UPM BIOFORE BEYOND FOSSILS

UPM CORPORATE ENVIRONMENTAL AND SOCIETAL RESPONSIBILITY STATEMENT 2021

UPM PULP AND PAPER MILLS

ABOUT THIS REPORT

EMAS reporting at UPM pulp and paper mills
All of UPM's European pulp and paper mills (except Caledonian in UK), as well as the Fray Bentos pulp mill in Uruguay and the Changshu paper mill in China are registered with the EU Eco-Management and Audit Scheme (EMAS), a voluntary environmental management system for companies and other organisations to improve, evaluate and report on their environmental performance on an annual basis.

UPM Corporate Environmental and Societal Responsibility Statement together with the Environmental and Societal Responsibility reports of each pulp and paper mill of UPM comprise the global EMAS statement of UPM Corporate. The statement has been done according to the European Commission regulation (EC) No 1221/2009.

Since 2018 societal responsibility indicators are part of all the mill supplements. UPM considers it important to report all the impacts generated at the mill locations, whether it is environmental or societal.

Information within the corporate part concerning the sites mentioned here as well as the information used for calculation of UPM Corporate level EMAS core indicators has been assessed and verified by the respective national EMAS auditor.

The present EMAS corporate part is fully updated and can be found with the mill supplements at upm.com.

The next Corporate Environmental and Societal Responsibility Statement will be published in 2023.

Corporate responsibility reporting at UPM
At UPM, the environmental and corporate responsibility reporting is integrated with the company's annual reporting. The UPM Annual Report 2021 follows the framework and disclosures of the Global Reporting Initiative's (GRI) Sustainability Reporting Standard and meets the requirements of the Core option. For the Annual Report and GRI content index table, please order a printed copy of the report or visit **upm.com/responsibility**.

Scope of the report
This statement forms the corporate part of the environmental and societal responsibility statement, which has been verified in accordance with the EU's Eco-Management and Audit Scheme (EMAS). The following sites are included in the EMAS scope:
– UPM Augsburg
– UPM Changshu
– UPM Ettringen
– UPM Fray Bentos
– UPM Hürth
– UPM Jämsänkoski
– UPM Kaukas
– UPM Kymi
– UPM Nordland Papier
– UPM Pietarsaari
– UPM Plattling
– UPM Rauma
– UPM Schongau
– UPM Steyrermühl
– UPM Tervasaari

Corporate registration number: FI-000058

Information about sites without EMAS registration
The UK site UPM Caledonian as well as the non-European site UPM Blandin are not EMAS registered. The information concerning these sites has not been assessed or verified within EMAS context.

UPM

UPM delivers renewable and responsible solutions and innovate for a future beyond fossils across six business areas: UPM Fibres, UPM Energy, UPM Raflatac, UPM Specialty Papers, UPM Communication Papers and UPM Plywood. As the industry leader in responsibility, we are committed to the UN Business Ambition for 1.5°C and the science-based targets to mitigate climate change. We employ 17,000 people worldwide and our annual sales are approximately EUR 9.8 billion. Our shares are listed on Nasdaq Helsinki Ltd. UPM Biofore – Beyond fossils.

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UPM**BIOFORE-BEYOND** FOSSILS

Contents

UPM IN BRIEF

UPM delivers renewable and responsible solutions and innovate for a future beyond fossils. Over the years, the company has reported the environmental impacts of its pulp and paper mills in Europe, China and Uruguay according to the EU Eco-Management and Audit Scheme (EMAS). Today the reports also provide a thorough analysis of the company's societal impact at a local level.

UPM – The Biofore Company

UPM delivers renewable and responsible solutions and innovate for a future beyond fossils across six business areas: UPM Fibres, UPM Energy, UPM Raflatac, UPM Specialty Papers, UPM Communication Papers and UPM Plywood. We employ around 17,000 people worldwide and our annual sales are approximately EUR 9.8 billion.

Corporate responsibility is an integral part of all our operations and is seen as a source of competitive advantage. UPM is strongly committed to continuous improvement in economic, social and environmental performance.

Pulp

We have three pulp mills in Finland and one in Uruguay. UPM Pulp serves the global market annually with 3.7 million tonnes of sustainably produced eucalyptus, birch and softwood pulp grades for a variety. The pulp mills are also producing wood-based renewable energy as well as by-products and residues, which are used for innovative bio-products.

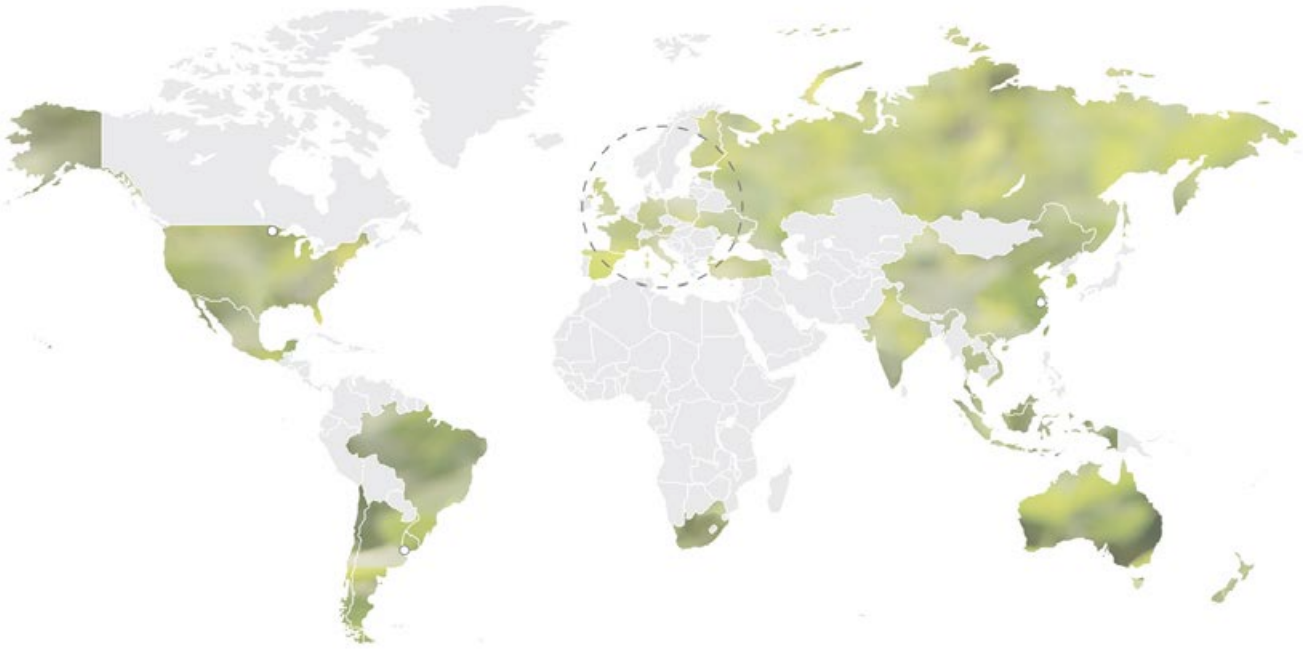
Pulp is a biodegradable raw material for numerous end-uses such as packaging materials, various papers, hygiene products, textiles as well as binders for cosmetics, pharmaceuticals, food, paints, etc.

Paper

We have one Specialty Papers production unit in China, one in Germany and two units in Finland, with the combined capacity of 2 million tonnes. UPM Specialty Papers offers labelling materials and release liners, office and graphic papers as well as packaging papers.

We have 13 Communication Papers production units in Europe and in the USA, with the combined capacity of 6 million tonnes. UPM Communication Papers offer magazine paper, newsprint and fine papers for a wide range of end uses.

The decline in paper demand has been predictable and steady during recent years. Our focus has been on operational excellence to meet customer demand.



Profiles of UPM pulp and paper mills

	Environmental management system		Quality management system	Health & safety system	Energy management system	Food safety management system				On-site pulping		Effluent treatment plant	Power plant and/or boiler	Fuels	
	ISO 14001	EMAS	ISO 9001	ISO 45001	ISO 50001 EES+*	ISO 22000	Paper machines	Paper grades	Chemical pulp grades	Mechanical pulping	Deinking			renewable	fossil
Augsburg, DE	x	x	x	x	x	–	1	LWC	–	x	x	municipal	x	–	x
Blandin, US	x	–	x	x	–	–	1	LWC	–	x	–	municipal	x	–	x
Caledonian, GB	x	–	x	x	–	–	1	LWC	–	x	–	municipal	x	x	x
Changshu, CN	x	x	x	x	x	x [3]	3	fine (WFU, WFC), label	–	–	–	own	x	x	x
Ettringen, DE	x	x	x	x	x	–	1	SC	–	x	x	own	x	–	x
Fray Bentos, UY	x	x	x	x	x	x	–	–	eucalyptus pulp	–	–	own	x	x	x
Hürth, DE	x	x	x	x	x	–	1	newsprint	–	–	–	external	external	–	x
Jämsänkoski, FI	x	x	x	x	x [1]	x [3]	3	SC, MFS, news-print, label, packaging	–	x	x	own	x	x	x
Kaukas, FI	x	x	x	x	x [2]	x [4]	1	LWC	softwood and birch pulp	x	–	own	x	x	x
Kymi, FI	x	x	x	x	x [2]	x [4]	2	fine (WFU, WFC), label	softwood and birch pulp	–	–	own	x	x	x
Nordland, DE	x	x	x	x	x	x [3]	4	fine (WFU, WFC)	–	–	–	own	x	–	x
Pietarsaari, FI	x	x	x	x	x	x	–	–	softwood and birch pulp	–	–	own	x	x	x
Plattling, DE	x	x	x	x	x	–	2	SC, LWC	–	x	x	own	external	–	x
Rauma, FI	x	x	x	x	x [1]	–	2	LWC	–	x	–	own	x	x	x
Schongau, DE	x	x	x	x	x	–	3	SC, newsprint, MFS	–	x	x	own	x	x	x
Steyrermühl, AT	x	x	x	x	x	–	1	newsprint	–	x	x	own	x	x	x
Tervasaari, FI	x	x	x	x	x [1]	x	2	label	–	–	–	own	x	x	x

[1] EES+ certification
[2] EES+ certification in paper mill and ISO 50001 in pulp mill
[3] Label papers
[4] In pulp mill (not in paper mill)

* Finnish authorities responsible for energy saving have developed Energy Efficiency System EES+. In terms of energy reviews the requirements of EES+ are consistent with the ISO 50001 standard. EES+ has been integrated with the ISO 14001 based environmental system at a mill.

LWC: light-weight coated paper
SC: supercalendered paper
WFC/WFU: woodfree coated/woodfree uncoated
MFS: machine-finished specialities

Numbers of personnel and capacity can be found in the mill supplements (available at **upm.com/responsibility**).

All certificates can be found from UPM's Certificate Finder (available at **upm.com/responsibility**).

Safe, recyclable products from renewable raw materials

The main raw material for all UPM's pulp and paper products is wood – a renewable natural resource. Paper can easily be recycled and used again. UPM uses significant amounts of recovered paper as raw material.

The choice of raw material used in paper production is based on the requirements of the end product. The production of different grades is optimised as much as possible according to the availability of raw materials in close proximity to UPM mills. Fresh wood is a natural raw material for grades made, for example, in Finland, and recycled fibre is used at the Central European mills.

Typical end uses of UPM pulp and papers

PRODUCT GROUP	EXAMPLES OF END USES
Chemical pulp	Household and toilet papers, napkins, handkerchief tissue, consumer packages, labels, graphic papers, textiles and binders
Magazine papers	Magazines, advertising material, catalogues
Newsprint	Newspapers, newspaper inserts, supplements
Fine papers	Office papers, magazines, books, advertising material, envelope papers
Specialty papers	Face and release papers for self-adhesive labels

Product safety

All UPM pulp products are elemental chlorine free (ECF) or total chlorine free (TCF) and UPM paper products are manufactured from elemental chlorine free (ECF) or total chlorine free (TCF) pulps.

