials going into vegetable inks, particularly soy-based oil, and trade-offs with mineral inks.
- Suppliers in Europe (36%), North & Central America (33%) and Asia (54%) are also using UV inks, however, this is to a lesser degree than both vegetable and mineral inks. UV inks can be energy-intensive with high processing costs due to the technical complexity of the ink (Book Chain Project*).

* Book Chain Project: A design guide for the Book Chain Project publishers.

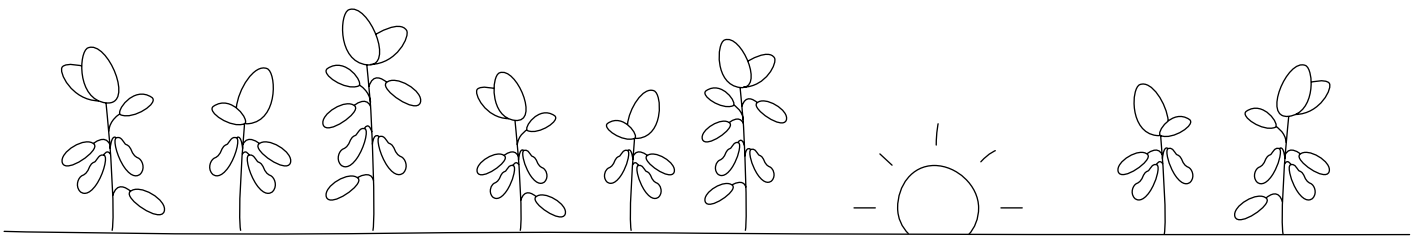
**% OF SUPPLIERS USING VEGETABLE INK**




% of suppliers using vegetable inks

% of suppliers using vegetable inks containing soy based oil

% of suppliers using sustainably sourced soy

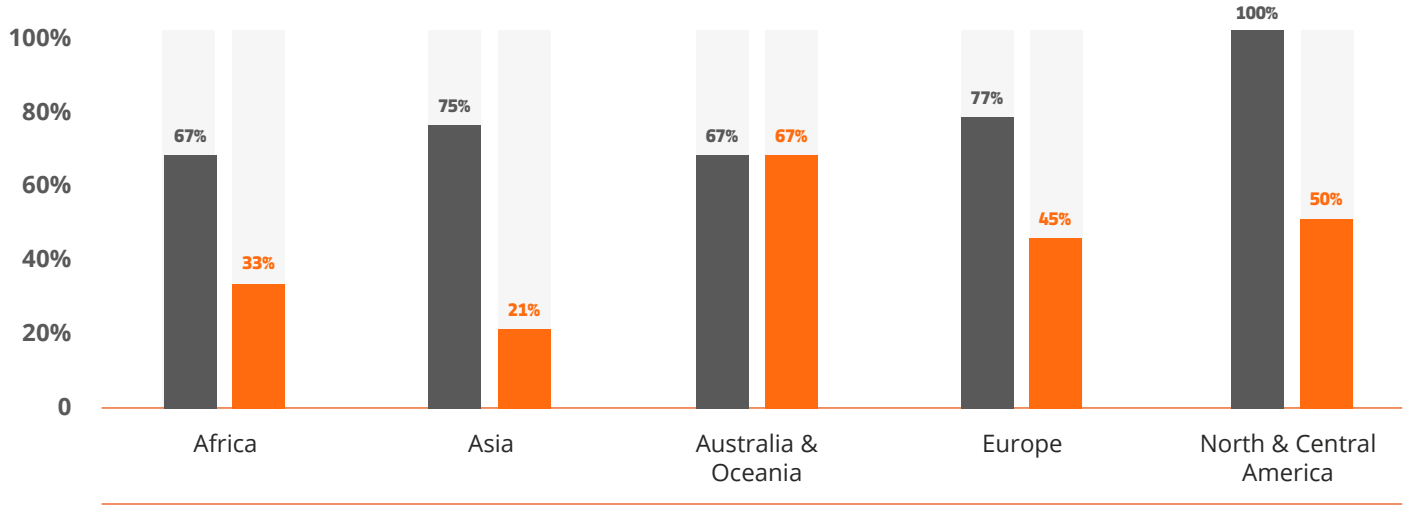


**The majority of suppliers, apart from those in Asia, have stated in their EQs that when using vegetable inks containing soy-based oil, this soy is sourced sustainably.**