They also fulfil the requirements of the European Packaging and Packaging Waste Directive 94/62/EC and its amendments.

Product safety is the single most important responsibility related concern for UPM's customers. To support its paper customers, UPM publishes Product Safety Profiles annually. Product Safety Profile is a tool to ensure that UPM's customers receive all relevant product information in one concise source. The document includes basic facts on product composition, product certificates, regulations related to product compliance and other possible measures taken to ensure that the product is safe.

In 2022 UPM will finalize implementation of new chemical database. In this connection we are implementing an automated pre-screening of hazardous substances that are restricted for example in European chemicals regulation, REACH.

ISO 22000 food safety management system is used at all UPM pulp mills and at UPM Specialty Papers European mills to ensure food safety of products.

Environmental product declarations

UPM provides environmental product declarations for pulp and paper. The data is presented as annual averages for a paper machine line or pulp mill.

Paper Profile is an environmental product declaration scheme developed and provided by leading paper producers (paperprofile.com). It covers key environmental aspects related to pulp and paper production including product composition and emissions, wood procurement and environmental management. Paper Profiles are available for all UPM paper machine lines.

Furthermore, UPM publishes detailed information about the carbon footprint of its pulp and paper products. The information is provided together with the Paper Profiles and the Pulp product declarations.

Environmental labels

UPM pulp and paper products fulfil the criteria for most of the internationally recognised ecolabels. Thus UPM customers have the possibility of using a number of different ecolabels. Criteria for these labels can focus on one part of the supply chain only (for example FSC™ (FSC C014719) and PEFC (PEFC/02-31-80) forest certification), or span a range of criteria from raw materials and the production process to the final product (for example the EU Ecolabel). Please see the respective mill supplement for up-to-date information about availability of environmental labels. All certificates can be found from UPM's Certificate Finder (available at **upm.com/responsibility**).

FSC www.fsc.org FSC® C014719 The mark of responsible forestry

PEFC PEFC/02-31-80 Promoting Sustainable Forest Management www.pefc.org

EU Ecolabel www.ecolabel.eu EU Ecolabel : FI/011/001

ENVIRONMENTAL PERFORMANCE

All process water is treated in mechanical and biological effluent treatment plants before being released into watercourses.

Environmental targets show direction

UPM's Biofore strategy guides us in the achievement of our responsibility targets for 2030 and contributes positively to achieving the UN Sustainable Development Goals (SDGs).

In order to guide our responsibility activities, we have established a set of responsibility focus areas with targets and key performance indicators which are reviewed every year based on a materiality analysis. We have also identified the SDGs where we can have the greatest impact, either by minimising our negative impacts or by increasing our positive impacts. Those most relevant SDGs for UPM are aligned with the responsibility focus areas.

In terms of environmental responsibility, the focus areas are forests and biodiversity, climate, water, waste and product stewardship. In terms of social responsibility, the focus areas are continuous learning and development, responsible leadership, diversity and inclusion, fair rewarding, safe and healthy working environment and community involvement. See details in UPM Annual Report.

UPM's environmental focus areas, key performance indicators and current Group-level performance in relation to the relevant targets can be seen in the table below. The annual target-setting of UPM's pulp and paper mills is published in the mill supplements. The mill-level targets reflect UPM's long-term targets at a local level. In addition, the mill-level targets focus on the specific local development areas.

ENVIRONMENTAL	2030 TARGET	2021 RESULTS (2020 RESULTS)
Forests and biodiversity Ensuring sustainable land use and keeping forests full of life	• Climate-positive land use (continuous) • 100% of fibre certified by 2030 [1)] • Positive impact on biodiversity: implementing biodiversity programme and developing monitoring system (continuous) [2)]	• Five-year annual average carbon sink of UPM's own and leased forests was approx. 3.8 m tonnes of CO_2 equivalents • 84% (83%) of all wood used by UPM is sourced from certified forests. • Overall positive development measured, 6 positive and 2 negative subindicators
Climate Creating climate solutions and working towards carbon neutrality	• 65% reduction of fossil CO_2 emissions from our own combustion and purchased electricity by 2030 (Scope 1 and 2) [3)] • No coal and peat usage in on-site energy generation by 2030 • 1% annual energy efficiency improvement (continuous) • 70% share of renewable fuels (continuous) • 20% reduction of acidifying flue gases by 2030 (NO_x /SO_2) [3)]	• Fossil CO_2 emissions reduced by 27% compared to 2015 and by 8% compared to 2020 • New target • Achieved • 70% (72%) share reached in the use of renewable fuels • 27% reduction of acidifying flue gases since 2015 for the UPM average product
Water Using water responsibly	• 40% reduction of effluent load (chemical oxygen demand, COD) by 2030 [4)] • 30% reduction of wastewater volume by 2030 [4)] • 100% of nutrients used at effluent treatment from recycled sources by 2030 [4)]	• 38% reduction in effluent load (chemical oxygen demand, COD) since 2008 for the UPM average product • 18% reduction in wastewater volume since 2008 for the UPM average product • 35% (28%) of nutrients from recycled resources
Waste Promoting material efficiency and circular economy – reduce, reuse and recycle	• No process waste sent to landfills or to incineration without energy recovery by 2030	• 89% (89%) of all UPM's process waste was recovered and recycled. The total amount of process waste to landfills decreased by 3% compared to 2020.
Product stewardship Taking care of the entire lifecycle	• Climate-positive product portfolio (continuous) • Development of new products and services with contribution to the UN SDGs (continuous) • 100% of applicable products eligible for ecolabelling	• Scientific study on substitution and storage effect continued • Piloting of the Sustainable Product Design concept continued • 84% (82%) of UPM sales were eligible for ecolabelling

[1)] Forest management certification
[2)] Covers UPM own forests in Finland
[3)] From 2015 level
[4)] From 2008 level, relevant for pulp and paper production

Goal 6: Clean water and sanitation (Target: 6.3)

Goal 7: Affordable and clean energy (Targets: 7.2 and 7.3)

Goal 8: Decent work and economic growth (Targets: 8.2, 8.5 and 8.8)

Goal 12: Responsible consumption and production (Targets: 12.2, 12.4 and 12.5)

Goal 13: Climate action (Target: 13.1)

Goal 15: Life on land (Targets: 15.2 and 15.5)

Environmental development – Pulp

Our annual pulp production capacity of 3.7 million tonnes is produced in Finland and in Uruguay. In 2021, the strong demand for tissue and hygiene products as well as for packaging and specialty paper products supported the global pulp demand. Pulp consumption in graphic paper end-use segment recovered from 2020.

Environmental performance of the pulp mills continued as strong in 2021.

UPM is currently building a new world-class pulp mill near Paso de los Toros in central Uruguay. The USD 3.47 billion investment in a 2.1 million-tonne greenfield eucalyptus pulp is scheduled to begin production in the end of Q1 2023.

Fibre sources

In 2021, 80% of wood used in pulp production was from FSC® and/or PEFC certified forests with the remainder coming from controlled sources.

Energy

UPM's pulp mills are more than self-sufficient in energy usage and providing surplus heat for the integrated paper mill or to external parties and providing surplus electricity to the grid. The share of renewable energy remained on a good level at 94%.

Air

In 2021, specific emissions of fossil carbon dioxide from own fuel usage (scope 1) decreased slightly from 2020. Specific fossil carbon dioxide emissions from purchased electricity (scope 2) was included in EMAS scope in 2021. Nitrogen oxide and sulphur dioxide stayed in the same good level. Particulates slightly increased and total reduced sulphur slightly decreased. UPM's target to reduce acidifying flue gases (NO_x and SO_2) is 20% by 2030 from 2015 levels. Progress since 2015 has been good, being 11% so far. In line with UPM's commitment to reduce fossil CO_2 emissions (scope 1 and 2) by 65% until 2030 a road map to achieve this target has been drawn and its implementation is in progress.

Water

In 2021 specific waste water volume stayed in same level as in 2020, 30.7 m^3 per tonne of pulp. COD load per tonne of pulp increased slightly from 8.9 kg in 2020 to 9.4 kg in 2021. The waste water volume per tonne of pulp has decreased by 29% and COD per tonne of pulp has decreased by 47% from 2008 levels, which is the base year of our target. All mills have road maps for reducing water use and effluent load to achieve the 2030 targets.

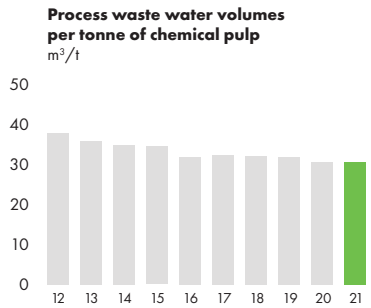
Waste

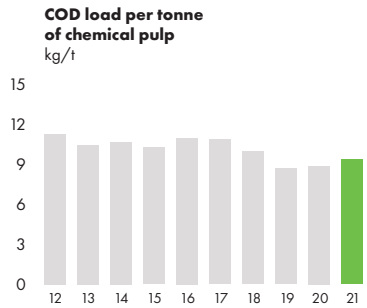
The amount of waste sent to landfills increased from 12.6 kg per tonne of pulp in 2020 to 14.4 kg per tonne of pulp in 2021. That was mainly due to damaged lime kiln sealing in Fray Bentos pulp mill. This event increased the amount of green liquor dregs and sludge to be landfilled. Over the last ten years the amount of waste sent to landfills has decreased by 15%. Green liquor dregs are one of the most challenging side streams of UPM's pulp, and we are currently developing several innovative processes for utilising this material in Finland and Uruguay.

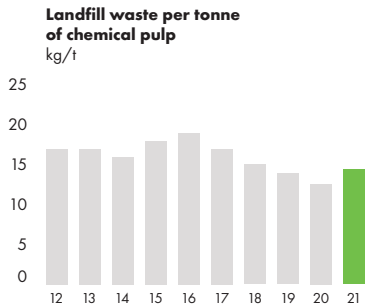
Biodiversity

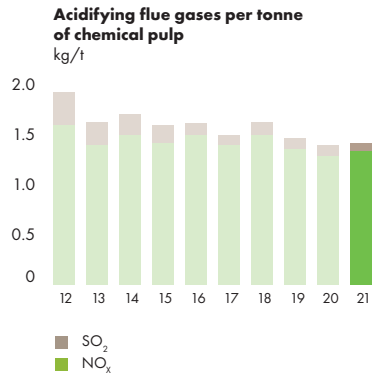
Mills report their land-use with regards to biodiversity. In 2021 there was in total 2,300 hectares of nature-oriented areas on site and off site that pulp mills and integrated pulp and paper mills own or manage. That consists mainly of the Mafalda protection area in Uruguay managed by Fray Bentos.

Read more at
upmpulp.com









Environmental development – Paper

Demand for label papers, release base papers and packaging papers remained strong in 2021. Fine paper supply-demand balance proved challenging in the Asia-Pacific region.

In 2021, the UPM Changshu paper mill was recognised as a frontrunner in sustainable development within the Jiangsu province. The mill's water management and water pollution control were the particular processes for which this recognition was received.

Graphic papers' demand was good, but our profitability was weak due to significant cost increases in pulp, recycled fibre and logistics.

The UPM Kaipola paper mill was permanently closed in January 2021 and the UPM Shotton newsprint mill was sold in September 2021.

Figures in this page include UK site UPM Caledonian and US site UPM Blandin which are not EMAS registered. The information concerning these sites, and therefore neither summary figures in this page, have not been verified within EMAS context.

Fibre
In 2021, 22% of all fibre used in UPM's paper production was recycled fibre. In 2021, 85% of the fibres used in paper production originated from FSC® and/or PEFC certified sources, the remainder came from controlled sources.

Water
In 2021 specific waste water volume decreased from 11.6 m^3 per tonne of paper to 10.1 m^3 per tonne of paper. Also COD load slightly decreased from 3.4 kg per tonne of paper to 3.2 kg per tonne of paper. In addition, good improvement was reached regarding the use of fresh water, as water intake decreased from 24 m^3 per tonne of paper to 20 m^3 per tonne of paper. All mills have prepared a road map in order to reach their targets for reducing water use and effluent load by 2030.

Air
In 2021, emissions of NO_X and SO_2 per tonne of paper slightly decreased. Specific emissions of fossil carbon dioxide from own fuel usage (scope 1) decreased slightly from 2020. Specific fossil carbon dioxide emissions from purchased electricity (scope 2) was included in EMAS scope in 2021. At UPM Nordland paper mill in Germany, we are currently constructing a natural gas-fired combined heat and power (CHP) plant. At UPM Hürth paper mill in Germany, we are building a new biomass-fired plant.

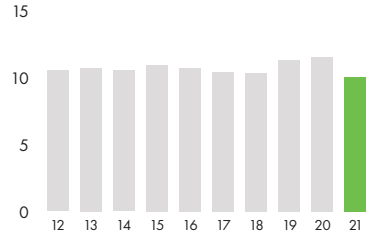
Energy
The electricity consumption per tonne of paper decreased from 1,300 kWh in 2020 to 1,200 kWh in 2021. In 2021, 37% of fuels used for on-site energy generation were based on biomass. For purchased electricity, the renewable share was 14% in 2021.

Waste
In 2021 the amount of landfilled waste decreased from 6.3 kg per tonne of paper in 2020 to 1.7 kg per tonne of paper in 2021. That was mainly because of selling of Shotton paper mill and recovered side stream utilization opportunities after the Covid-19 pandemic. The biggest waste fraction for UPM's paper mills is ash, which results from energy generation at the mills. Overall for UPM's paper mills in 2021, over 97% of waste was recycled or recovered as energy.

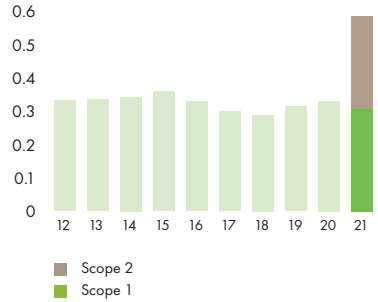
Biodiversity
Mills report their land-use with regards to biodiversity. In 2021 there was in total 790 hectares of nature-oriented areas on site and off site paper mills and integrated pulp and paper mills own or manage. A "nature-oriented area" is an area dedicated primarily to nature preservation or restoration.

Read more at
upmpaper.com

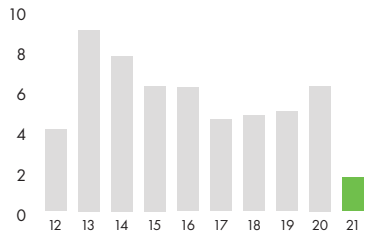
Process waste water volumes per tonne of paper
m^3/t



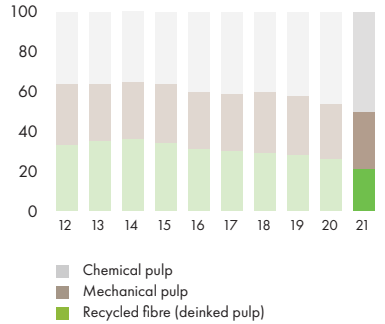
Fossil carbon dioxide emissions per tonne of paper
CO_2 t/t



Landfill waste (incl. incineration without energy recovery) per tonne of paper
kg/t



Fibre raw materials used in UPM's paper
%



Environmental development – Common topics for pulp and paper

Supplier assessments and requirements

The UPM Supplier and Third Party Code defines the minimum requirements concerning social, environmental and economic responsibility that apply to all our suppliers and third party intermediaries (e.g. agents, joint venture partners and distributors acting on behalf of UPM). It is additionally expected that our suppliers advance the same requirements in their own supply chains.

In addition to conducting risk assessments as part of our supplier selection, we carry out continuous risk assessments covering our entire existing supplier base. Risk assessments are an integral part of our supplier management activities. We utilize them to reveal possible shortcomings in supplier performance and compliance.

Clean Run

Clean Run is a global, holistic concept to manage the daily environmental performance all over UPM. It brings additional value to the ISO 14001 environmental management system which is a basis for all our environmental operations globally. Clean Run is also a tool to manage environmental risks and to continuously develop the controls. Sharing best practises between the sites is an essential part of the Clean Run concept.

Clean Run is continuous improvement of environmental performance towards zero deviation target. The concept offers a framework for all sites to plan the actions to improve their environmental performance.

Clean Run categorises environmental incidents from 0–5 based on the severity of environmental impact: Environmental walks and discussions, observations (Category 0), near misses (Category 1–2) and deviations (Categories 3–5).

In 2021, no serious environmental incidents occurred at UPM's pulp and paper mills. However, 25 (2020: 17; 2019: 19) minor temporary deviations from permit limits occurred in total in whole UPM. Those were immediately reported to authorities and corrective measures were taken to prevent similar situations from occurring again.

Best Available Techniques (BAT)

Industry-specific reference documents are developed by the European IPPC Bureau. The conclusions for the pulp and paper industry were published by the EU Commission in September 2014. The BAT conclusions are now the reference for setting permit conditions for installations covered by the EU's Industrial Emissions Directive. The implementation period is four years. UPM is benchmarking its production lines against the BAT levels.

Environmental core indicators 2021

UPM PAPER MILLS

Scope: all UPM paper mills

	2019		2020		2021	
Production	8,230,000 t		7,020,000 t		7,300,000 t	
	Total amount per year	Indicator per tonne of paper	Total amount per year	Indicator per tonne of paper	Total amount per year	Indicator per tonne of paper
Energy efficiency						
Total direct energy consumption						
Electricity consumption	10,900 GWh	1,300 kWh/t	9,200 GWh	1,300 kWh/t	8,900 GWh	1,200 kWh/t
Steam consumption	10,000 GWh	1,200 kWh/t	8,500 GWh	1,200 kWh/t	8,500 GWh	1,200 kWh/t
Total renewable energy consumption						
Electricity consumption	2,700 GWh	330 kWh/t	1,600 GWh	220 kWh/t	1,700 GWh	230 kWh/t
Steam consumption	4,300 GWh	520 kWh/t	3,400 GWh	480 kWh/t	3,100 GWh	430 kWh/t
Material efficiency						
Chemical pulp	2,380,000 t	290 kg/t	2,260,000 t	320 kg/t	2,430,000 t	330 kg/t
Mechanical pulp	1,730,000 t	210 kg/t	1,400,000 t	200 kg/t	1,430,000 t	200 kg/t
Recycled fibre pulp	1,600,000 t	200 kg/t	1,270,000 t	180 kg/t	1,040,000 t	140 kg/t
Minerals	2,030,000 t	250 kg/t	1,740,000 t	250 kg/t	1,920,000 t	260 kg/t
Binder	230,000 t	28 kg/t	200,000 t	30 kg/t	242,000 t	30 kg/t
Water						
Water intake	202,000,000 m^3	25 m^3/t	165,000,000 m^3	24 m^3/t	147,000,000 m^3	20 m^3/t
Process waste water	94,600,000 m^3	12 m^3/t	81,300,000 m^3	12 m^3/t	74,000,000 m^3	10 m^3/t
COD [1]	27,900 t	3 kg/t	24,000 t	3 kg/t	24,000 t	3 kg/t
TSS [1]	2,400 t	0.3 kg/t	2,000 t	0.3 kg/t	1,900 t	0.3 kg/t
Side-products [2]	177,000 t	22 kg/t	157,000 t	22 kg/t	158,000 t	22 kg/t
Ash	125,000 t	15 kg/t	106,000 t	15 kg/t	99,900 t	14 kg/t
Wood residues	47,900 t	6 kg/t	45,600 t	6 kg/t	53,300 t	7 kg/t
Others	4,700 t	1 kg/t	5,500 t	1 kg/t	4,800 t	1 kg/t
Non-hazardous waste [2]						
Recycling, energy recovery, composting	468,000 t	57 kg/t	453,000 t	65 kg/t	382,000 t	52 kg/t
Ash [3]	207,000 t	25 kg/t	176,000 t	25 kg/t	137,000 t	19 kg/t
Sludges	193,000 t	23 kg/t	207,000 t	29 kg/t	171,000 t	23 kg/t
Others	67,500 t	8 kg/t	70,500 t	10 kg/t	74,300 t	10 kg/t
Intermediate storage	1,900 t	0.2 kg/t	0 t	0 kg/t	0 t	0.0 kg/t
Ash	1,900 t	0.2 kg/t	0 t	0 kg/t	0 t	0.0 kg/t
Others	0 t	0 kg/t	0 t	0 kg/t	0 t	0.000 kg/t
Landfill, incineration without energy recovery	40,800 t	5 kg/t	44,100 t	6 kg/t	12,100 t	2 kg/t
Ash [3]	16,200 t	2 kg/t	19,400 t	3 kg/t	170 t	0 kg/t
Sludges and pulp rejects	9,800 t	1 kg/t	9,200 t	1 kg/t	11,500 t	2 kg/t
Others	14,800 t	2 kg/t	15,600 t	2 kg/t	500 t	0.1 kg/t
Recycling rate	92%		91%		97%	
Hazardous waste [4]	3,000 t	0.4 kg/t	4,100 t	0.6 kg/t	2,700 t	0.4 kg/t
Emissions to air						
CO_2 fossil	2,600,000 t	320 kg/t	2,332,000 t	330 kg/t	2,248,000 t	310 kg/t
CO_2 fossil from purchased electricity					2,045,000	280 kg/t
NO_x, as NO_2	3,100 t	0.4 kg/t	2,300 t	0.3 kg/t	2,000 t	0.3 kg/t
SO_2	640 t	0.1 kg/t	370 t	0.1 kg/t	330 t	0.04 kg/t
Particulates	34 t	0.004 kg/t	28 t	0.004 kg/t	28 t	0.004 kg/t
Land use [5]						
Total land use on site					1,300 ha	
Total sealed area on site					780 ha	
Total nature-oriented area on site					500 ha	
Total nature-oriented area off site					290 ha	

[1] Includes the load before effluent treatment in AUG, HÜR and CAL (waste water is treated externally).
[2] Reported in dry tonnes.
[3] Including ash, which is considered as hazardous waste in the UK.
[4] Total tonnes.
[5] Incl. paper mills and integrated pulp and paper mills.