# MATERIAL USE & WASTE
# SHRINK WRAP

- Shrink wrap is widely used throughout the publishing industry. However, the most common shrink wrap is fossil fuel-based single-use plastic which is a contributor to the plastic pollution problem.
- Fossil fuel-based shrink wrap is the most common type of shrink wrap used across all five regions and is most predominantly used in North and Central America, followed by Asia and Europe.
- Some print suppliers are using alternatives to fossil fuel-based plastic shrink wrap such as kraft paper, cardboard, and/or bio-based plastic shrink wrap. For more information about the trade-offs of fossil fuel-based shrinkwrap and alternatives, read the BCP's Plastics Guide for the Publishing Industry.
- North and Central America is one of the regions where there is the highest percentage of suppliers using alternatives to fossil fuel-based shrink wrap. The same percentage of suppliers in Australia and Oceania are also using alternatives. China is the region with the lowest percentage, with only 23% of suppliers using alternatives.

**SPLIT BETWEEN SUPPLIERS USING FOSSIL FUEL-BASED SHRINK WRAP AND SUPPLIERS USING ALTERNATIVES**



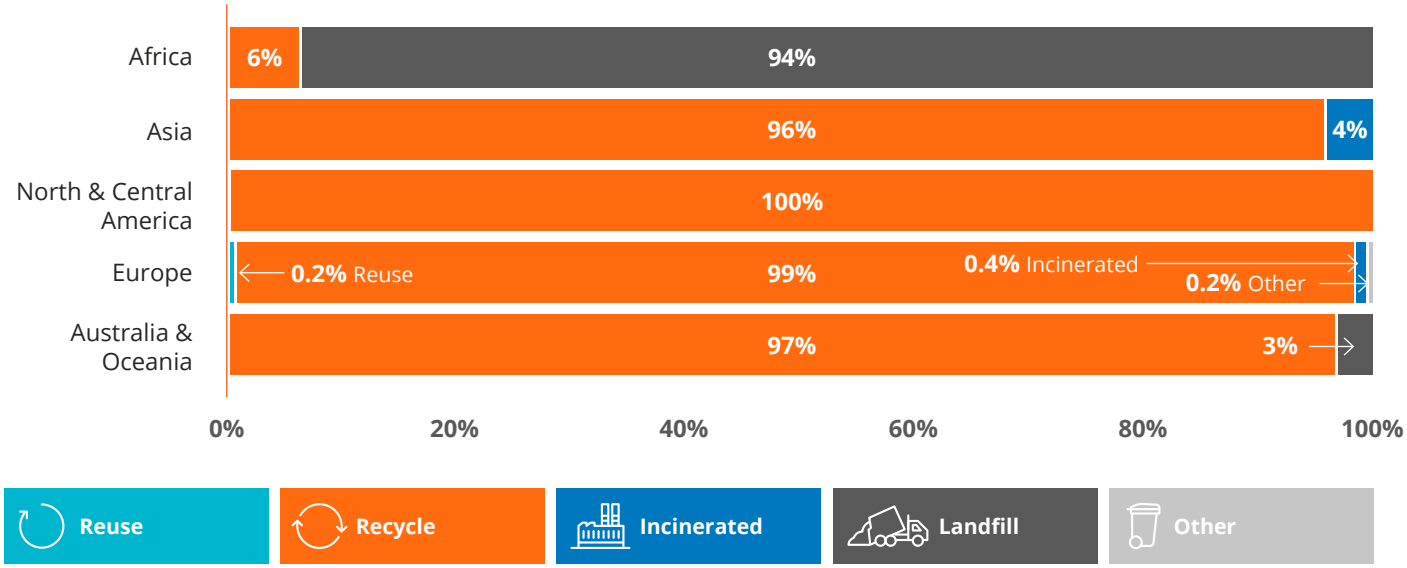

% of suppliers that use Fossil fuel based shrink wrap

% of suppliers that use alternatives

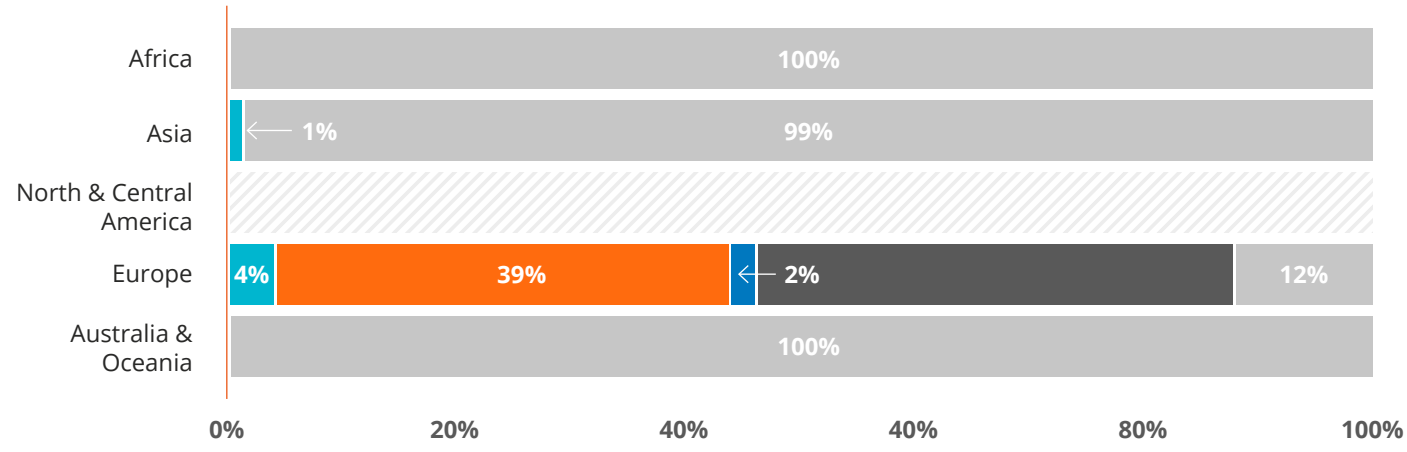