Environmental core indicators 2021

UPM PAPER MILLS

Scope: EMAS-registered UPM paper mills

	2019		2020		2021	
Production	7,850,000 t		6,490,000 t		6,860,000 t	
	Total amount per year	Indicator per tonne of paper	Total amount per year	Indicator per tonne of paper	Total amount per year	Indicator per tonne of paper
Energy efficiency						
Total direct energy consumption						
Electricity consumption	10,100 GWh	1,300 kWh/t	8,300 GWh	1,300 kWh/t	8,200 GWh	1,200 kWh/t
Steam consumption	9,300 GWh	1,200 kWh/t	7,600 GWh	1,200 kWh/t	7,800 GWh	1,100 kWh/t
Total renewable energy consumption						
Electricity consumption	2,400 GWh	310 kWh/t	1,200 GWh	180 kWh/t	1,300 GWh	200 kWh/t
Steam consumption	3,800 GWh	490 kWh/t	2,700 GWh	420 kWh/t	2,800 GWh	400 kWh/t
Material efficiency						
Chemical pulp	2,343,000 t	300 kg/t	2,200,000 t	340 kg/t	2,350,000 t	340 kg/t
Mechanical pulp	1,629,000 t	210 kg/t	1,250,000 t	200 kg/t	1,220,000 t	180 kg/t
Recycled fibre pulp	1,428,000 t	180 kg/t	1,100,000 t	170 kg/t	1,040,000 t	150 kg/t
Minerals	1,970,000 t	250 kg/t	1,630,000 t	250 kg/t	1,780,000 t	260 kg/t
Binder	221,000 t	28 kg/t	193,000 t	30 kg/t	225,000 t	33 kg/t
Water						
Water intake	180,000,000 m^3	23 m^3/t	153,000,000 m^3	24 m^3/t	135,000,000 m^3	20 m^3/t
Process waste water	85,700,000 m^3	11 m^3/t	70,900,000 m^3	11 m^3/t	65,300,000 m^3	10 m^3/t
COD [1]	26,600 t	3 kg/t	20,000 t	3 kg/t	18,600 t	3 kg/t
TSS [1]	2,300 t	0.3 kg/t	1,800 t	0.3 kg/t	1,600 t	0.2 kg/t
Side-products [2]	177,000 t	23 kg/t	157,000 t	24 kg/t	158,000 t	23 kg/t
Ash	125,000 t	16 kg/t	106,000 t	16 kg/t	99,900 t	15 kg/t
Wood residues	47,900 t	6 kg/t	45,600 t	7 kg/t	53,300 t	8 kg/t
Others	4,700 t	1 kg/t	5,500 t	1 kg/t	4,800 t	1 kg/t
Non-hazardous waste [2]						
Recycling, energy recovery, composting	407,000 t	52 kg/t	396,000 t	61 kg/t	341,000 t	50 kg/t
Ash [3]	171,000 t	22 kg/t	153,000 t	24 kg/t	128,000 t	19 kg/t
Sludges	191,000 t	24 kg/t	198,000 t	30 kg/t	171,000 t	25 kg/t
Others	45,300 t	6 kg/t	45,100 t	7 kg/t	41,900 t	6 kg/t
Intermediate storage	1,900 t	0.2 kg/t	0 t	0 kg/t	0 t	0 kg/t
Ash	1,900 t	0.2 kg/t	0 t	0 kg/t	0 t	0 kg/t
Others	0 t	0 kg/t	0 t	0 kg/t	0 t	0 kg/t
Landfill, incineration without energy recovery	30,600 t	4 kg/t	2,600 t	0.4 kg/t	140 t	0.02 kg/t
Ash [3]	16,000 t	2 kg/t	0 t	0 kg/t	0 t	0 kg/t
Sludges and pulp rejects	0 t	0 kg/t	0 t	0 kg/t	31 t	0 kg/t
Others	14,500 t	2 kg/t	2,600 t	0.4 kg/t	100 t	0.02 kg/t
Recycling rate	93%		99%		99.9%	
Hazardous waste [4]	2,800 t	0.4 kg/t	2,900 t	0.4 kg/t	2,600 t	0.4 kg/t
Emissions to air						
CO_2 fossil	2,470,000 t	320 kg/t	2,215,000 t	340 kg/t	2,120,000 t	310 kg/t
CO_2 fossil from purchased electricity					1,785,000 t	260 kg/t
NO_x, as NO_2	2,800 t	0.4 kg/t	1,700 t	0.3 kg/t	1,700 t	0.2 kg/t
SO_2	600 t	0.1 kg/t	320 t	0.1 kg/t	300 t	0.04 kg/t
Particulates	34 t	0.004 kg/t	25 t	0.004 kg/t	23 t	0.003 kg/t
Land use [5]						
Total land use on site					1,300 ha	
Total sealed area on site					780 ha	
Total nature-oriented area on site					480 ha	
Total nature-oriented area off site					290 ha	

[1] Includes the load before effluent treatment in AUG and HÜR (waste water is treated externally)
[2] Reported in dry tonnes.
[3] Including ash, which is considered as hazardous waste in the UK.
[4] Total tonnes.
[5] Incl. paper mills and integrated pulp and paper mills.

Environmental core indicators 2021

UPM CHEMICAL PULP MILLS

Scope: all UPM pulp mills

	2019		2020		2021	
Production	3,700,000 t		3,640,000 t		3,760,000 t	
	Total amount per year	Indicator per tonne of chemical pulp	Total amount per year	Indicator per tonne of chemical pulp	Total amount per year	Indicator per tonne of chemical pulp
Energy efficiency						
Total direct energy consumption						
Electricity consumption	2,200 GWh	600 kWh/t	2,100 GWh	570 kWh/t	2,200 GWh	580 kWh/t
Steam consumption	11,700 GWh	3,100 kWh/t	13,700 GWh	3,800 kWh/t	13,700 GWh	3,700 kWh/t
Total renewable energy consumption						
Electricity consumption	2,000 GWh	550 kWh/t	1,900 GWh	510 kWh/t	1,800 GWh	480 kWh/t
Steam consumption	10,800 GWh	2,900 kWh/t	12,800 GWh	3,500 kWh/t	12,900 GWh	3,400 kWh/t
Material efficiency						
Wood	16,400,000 m^3	4 m^3/t	15,900,000 m^3	4 m^3/t	16,600,000 m^3	4 m^3/t
Process chemicals [1]	457,000 t	120 kg/t	442,000 t	120 kg/t	455,000 t	120 kg/t
Water						
Water intake	224,000,000 m^3	61 m^3/t	214,000,000 m^3	59 m^3/t	249,000,000 m^3	66 m^3/t
Process waste water	119,000,000 m^3	32 m^3/t	112,000,000 m^3	31 m^3/t	115,000,000 m^3	31 m^3/t
COD	32,200 t	9 kg/t	32,400 t	9 kg/t	35,300 t	9 kg/t
TSS	1,100 t	0.3 kg/t	1,200 t	0.3 kg/t	1,200 t	0.3 kg/t
AOX	290 t	0.1 kg/t	270 t	0.1 kg/t	280 t	0.1 kg/t
Residues [2]			71,000 t	19.0 kg/t	78,000 t	21.0 kg/t
Tall oil			69,000 t	19.0 kg/t	77,000 t	20.0 kg/t
Turpentine			1,500 t	0.4 kg/t	1,400 t	0.4 kg/t
Side-products [3]	2,800 t	1 kg/t	1,200 t	0.3 kg/t	7,200 t	1.9 kg/t
Green liquor dregs	1,400 t	0.4 kg/t	120 t	0.03 kg/t	1,300 t	0.36 kg/t
Lime	1,400 t	0.4 kg/t	1,100 t	0.3 kg/t	5,900 t	1.6 kg/t
Others					2,400 t	0.6 kg/t
Non-hazardous waste [3]	176,000 t	48 kg/t	146,000 t	40 kg/t	153,000 t	41 kg/t
Recycling, energy recovery, composting	108,000 t	29 kg/t	98,400 t	27 kg/t	92,400 t	25 kg/t
Sludges	15,800 t	4 kg/t	17,500 t	5 kg/t	17,400 t	5 kg/t
Bark and wood waste	68,600 t	19 kg/t	66,100 t	18 kg/t	63,700 t	17 kg/t
Others	23,200 t	6 kg/t	14,800 t	4 kg/t	11,300 t	3 kg/t
Intermediate storage	17,200 t	5 kg/t	1,900 t	1 kg/t	6,400 t	2 kg/t
Bark and wood waste	350 t	0.1 kg/t	540 t	0.1 kg/t	0 t	0.0 kg/t
Lime	200 t	0.1 kg/t	720 t	0.2 kg/t	2,000 t	0.5 kg/t
Construction waste	0 t	0 kg/t	0 t	0 kg/t	0 t	0 kg/t
Others	16,600 t [4]	4 kg/t	670 t	0.2 kg/t	4,300 t	1.1 kg/t
Landfill	51,300 t	14 kg/t	46,000 t	13 kg/t	54,300 t	14 kg/t
Green liquor dregs	38,700 t	10 kg/t	38,500 t	11 kg/t	46,400 t	12 kg/t
Sludges	5,700 t	2 kg/t	4,900 t	1 kg/t	6,100 t	2 kg/t
Lime	0 t	0 kg/t	0 t	0 kg/t	0 t	0 kg/t
Others	6,900 t	2 kg/t	2,600 t	1 kg/t	1,700 t	0 kg/t
Recycling rate	61%		67%		60%	
Hazardous waste [5]	430 t	0.1 kg/t	540 t	0.1 kg/t	250 t	0.1 kg/t
Emissions to air						
CO_2 fossil	270,000 t	73 kg/t	277,000 t	76 kg/t	265,000 t	71 kg/t
CO_2 fossil from purchased electricity					114,000 t	30 kg/t
NO_X, as NO_2	5,000 t	1 kg/t	4,700 t	1 kg/t	5,000 t	1 kg/t
SO_2	160 t	0.1 kg/t	390 t	0.10 kg/t	300 t	0.1 kg/t
Particulates	560 t	0.2 kg/t	650 t	0.2 kg/t	990 t	0.3 kg/t
TRS	120 t	0.03 kg/t	92 t	0.03 kg/t	59 t	0.02 kg/t
Land use [6]						
Total land use on site					1,300 ha	
Total sealed area on site					570 ha	
Total nature-oriented area on site					680 ha	
Total nature-oriented area off site					1,600 ha	

[1] Main chemicals used: oxygen gas, sodium hydroxide, sodium chlorite or chlorate, sulphuric acid, limestone, hydrogen peroxide
[2] Sold volumes
[3] Reported in dry tonnes
[4] 15,200 t of sludge moved from sedimentation pool to intermediate storage field
[5] Total tonnes
[6] Incl. pulp mills and integrated pulp and paper mills

SOCIETAL PERFORMANCE

Volunteers at the UPM Changshu Mill in China spread green awareness and social wellbeing through youth-driven projects. Wang Feng has been regularly visiting local schools to educate kids about low-carbon living and energy saving as part of the UPM Green Future project.

UPM plays a significant role in contributing to societal development

Transparent reporting on all the aspects of responsibility, including environmental, social and economic is very important in UPM. In 2017 we expanded our EMAS reports to cover local societal impacts in addition to the traditionally reported environmental performance. With "societal" we refer both to the socio and economic impacts.

Each mill presents its most important societal impacts in its mill supplement. Many issues are similar to all the mills. The mill supplements provide e.g. information on our contribution to employment, health and safety of employees, tax income and purchasing power, responsible sourcing as well as co-operation with the communities.

Employment

EMAS mills employed directly around 7,600 people in 2021. In addition, significant indirect employment impacts are generated by use of raw materials and services. We have been able to calculate the indirect employment effects for Finnish EMAS mills using a mathematical model developed by the Research Institute of the Finnish Economy (Etla). The model is based on input-output statistics from Statistics Finland. Those statistics show how companies from different industries buy goods and services from each other. The six EMAS production units in Finland generated around 3,100 direct jobs and around 3,100 indirect jobs in the region in 2021.

Health and safety

Our goal in UPM is to be the industry leader in health and safety. Our employees, as well as business partners and their employees, are required to adopt safe work practices and to comply with the rules and standards we have established.

In 2021, in the entire UPM, the total recordable injury frequency (TRIF, total injuries per one million hours worked) was 7.2 (6.2 in 2020) for UPM workforce including contractors. Lost time accident frequency (LTAF, lost-time accidents per one million hours worked) was 3.5 (3.5 in 2020). The TRIF includes LTA cases as well as cases of modified duties and accidents requiring medical treatment. The frequency of accidents excluding contractors was 6.3 (TRIF) and 3.1 (LTAF) in 2020. The mill specific safety figures can be found in the mill supplements.

Our safety work is based on long-term planning, effective safety communications and leadership. Safety is integrated in all our new and ongoing projects, and proactive safety is well-integrated in project plans and site practices. For us, good quality means thorough investigation and effective risk management, and this has played an important role in making our operations safe. We have utilised cross-learning to improve safety in our units: Sharing safety observations and best practice on safety have allowed us to learn from each other and improve safety in our units.

UPM's economic impact spreads not just on the corporate or country level but also in the local communities.

Purchasing power

Effects on the consumption generated by the Finnish mills were also calculated by the earlier mentioned Etla's model. Consumption impacts are generated by employees working at the mill and employees working at the value chain of the mill, typically working in other industries. That presents direct and indirect employees' private consumption of commodities through net income. Consumption impact generated by the six EMAS sites in Finland in 2021 was around EUR 150 million locally and EUR 280 million nationally.

Tax impact

Tax income generated by our business operations is an essential part of our societal impact as the tax income strengthens the vitality of the local community and supports public services. UPM pays corporate income taxes in the countries where added value is created and profit is generated. Based on UPM's corporate and operational structure, UPM reports and pays its corporate income taxes mainly in countries where production activity takes place and where innovations are developed. In 2021, UPM's corporate income taxes paid and property taxes were approximately EUR 306 million in total (EUR 178 million in 2020).

In addition to the taxes on income, UPM's various production inputs and outputs are also subject to taxation, which is either paid by UPM (e.g. energy taxes and real estate/property taxes) or collected by UPM (e.g. VAT, payroll taxes and social security contributions). Taxes are paid in accordance with the local tax legislation and regulations of the country in question.

The mills' operations benefit the local community in many ways. Municipal share of corporate income taxes and real estate taxes paid by UPM support the economy of the local community. In addition, the income taxes on salaries and social security contributions paid by UPM employees have also a significant local impact. Local tax impact figures are presented in the EMAS mill supplement for China, Austria, Uruguay and Finland. Those nine EMAS mills in their respective municipals/countries generated in total approximately EUR 226 million local tax impact in 2021 (when including e.g. the above mentioned local taxes). EMAS mills in Germany have not published their local tax footprint in 2021 mill supplements, but in Germany, the 6 EMAS mills generated in total around EUR 121 million local tax impact including income taxes on salaries and social security contributions, municipal trade taxes and real estate taxes.

Co-operation with communities

We are committed to developing the vitality of the communities close to our operations through active co-operation and open dialogue with local stakeholders as well as, for example, through sponsorships and employee volunteering under the umbrella of our Biofore Share and Care programme. The focus areas of UPM's Biofore Share and Care programme are: Reading & learning, Engaging with communities and Beyond fossils initiatives.

The mills' engagement with the local communities are for example cases in which support has been given to the local educational institutions and associations or community consultation via regular roundtables with local stakeholders. Details about the mills' engagement activities can be found from the mill supplements.

Responsible sourcing

UPM is committed to responsible sourcing practices throughout the entire supply chain. We work closely with our suppliers to ensure that our suppliers understand and meet all of the company's requirements. UPM requires its suppliers to comply with the UPM Supplier and Third Party Code that defines suppliers' minimum requirements in terms of responsibility with regard to matters such as environmental impact, human rights, labour practices, health and safety, product safety, corruption and bribery.

UPM's target is to have 100% of raw material spend and 80% of all spend covered by UPM Supplier and Third Party Code by 2030. In 2021, 96% of UPM's raw material spend and 86% of all spend was covered by UPM Supplier and Third Party Code.

ENVIRONMENTAL MANAGEMENT

UPM Forestal Oriental's employees working at the nursery located in Paysandú, Uruguay. This modern nursery specialises in Eucalyptus dunnii.

Environmental management based on continuous improvement

At UPM, environmental management is guided by UPM's Biofore strategy – as well as by our Code of Conduct 1) and our Responsibility Statement [2].

Integrated management systems

The mills' certified management systems are the practical tools used for environmental management. These systems embrace the principles of continuous improvement by target setting and monitoring of the implementation. All mills work with integrated management systems. All mills have certification to ISO standard 14001 for environmental management system. Additionally, quality, health and safety issues as well as energy are included in the mills' management systems and at many mills such systems are certified to the ISO 9001 standard and ISO 45001 standard and ISO 50001 standard or Energy Efficiency System+ (in Finland). All UPM pulp mills and UPM Specialty Papers' production lines have also Food Safety management system, ISO 22000, in place. UPM Changshu paper machine 3 has both, a certified ISO 22000 and a certified FSSC 22000 Food Safety management system. The Chain of Custody system for monitoring the origin of wood is also part of the mills' integrated management systems.

Competencies, responsibilities and procedures relating to quality, environment or occupational health and safety are described in the mills' management manual and the accompanying process and work instructions documentation. Internal audits and management review are carried out at the mills in accordance with the requirements of the standards. Existing warning and protection systems, compliance with relevant legal and statutory requirements and the control of measuring equipment are all firmly integrated in the mills' management systems.

Organisation

The mills are responsible for ensuring that external obligations are met and that targets established internally are reached. The mills' environmental managers or management appointee act as experts and handle practical aspects, development, co-ordination of environmental matters and reporting. The VP, UPM Responsibility, is responsible for Group-wide environmental issues.

Environmental issues are part of the day-to-day work of the entire personnel. Environmental competence is essential and respective training is organised with, for example, regular training for chemical handling, safety and risk management or general introduction for new employees.

Indirect environmental impact arising, for example, from raw material procurement and transportation are also taken into consideration. The mills co-operate with the global functions responsible for these issues within the Group.

[1] Read more at **upm.com/responsibility**

[2] See more on page 40

Guillermo Ponte from UPM Fray Bentos pulp mill having a regular fire brigade training with his team.

Continuous improvement

Environmental management is based on continuous identification of the factors influencing the environmental impact of the operations. Environmental impact is the starting point for annual target-setting and development of detailed environmental programmes with measures, schedules and responsibilities. Attainment of the targets is monitored regularly.

In addition to the specific targets outlined by the individual mills, the Group sets common long-term goals that apply to all sites, such as increasing the proportion of certified wood, decreasing water consumption and increasing the reuse of waste (see page 8).

Management of environmental risks

All mills take specific actions to prevent environmental hazards. Environmental risk assessments have been carried out to identify potential risks. The most significant risks at the pulp and paper mills relate to process malfunctions and to the transportation, storage and handling of chemicals at the mills. The results of the risk assessments are documented at the mills. This data is updated if any changes are made to the process. To reduce the identified risks, the mills provide guidance and training and carry out process modifications and investments when needed.

In the event of accidents or emergencies, the mills take precautions to prevent or mitigate the harmful environmental impact. Most mill sites have their own fire department or fire crews who are trained in such a way that they are also able to intervene in case of chemical accidents.

The mills' effluent treatment plants are equipped with a containment basin to deal with process malfunctions and chemical accidents. The water contained in these basins, can be cleaned in a controlled manner without jeopardising the treatment plant's operation.

Environmental communication

In accordance with our corporate values, UPM informs stakeholders about its environmental activities openly and actively.

The aim is to ensure a rapid and accurate flow of information to the Group's personnel, residents in the mill locations and other stakeholders. Separate guidelines have been drawn up for exceptional situations.

Fire crisis situations are regularly trained in every UPM unit. In this picture the team Gerardo Cardozo (left), Patricia Aboal and Julio Sanchez practise their skills at UPM Fray Bentos pulp mill in Uruguay.

MANUFACTURE OF PULP AND PAPER

120 years old UPM Griffin is the oldest company logo in Finland. UPM Griffin is also displayed on the first sheet of each pulp bale that leaves UPM Kymi pulp mill. In the picture Jyri Kylmälä, the General Manager of UPM Kymi mill checks the cover sheet and logo.

From wood fibres to pulp and paper

The raw materials used in papermaking are mechanical and chemical pulp made from fresh wood fibre and recycled fibre pulp. In addition to fibre raw materials, the process requires water, and some paper grades require mineral fillers, coating pigments and binders. Different process chemicals are used during pulp processing and to improve the paper's runnability on the paper machine and the quality of the end products.

The process flowchart and descriptions on the following pages present the main stages of pulp and paper manufacture.

MANUFACTURE OF MECHANICAL PULP

Debarking

Mechanical pulp is produced from fresh spruce logs. The logs are passed through a debarking drum; the bark is burned in a bark boiler to produce electricity and heat, or otherwise reused. Chips produced as by-products at sawmills are also used.

Manufacture of mechanical pulp

Wood fibres are separated from each other by mechanical pressure. Frictional forces transform the mechanical effort into heat, which softens the lignin acting as a binder between the wood fibres and thus breaks the inter fibre bonds.

In the manufacturing process of refiner mechanical pulp, wood is chipped and the chips are refined into pulp in refiners. In thermomechanical pulping (TMP), pressure and heat are used to speed up the separation of the fibres, and part of the heat generated is recovered and used for paper drying.

In the manufacture of groundwood pulp, entire spruce logs are pressed against a rotating grindstone. Pressure and heat may be used to boost the grinding process.

As lignin is still present in the finished mechanical pulp, wood pulp yield in mechanical pulp production is twice the yield obtained in the chemical pulping process. However, mechanical pulp production requires a lot of electricity.

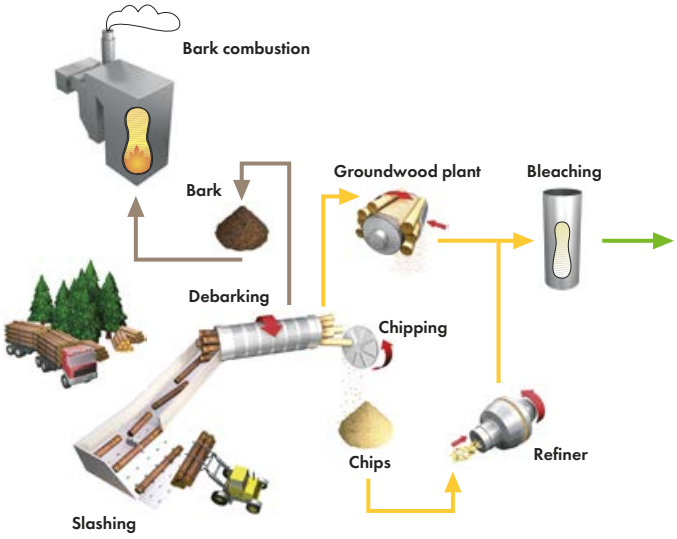
Bleaching

Mechanical pulps are bleached using hydrogen peroxide or dithionite. Furthermore, auxiliary chemicals are used in bleaching to regulate the acidity of the process and to ensure the desired effect of the bleaching chemicals.

Properties of mechanical pulp

Mechanical pulp is used in the manufacture of printing papers on account of its economic advantages and its optical characteristics. It is used in products that are not archived, because the lignin, i.e. the binder contained in the pulp, turns yellow due to the effect of UV light.

Pine, spruce, birch and eucalyptus are the raw materials used for the production of sulphate pulp. The debarked wood is chipped and screened before the pulp cooking process. The picture shows the pine, spruce and birch chip stores at the UPM Kymi pulp mill in Finland.



MANUFACTURE OF CHEMICAL PULP

Pulps prepared from different tree species have different properties. Long fibre softwood pulp is used to increase the paper's strength and to improve its runnability on the paper machine. Short fibre hardwood pulp improves the paper's printing properties. Bleached chemical pulp preserves its properties and its brightness even when printed products are archived for a long period.

Debarking

Pine, spruce, birch and eucalyptus are the raw materials used for the production of sulphate pulp. The pulp preparation process begins with the debarking of the logs in the debarking drum. The bark is burned in a bark boiler to produce electricity and heat.