## Fossil fuel-based shrink wrap is the most common type of shrink wrap used across all five regions...

# MATERIAL USE & WASTE
# WASTE

### TREATMENT OF NON-HAZARDOUS WASTE BY REGION




### TREATMENT OF HAZARDOUS WASTE BY REGION




*There is currently not enough available data for North & Central America

## Non-hazardous waste

- The treatment and disposal of waste plays a key role in the environmental impact of products. Across all regions, apart from Africa, the majority of non-hazardous waste is recycled, with 100% of waste being recycled from suppliers in North and Central America. It should be noted that waste treatment methods vary from country to country and are often influenced by the availability of technology (Haile et al, 2021).
- Suppliers in Africa send the majority of their non-hazardous waste to landfill and then recycle the remaining waste.
- In the cases where suppliers are disposing of their waste in other ways, this commonly includes the waste being bought back or resold.

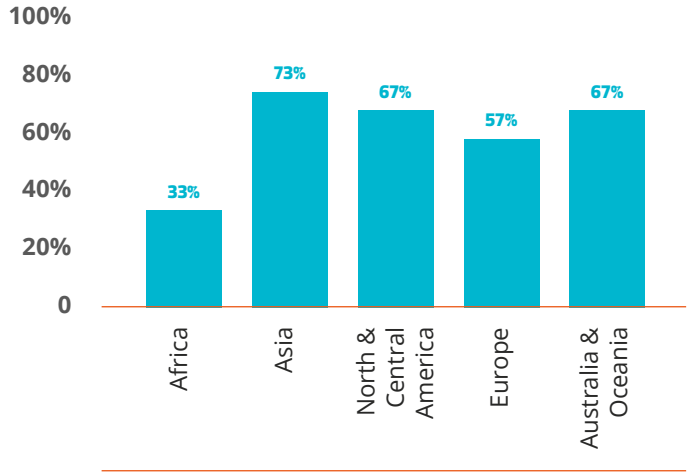
## Hazardous waste

- Suppliers are treating their hazardous waste differently to non-hazardous waste, which is to be expected.
- Suppliers in Australia & Oceania, Asia and Africa are primarily sending their hazardous waste offsite to be treated by a specialist chemical processing company.
- Europe is the only region where suppliers are splitting the treatment methods between recycling, incineration, and disposal via waste treatment companies.