Chipping

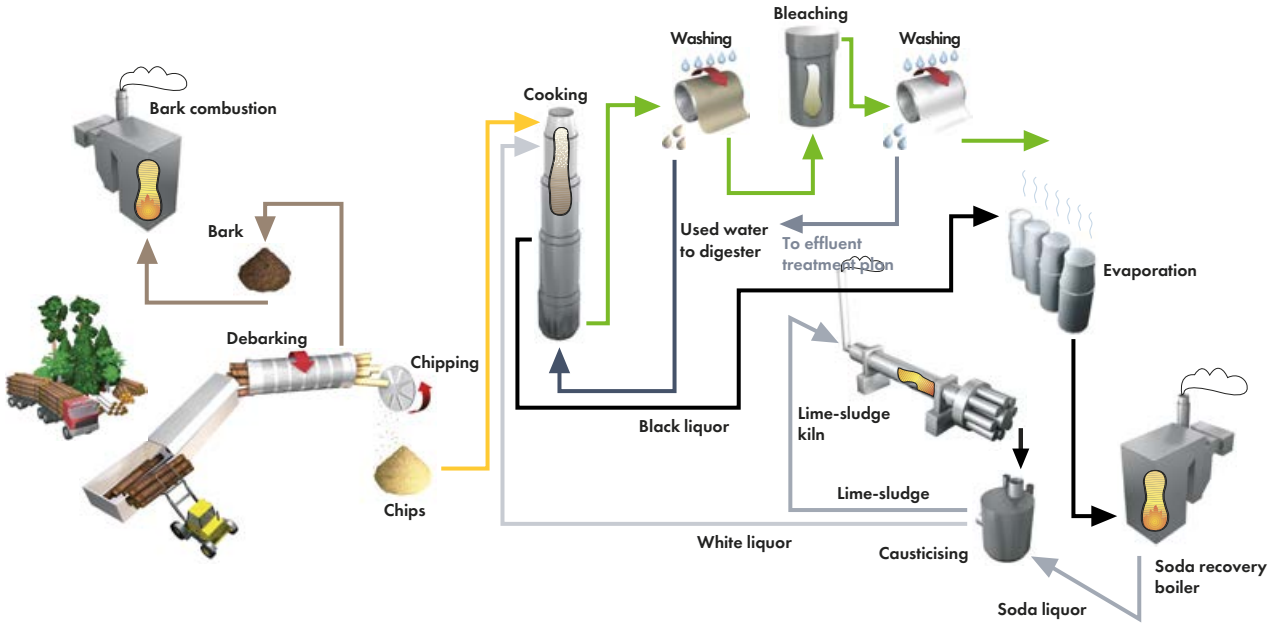
The debarked wood is chipped and screened. Additionally, chips produced from slabs and sticks and created as sawmill by-products are used.

Cooking

In the manufacture of chemical pulp, wood fibres are separated from each other by dissolving the lignin, i.e. the substance acting as a binder between fibres, by means of chemicals and heat. In the sulphate process, chips are cooked in a liquor containing sodium hydroxide and sodium sulphate as chemical agents. This mixture is called white liquor. During the cooking, about half of the wood raw material is dissolved in the cooking liquor. For this reason, the yield is only about half of that obtained in mechanical pulping.

Washing

The cooked pulp is washed with hot water. The used waters are directed in a counterflow direction to the digester to be used as washing waters. The washing water leaves the digester in the form of diluted black liquor containing the dissolved wood and the used cooking chemicals and enters the evaporation stage.



Bleaching

After cooking, sulphate pulp is brown. It is then bleached in a multistage process. The bleaching agents used at UPM's mills are oxygen, hydrogen peroxide, chlorine dioxide and ozone. The washing waters from the bleaching stages, after the oxygen stage, are pumped to the effluent treatment plant.

Evaporation

In evaporation, water is removed from the black liquor in several stages, so that the resulting high concentration black liquor contains only about one-fifth water.

Soda recovery boiler

Black liquor is burned in the soda recovery boiler to recover energy in the form of heat and electricity. The chemical pulp mill produces energy not only for its own needs but also for the paper mills or external parties. From the soda recovery boiler, the cooking chemicals are recovered as soda liquor.

Causticising

In causticising, the sodium carbonate contained in the soda liquor is reconverted into sodium hydroxide by means of burned lime. In this way, the soda liquor is reconverted into white liquor. Causticising transforms the burned lime into calcium carbonate, i.e. lime-sludge.

Lime-sludge kiln

The lime-sludge is separated from the white liquor and washed and reconverted into burned lime in the lime-sludge kiln.

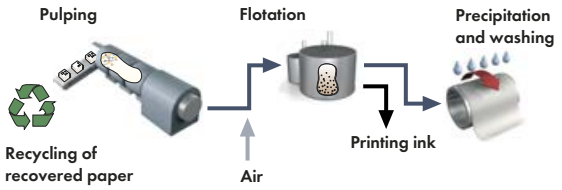
MANUFACTURE OF RECYCLED FIBRE PULP

Pulping
The production of recycled fibre pulp begins by processing the recovered paper in a drum pulper, in which the stock is diluted to form a pulp-water slurry. Plastic, metal and other impurities contained in recovered paper are removed by screening and reused when possible or taken to a landfill. When using old corrugated cardboard for the production of specialty papers no further process steps are needed. When using recovered graphic paper for the production of new graphic paper the following process steps are needed to produce so-called deinked pulp.

Flotation
In flotation, soap is added and air is blown into the pulp/water mixture to remove the printing ink. The hydrophobic printing ink particles adhere to the ascending air bubbles, and the foam formed on the surface is removed.

Screening and washing
After the flotation, the pulp is screened to remove any remaining impurities. Finally the pulp is washed.

Deinking residues
About 70–80% of the recovered paper delivered to the mills can be used to produce new paper. Losses are mainly so-called deinking sludge from the flotation process (too short and brittle fibres, pigments and printing inks). The fibrous sludge generated is dried and burned at the mill's power plants to produce electricity and heat, or dispatched to be used in other applications.



MANUFACTURE OF PAPER

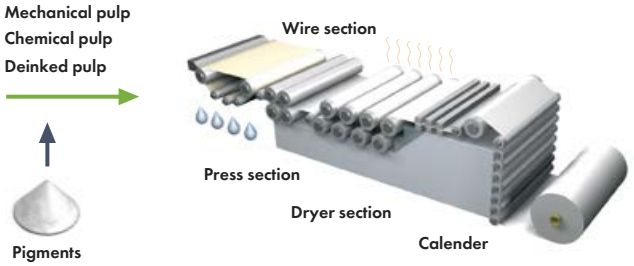
Paper stock
Fibres (mechanical, chemical and/or deinked pulp), fillers and additives are mixed to form a slurry consisting of more than 99 percent water.

Wire section
The pulp slurry is spread on the wire, i.e. the plastic fabric on which the paper web is formed as the water drains away through it by means of suction. A dry matter content of about 20% is achieved at the wire section.

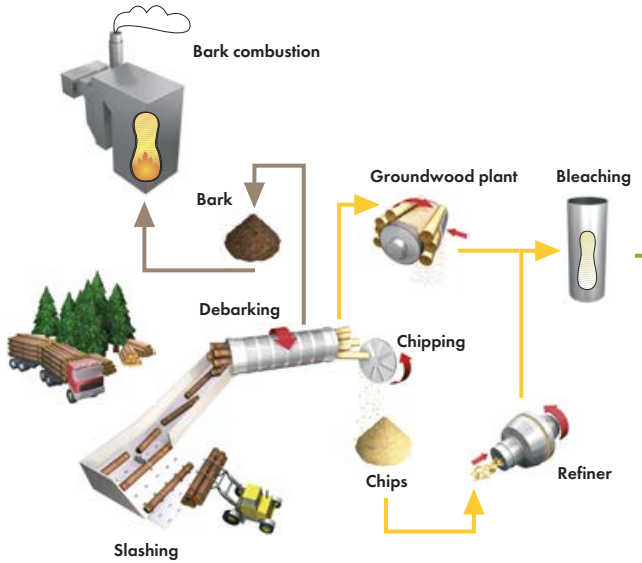
Press section
The wet paper web is pressed between felts and rolls to obtain a dry matter content of some 45 percent.

Dryer section
In final drying, a dry matter content of 90–95% is achieved by dewatering the web through evaporation using hot cylinders. The heat used for drying is recovered and the water vapour is discharged into the air. The "plume" emitted from the exhaust stacks of a paper mill consists of this water vapour.

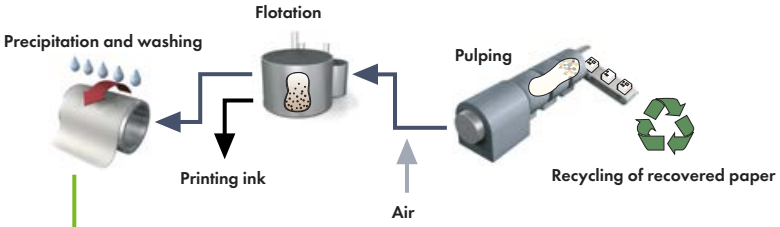
Coating, calendering and finishing
The quality and properties of paper can be finished on a calender placed either on or off the machine and/or by coating the paper. The calender smooths the surface of the paper by passing it once or several times through a series of nips. Paper can be coated several times. The coater unit is used for applying a coating colour, after which the paper web is dried. The machine or parent reel is cut into smaller rolls that are more suitable for further processing, or into sheets.



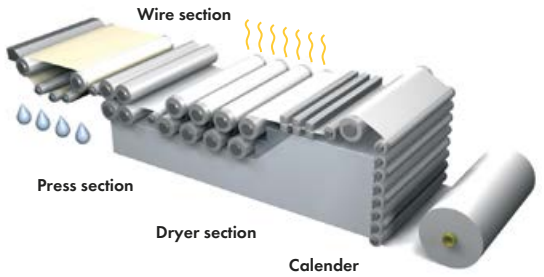
Manufacture of mechanical pulp



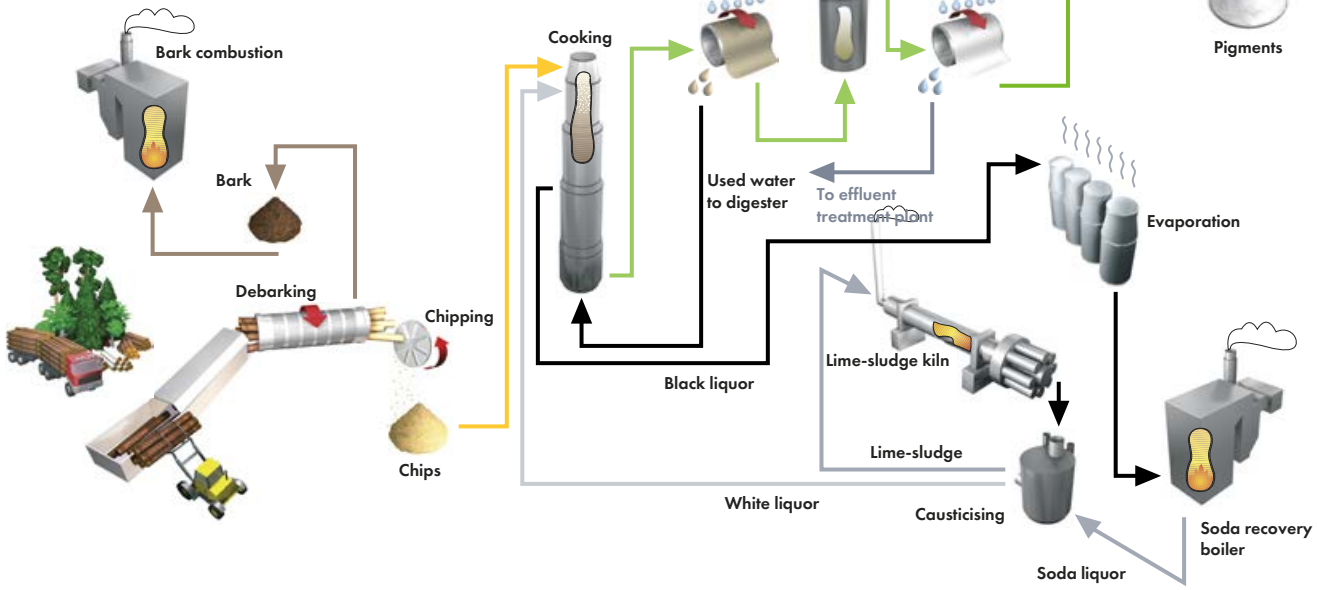
Manufacture of recycled fibre pulp



Manufacture of paper



Manufacture of chemical pulp



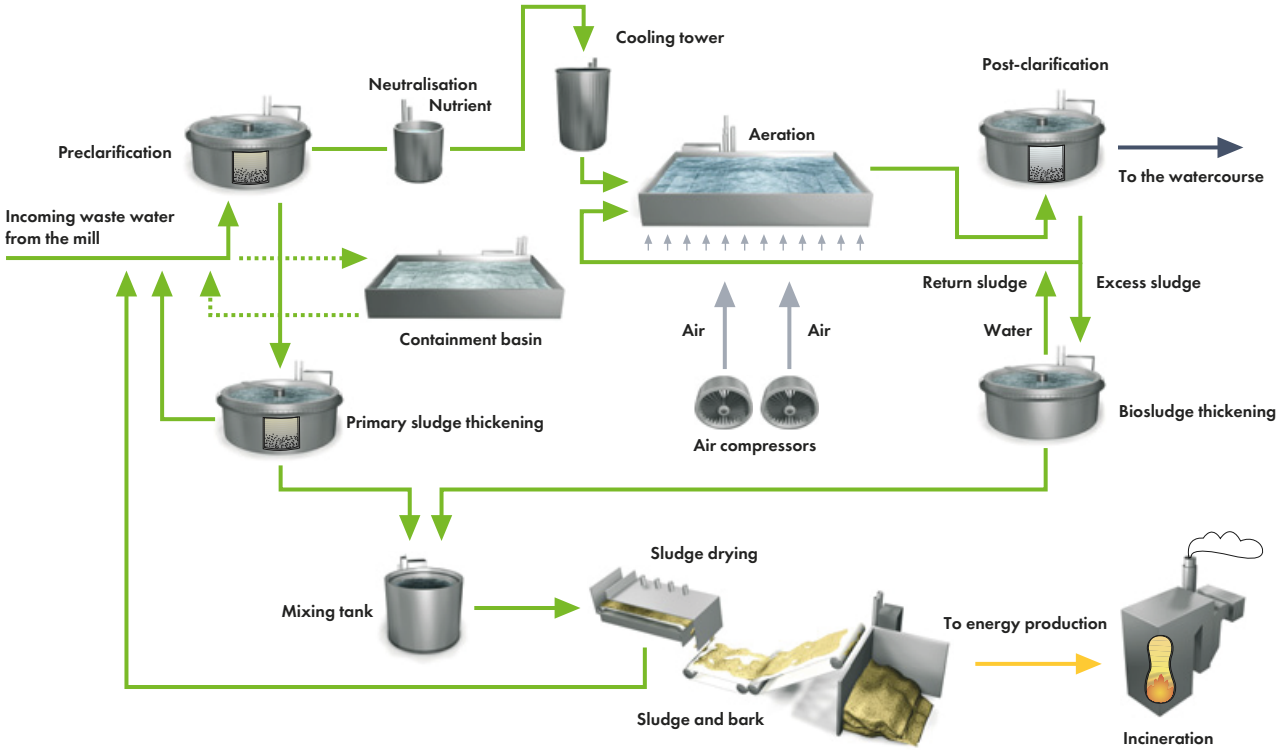
WASTE WATER TREATMENT PRINCIPLE AT AN ACTIVATED SLUDGE PLANT

Incoming waste water
The substances present in pulp and paper mill waste water are mainly derived from wood (including lignin, starch, alcohols and nutrients). Additionally, the waste water contain different process chemicals and adjuvants (coating pigments, fillers and binders). Some of these substances are in a solid state, others in a colloidal or dissolved form. Only small amounts of nutrients (nitrogen and phosphorus) are present in the mills' waste water compared to, for example, municipal waste water.

Primary clarification
At the primary clarifier stage, solid particles settle to the bottom of the basin, from where they are removed. At this stage, solid content removal should be close to 95–98%.

Nutrients
To function properly, the activated sludge, henceforth the microbes, in the aeration basin need nutrients, especially nitrogen (N) and phosphorus (P). This is why urea and phosphoric acid are added to the water.

Neutralisation
Before entering the aeration basin, the waste water is neutralised if needed. For this, the water's pH level is adjusted to a level ranging from 6 to 8 by adding lime, sulphuric acid or sodium hydroxide when needed.



Cooling
The aeration basin's microbes work best at temperatures below 35°C. If the water temperature is any higher, cooling is required.

Aeration
In the aeration basin of a biological treatment plant, nature's own microbes and protozoa feed on the organic matter dissolved in the waste water.

As a result, organic load of the water decreases and the amount of biomass increases. This process requires oxygen, which is pumped into the aeration basin using compressors.

Secondary clarification
At the secondary clarification stage, the biosludge settles to the bottom of the basin. Most of this sludge is returned to the aeration basin. The excess sludge is pumped to the biosludge thickener and the treated water is discharged into the watercourse.

Excess sludge
The excess sludge thickens in the biosludge thickener, from where it is pumped to sludge dewatering presses. The water from the biosludge thickener is returned to the aeration basin.

Safety basin basin
In exceptional situations, wastewater can be directed to a separate safety basin basin and pumped back for treatment after normal conditions have been restored.

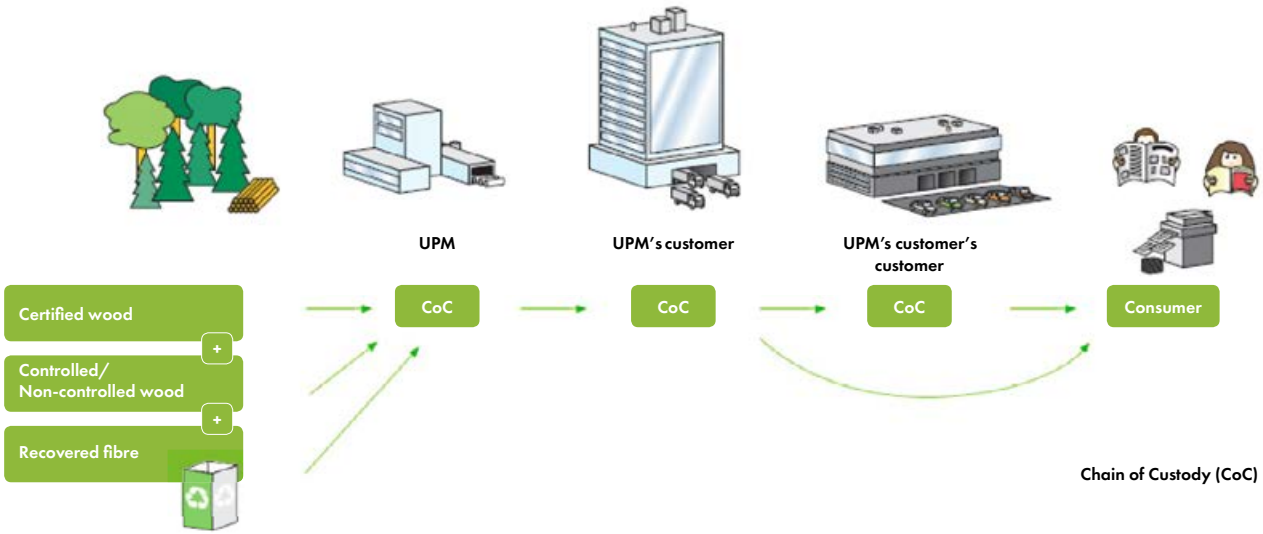
Sludge drying
The primary sludge from primary clarification and the excess sludge from secondary clarification are mixed in a mixing tank and the mixture is pressed as dry as possible with the help of screw or belt filter presses. The dried sludge is then incinerated at the power plant.

RAW MATERIALS, ENERGY AND LOGISTICS

UPM verifies that all wood raw material supplied to its mills is sustainably sourced, legally logged and procured in accordance with the requirements of international forest certification schemes.

Knowing that wood originates from a sustainable source

Wood is UPM's most important raw material. UPM is committed to sustainable forest management and monitors the origin of wood to ensure it is sustainably and legally sourced. Certified chain of custody systems have been implemented in all UPM's mills.



Chain of Custody (CoC)

At UPM pulp and paper mills, wood is used for the manufacture of chemical and mechanical pulp. UPM's Wood Sourcing and Forestry is responsible for the supply of wood to these mills. UPM is committed to forest management and harvesting practices based on the internationally accepted principles of sustainable forest management.

UPM's wood fibre is sourced mainly from private forests and company-owned forests and plantations in Finland, USA and Uruguay. Forest certification, chain of custody, origin of wood tracking systems and UPM's global biodiversity programme are just some of the many tools UPM uses to safeguard sustainable and legal wood sourcing.

Origin of wood

UPM monitors the origin of wood it receives and has set strict requirements on its suppliers for the delivery of sustainable and legal wood fibre. These requirements are implemented through a variety of tools. UPM carries out supplier audits and logging site checks to ensure that suppliers' operations meet UPM's requirements.

Forest certification

All of UPM's forests are certified according to a credible, internationally recognised forest certification scheme, namely FSC™ or PEFC. The certificate provides independent third-party verification of the quality of forest management in relation to the criteria of a local sustainable forest management standard.

Chain of custody

All UPM's wood sourcing organisations and pulp and paper mills have third-party verified chain of custody systems according to the two main international standards – FSC™ and/or PEFC. Chain of custody is a tool that enables the monitoring and reporting of the volumes of certified wood supplied to the mills. This information along with product labelling is a valuable tool for verifying sustainable and legal forestry practices to customers and other stakeholders. Chain of custody requirements also ensure that non-certified wood originates from controlled sources. This requires that the risks specified in the FSC risk assessment process are addressed in the UPM due diligence system and either avoided or mitigated to an acceptable low level.

UPM Forest Action

In year 2022 UPM puplished Forest action programmme. The global programme steers UPM's global wood sourcing operations and covers its own forests in Finland and the United States as well as its plantations in Uruguay. Forest Action is first global responsibility programme where impacts of forestry is comprehensively assessed on a global level. The programme goes beyond current standard requirements and its measures have a positive impact on the all fundamental aspects of sustainable forestry: climate, biodiversity, soil, water and societal contribution.

UPM wants to be a pioneer and a leading company in sustainable forest management. We want to enhance the acceptability of forestry trough actions in our own forests but also support other forest owners in their sustainability goals.

Learn more about sustainable forestry at
upm.com/responsibility
upmforestlife.com
upm.com/biodiversity
UPM Forest Action

A balance between fresh wood and recovered paper

The basic raw material for paper is wood, a renewable resource. Recovered paper is an essential raw material for us, too. In fact, approximately 20% of UPM's fibre raw material is recycled fibre. UPM is one of the world's leading users of recovered paper for graphic papers.

Papermaking starts with fibres – either fresh wood fibres in the form of chemical and mechanical pulp or recycled fibres obtained from recovered paper. The availability of raw material and paper's quality requirements largely determines the type and proportions of the different fibres used.

Fresh wood

UPM procures fresh wood for the production of mechanical and chemical pulp. Sawmill residues and small diameter logs, e.g. from forest thinnings, are used for mechanical and chemical pulp processing. Mechanical pulp – refined or groundwood – is usually produced at the respective paper mill site. All of UPM's pulp mills in Finland and Uruguay produce chemical pulp.

Pulp is also sourced from external pulp suppliers. All pulp suppliers are required to comply with UPM's pulp supplier requirements including tracing the origin of wood and sustainable forestry. Pulp suppliers also have to supply information on the environmental performance of their operations on a yearly basis. In addition, UPM regularly monitors and audits its pulp suppliers.

Recovered paper

UPM is one of the world's leading users of recovered paper for the production of graphic papers, consuming about 1.5 million tonnes of recovered paper annually.

UPM uses recovered paper at its European mills, which are located in highly populated regions. This ensures that recovered paper is available in sufficient amounts close to the paper mills. Due to transportation distances, a high level of recovered paper use is not economically and ecologically favourable in regions with small populations.

Wood fibres can be reused several times before they are no longer suitable for paper production. UPM utilises mainly graphic recovered paper from household collections, e.g. newspapers, magazines, catalogues and advertising supplements.

Handling and storage of loose paper for recycling. We use recovered paper at our European mills that are located in highly populated regions. The qualities of the product being produced and the location of the mill determine the use of recycled fibre.

Additives and chemicals used in pulp and paper production

Mineral fillers, coating pigments and binders are important raw materials for paper. Furthermore, chemicals are needed in stock preparation and bleaching as well as in process management.