## Waste reduction projects

- Over half of suppliers in all regions except for Africa have waste reduction projects in place. It is encouraging to see so many suppliers working on improving their waste management.
- 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**




BEST PRACTICE EXAMPLE

## Example from a Chinese Printer

- The print supplier has focused on switching to 'environment-friendly' raw materials and in 2021, began to control the consumption of raw materials, despite an increase in production value. This reduced consumption leads to reduced waste.
- The supplier has implemented several specific waste reduction solutions, including the Hazardous Waste Rag Treatment Scheme. Cleaning of the printing press produces around 45 tonnes of hazardous waste every year. By replacing the rag with a reusable sponge, which is more easily washed, it reduces waste rag by 80%. The remaining 20% of rag is still used but is then reused after washing. This solution reduces around 30 tonnes of hazardous waste every year.

**Across all regions, apart from Africa, the majority of non-hazardous waste is recycled, with 100% of waste being recycled from suppliers in North and Central America.**

# CONCLUSION

We hope this report has provided useful insights into the current impacts of the publishing supply chain on the environment. By providing country, sub-region and continent-level GHG emission factors, energy and water intensity figures, we hope to add to the understanding of how environmental impacts differ across geographies, and to help mills and suppliers benchmark themselves against current practice in their locations.

There are interesting differences across the different metrics across geographies. For example, energy and water intensities vary widely between regions. Environmental efficiency is increasingly becoming a business need, not in the least due to the energy price crisis in Europe and increased droughts and the resulting regulations on water use around the world. We hope that the examples of how mills and suppliers from across the world are reducing their energy and water consumption and switching to renewable energy will provide useful inspiration.

It is heartening to see that renewable energy consumption as a share of total energy consumption is increasing in various areas, particularly amongst European mills and suppliers. We were also pleased to see that well over two-thirds of mills across all regions, and 50% of suppliers in all regions except Europe, have water reduction targets in place. The industry has a long way to go, but action is being taken across countless mills and suppliers to further reduce environmental impacts.

Not many industries have as much primary data on their supply chain as the publishing industry has through the Book Chain Project. This report is one small element of our work to help the industry use that data to create more sustainable supply chains. Going forward, it is clear that there are still some data gaps to fill. While we will remain focussed on improving and expanding the data gathered through the Environmental Questionnaires, we will also ensure that data is used by publishers, mills and suppliers to identify and inspire improvement where it most matters.

**It is heartening to see that renewable energy consumption as a share of total energy consumption is increasing in various areas, particularly amongst European mills and suppliers.**

# APPENDIX

## Data points for mills and suppliers

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

Where a data point relies on data from only two sites, the comparability of sites was checked in terms of production volume. This was based on the production volume being within +/- 25%. If two sites had a greater difference in production volume, the data points were not included. This was to ensure the robustness of data, given the small sample size.
This explains why there are instances in the tables below where a '2' is highlighted amber (meaning the data point has been included) and others are highlighted red (meaning the data point has been excluded).

Appendix

# MILLS

| COUNTRY | Fully Integrated | | Semi-integrated (> 50% own pulp) | | Non-Integrated | |
|---|---|---|---|---|---|---|
| | 2020 | 2021 | 2020 | 2021 | 2020 | 2021 |
| Austria | - | - | - | - | 2 | 2 |
| Canada | 3 | - | - | - | - | - |
| China | 3 | 1 | 2 | 1 | 5 | 1 |
| Finland | - | - | 2 | - | 2 | 3 |
| France | 1 | - | - | - | - | - |
| Germany | - | - | 2 | - | 1 | - |
| India | 3 | - | - | 1 | 3 | 2 |
| Indonesia | - | - | - | - | 1 | 1 |
| Italy | - | - | - | - | 1 | 1 |
| Korea (Republic) | 1 | - | - | - | - | - |
| Mexico | - | - | - | - | 1 | 1 |
| Netherlands | - | - | - | - | - | 1 |
| Portugal | 2 | - | - | - | - | - |
| Russia | 1 | 1 | - | - | - | - |
| Slovakia | - | 1 | - | - | - | - |
| Sweden | - | - | - | - | 1 | - |
| United Kingdom | - | - | 2 | 1 | - | - |
| United States | 2 | 1 | - | - | - | - |

| SUB-REGION | Fully Integrated | | Semi-integrated (> 50% own pulp) | | Non-Integrated | |
|---|---|---|---|---|---|---|
| | 2020 | 2021 | 2020 | 2021 | 2020 | 2021 |
| Southern Africa | - | - | - | - | - | - |
| Australia & Oceania | - | - | - | - | - | - |
| Central America | - | - | - | - | 1 | 1 |
| North America | 5 | 1 | 1 | - | - | - |
| East Asia | 4 | 1 | 2 | 1 | 5 | 1 |
| South Asia | 3 | - | - | 1 | 3 | 2 |
| Southeast Asia | - | - | - | - | 1 | 1 |
| Western Asia | - | - | - | - | - | - |
| Eastern Europe | 1 | 2 | - | - | - | - |
| Northern Europe | - | - | 2 | - | 3 | 3 |
| Southern Europe | 2 | - | - | - | 1 | 1 |
| Western Europe | 1 | - | 4 | 1 | 3 | 3 |

| REGION | Fully Integrated | | Semi-integrated (> 50% own pulp) | | Non-Integrated | |
|---|---|---|---|---|---|---|
| | 2020 | 2021 | 2020 | 2021 | 2020 | 2021 |
| Africa | - | - | - | - | - | - |
| Asia | 7 | 1 | 2 | 2 | 9 | 4 |
| Australia & Oceania | - | - | - | - | - | - |
| Europe | 4 | 2 | 6 | 1 | 7 | 7 |
| North & Central America | 5 | 1 | 1 | - | 1 | 1 |

# SUPPLIERS

| COUNTRY | Print Suppliers | |
|---|---|---|
| | 2020 | 2021 |
| Australia | 2 | 1 |
| Bulgaria | 1 | 1 |
| Canada | 1 | - |
| China | 13 | 6 |
| Germany | 2 | 1 |
| India | 1 | - |
| Italy | 4 | 1 |
| Latvia | 1 | - |
| Lithuania | 1 | - |
| Malaysia | 2 | - |
| Mexico | 1 | 1 |
| Netherlands | - | 1 |
| Poland | 1 | 1 |
| Singapore | 2 | 1 |
| Slovakia | 1 | - |
| South Africa | 1 | 2 |
| Spain | 2 | 1 |
| Turkey | 1 | - |
| United Kingdom | 4 | 1 |

| SUB-REGION | Print Suppliers | |
|---|---|---|
| | 2020 | 2021 |
| Southern Africa | 1 | 2 |
| Australia & Oceania | 2 | 1 |
| Central America | 1 | 1 |
| North America | 1 | - |
| East Asia | 13 | 6 |
| South Asia | 1 | - |
| Southeast Asia | 4 | 1 |
| Western Asia | 1 | - |
| Eastern Europe | 5 | 2 |
| Northern Europe | - | - |
| Southern Europe | 7 | 2 |
| Western Europe | 6 | 3 |

| REGION | Print Suppliers | |
|---|---|---|
| | 2020 | 2021 |
| Africa | 1 | 2 |
| Asia | 18 | 7 |
| Australia & Oceania | 2 | 1 |
| Europe | 19 | 7 |
| North & Central America | 2 | 1 |

# CONTACT

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


info@bookchainproject.com

bookchainproject.com

**Carnstone Partners Ltd**
Third Floor
26 Farringdon Street
London EC4A 4AB
United Kingdom


Carnstone

Carnstone is an independent management consultancy specializing in ESG and sustainability with a long track record in running industry groups.

carnstone.com @Carnstone @carnstone_partners carnstone