All stages of the papermaking process require certain additives – from raw material preparation to the formation of the paper web to the coating of the finished paper sheet. In chemical pulping, chips are cooked in a liquor containing sodium hydroxide and sodium sulphide as chemical agents. The bleaching agents used at UPM's mills are oxygen, hydrogen peroxide, chlorine dioxide and ozone.

It is an ongoing task to fully optimise the use of chemicals. UPM requires its suppliers of raw materials, goods and services to comply with the UPM Supplier and Third Party Code that defines suppliers' minimum requirements in terms of responsibility with regard to matters such as environmental impact, human rights, labour practices, health and safety, product safety, corruption and bribery. These issues are carefully assessed during the supplier selection process. Before purchasing decision UPM pre-evaluates safety of all chemicals following our internal Chemicals Management Standard that was updated in 2021.

PIGMENTS AND ADDITIVES USED AT UPM PULP AND PAPER MILLS

CATEGORY	PRODUCTS	USE
Pigments	Kaolin, ground calcium carbonate (GCC), talc, precipitated calcium carbonate (PCC)	• As mineral fillers to fill the cavities between the individual fibres in order to improve printability and to reduce the amount of fibre needed • As coating pigments applied to the surface of the paper web in order to improve printability and the paper's optical properties • Part of the pigments in paper are recovered together with the fibres
Binders	Starch derived from cereals or potato, synthetic latex	• Make the coating pigment adhere to the paper surface • Enhance the surface strength of the paper
Chemical pulping agents	Cooking chemicals: sodium hydroxide, sodium sulphide Bleaching chemicals: oxygen, hydrogen peroxide, chlorine dioxide and ozone	• Sodium hydroxide and sodium sulphide are recovered and reused in the process • No chlorine gas is used at UPM
Deinking agents	Fatty acid, caustic soda and water glass	• Used for deinking recovered paper
Bleaching agents	Hydrogen peroxide and sodium dithionite	• Used for bleaching mechanical and recycled fibre pulp
Further additives	Alum	• To prevent impurities from forming deposits • To make fibres and pigments bond together
	Retention, fixing and anti-foaming agents	• To keep the process clean • To ensure runnability and dewatering • To help web formation (support fibres and fines to be retained on the wire)
	Slime control agents, e.g. biocides	• Necessary for the nearly closed-loop water circuits • To prevent microbial growth in pipes and tanks, to improve runnability and paper quality
	Optical brighteners and dyes sizing	• Product quality critical chemicals • Used only at ppm level

Read more about product safety at
upm.com/responsibility

Focus on energy efficiency and renewable biomass-based fuels

UPM is a major energy generator. Most of the electrical and thermal energy is used for mechanical pulp and paper production. UPM favours the use of renewable and other fossil CO_2-free energy sources as well as of natural gas and strives to improve its energy efficiency.

UPM's pulp and paper mills use electrical and thermal energy. Mill operations that require the most electricity are those involved in the manufacture of mechanical pulp, paper machines and water and stock pumping. Thermal energy is needed to maintain process temperatures and to dry the paper.

At all pulp and almost all paper mills, steam and electricity are generated simultaneously by combined heat and power (CHP) plants. At some mills, all or part of the energy is produced by external power plant companies. In the case of Finnish mills, UPM is a shareholder in these power plant companies. Electricity is also obtained from the company's own hydropower plants and, additionally, in Finland from associated companies. The balance of the electricity needed is procured from regional electricity markets.

Power generation methods vary from country to country. The UPM portfolio includes mill site CHP, wind power, hydro, nuclear and thermal sources. UPM is a shareholder in a power company that has a stake in nuclear power plants in Finland.

Low-carbon energy sources dominate

Thanks to a high self-sufficiency rate in energy, UPM has been able to focus on energy solutions that produce less fossil carbon dioxide. Where possible, fossil fuels are substituted by renewable fuels. Where fossil fuels are needed, natural gas is the first choice, dependent upon availability in the region. More than half of the fuels used by UPM are fossil CO_2-free biomass-based fuels. In 2004, the EU directive for CO_2 emissions trading came into force in the EU. All European mills belonging to UPM have the relevant permit as granted by national authorities for the 2013–2021 period. UPM business areas are responsible for their EU CO_2 allowances and UPM Energy is assisting in operations of emissions trading.

CHP plants burn renewable fuels like bark, forest residues, fibre residues and solid residues from deinking and effluent treatment plants. Additionally, fossil fuels like natural gas or light fuel oil are used at CHP plants and steam boilers. Coal is used as an energy source only in mills where there is no other alternative fuel source. Chemical pulp mills combust biomassbased waste liquor – black liquor – that is formed during the pulping process.

Part of the heat resulting from production processes is recovered by means of heat exchangers and reused. At the mills producing thermomechanical pulp (TMP), part of the electricity needed can be recovered as steam and this covers a large part of the mill's steam needs.

The multi-fuel boilers are mostly modern and efficient fluidised bed boilers that are particularly well suited for burning wood-based fuels. The high pressure and temperature at the boilers ensure efficient energy production. The modern combustion and cleaning technologies result in low specific emissions.

At UPM's pulp and paper mills, internal technical energy audits have been carried out to improve energy efficiency. The mills have identified areas where energy could be saved and used more effectively. Many measures have been implemented, but major changes are usually made in connection with other investments, such as paper machine line modernisations.

Fossil carbon-free energy sources make up most of UPM's energy portfolio.

Global logistics operations

The transportation of raw materials and finished products places a load on the environment. The impacts can be reduced through sensible routing and planning as well as by favouring rail and sea transportation and low-emission fuels.

Each year UPM's mills receive several million tonnes of raw materials, additives and operational supplies. Delivering end-products to customers also results in a high traffic volume. Furthermore, solid waste needs to be transported to recovery and disposal facilities. UPM uses road, rail or sea transport – depending on distance, connection and delivery time.

Logistics' sub-contractors are required to comply with UPM's Cargo Handling Manual which includes instructions for cargo handling, storage, transportation and occupational health and safety.

Most of UPM's haulage is handled by long-term contract partners. Emissions arising from transportation can be influenced through the choice of fuel and by switching to rail and sea transport as much as possible. Our sea transport development projects focus on the use of low emission fuels and technologies that reduce fuel consumption. The ongoing development projects with the port operators also have an impact on fuel consumption and emissions through streamlining and optimising operations. Total emissions can also be reduced by ensuring that capacity is fully utilised and by balancing outbound and inbound deliveries.

Eugen Margraf from Nortrans Speditionsgesellschaft mbH is loading paper rolls which are leaving from UPM Nordland paper mill in Germany. All our logistics partners are required to comply with UPM's Cargo Handling manual, including instructions for cargo handling, storage, transportation and occupational health and safety.

ENVIRONMENTAL IMPACT

UPM Schongau paper mill is located on a bend on the Lech river in the Southern German town of Schongau. Today, UPM Schongau produces printing paper for newspapers, newspaper supplements, advertisers, brochures, magazines and catalogues.

Operations affect the environment in numerous ways

All UPM's operations impact the environment both directly and indirectly. Forest management influences landscape, forest structure and biodiversity. Production processes release emissions into watercourses and into the air. Solid waste is generated at the production facilities and noise and odour need to be managed. Indirect impacts arise mainly from transportation and the procurement of raw materials, chemicals, fuels and power.

The main environmental load from paper and pulp manufacture is to air and water.

UPM's mills have successfully implemented measures to reduce air and water emissions. Improved effluent treatment has enhanced the quality of cleaned waste water. Airborne emissions have been reduced by the use of low-sulphur fuels, changes in energy generation methods and environmental investments.

Environmental impact assessments are carried out at each site. An overview about key environmental aspects and their environmental impact can be seen in the following table. UPM regards all environmental aspects as substantial. At the mill sites, special emphasis is placed on the environmental aspects of water, air, energy, waste and local phenomena such as noise or odour. Emergency situations, for which crisis management procedures are in place, are also taken into consideration. The mills' environmental targets cover all areas where there is currently need for action or potential for improvement.

LIFE CYCLE THINKING – OUR APPROACH TO SUSTAINABILITY

KEY ENVIRONMENTAL ASPECT	MAIN ENVIRONMENTAL IMPACT	MEASURES
Wood raw materials	Use of the forest ecosystem (biodiversity, products and services from forest ecosystems, land use aspects); Indirect environmental impact by pulp suppliers	Use of wood from certified sustainable forestry (chain-of-custody verification); assessment of pulp suppliers.
Chemicals	Indirect environmental impact by suppliers; pollution due to inappropriate handling or storage.	Supplier qualification, supplier audits; requirement for certified environmental management systems; choice of environmentally sound products; UPM's restricted chemical substances list.
Fossil fuels and purchased electricity	Use of finite resources; climate change	Co-generation of heat and power; maximise use of renewable fuels and other CO_2 neutral energy sources; efficient energy use.
Airborne emissions from power plants	Acidification of the soil (NO_X, SO_2); air pollution (particles); climate change (from CO_2 from fossil fuels).	Compliance with limit values*; continuous improvement; use of renewable fuels; emission trading.
Emissions to water	Eutrophication (nitrogen, phosphorus); oxygen demand (COD, BOD); adsorbable organic compounds (AOX) for chemical pulp mills.	Compliance with limit values*; continuous improvement; modern elementary chlorine-free chemical pulp production.
Waste	Use of landfill sites and municipal waste incineration plants. Indirect environmental impact by third-parties for waste recycling and recovery, e.g. pollution due to inappropriate handling and storage.	Increase or maintain high recovery quota by following the principle "reduce, reuse and recycle". Third-party/supplier qualification, audits.
Noise	Adverse effects on personnel and local area	Compliance with limit values*; continuous improvement.
Odours	Adverse effects on local area	Optimised operation of production facilities and effluent treatment plants.
Transport	Indirect environmental impact (energy consumption; airborne emissions; noise).	Use of appropriate means of transport; dual-purpose transport; electric forklift trucks.
Products	Environmentally sound disposal after use	Recycling (recovered paper processing)
Soil	Acidification of the soil by airborne and water emissions; risk of pollution by landfill sites or by chemicals and oilcontaining equipment.	Best practices for the storage and handling of chemicals; compliance with landfill permits and legislation (landfill insulation; gas collection and treatment, leachate water treatment).

* The purpose of limits for waste water load, airborne emissions and noise specified in the operation permits is to prevent any significant environmental impact

Air emissions stem from energy generation

The majority of airborne emissions from pulp and paper mills result from energy generation. The choice of fuels, combustion technology and flue gas purification are ways to reduce these emissions.

Quantity and quality of air emissions depend on the amount of steam produced at power plants or boilers, on the operating rate of the paper machines and the fuels used. More than 50% of fuels used by UPM's power plants are biomass-based fuels that are free from fossil CO_2 emissions. Boilers using biomass-based fuels, oil and coal are equipped with filter systems. Compliance with permit limits is continually measured at all power plants and the reliability of these measurements is verified by a third party. Results and emission calculations are reported to the relevant authorities. Possible TRS (total reduced sulphur) emissions from chemical pulp mills are usually caused by shutdowns and start-ups.

UPM's versatile set-up of cost-competitive, low-emission energy includes, among others, hydropower generation. The major part of electricity generated by UPM is free of CO_2 emissions from fossil fuel.

POSSIBLE AIR EMISSIONS	SOURCE	REDUCTION MEASURE
Carbon dioxide, sulphur dioxide, nitrogen oxides, small amounts of particles and organic compounds	Energy generation at power plants; emission parameter depends on used fuels	• Minimised by efficient purification, by the choice of fuels and by controlling the combustion conditions in the boilers
Odour from malodorous sulphur compounds TRS (total reduced sulphur)	Chemical pulp production	• Reduced by collecting and burning
Odour from decomposing of organic substances	Closed-circuit water systems (e.g. through high temperature and anaerobic conditions	• Measures taken at mill sites when needed
Noise	Production facilities, e.g. wood handling, debarking, suction pumps	• Controlled at the source or along its propagation • Minimised at the stage when new equipment is being acquired and new facilities constructed • Older plants systematically refitted with sound insulation systems

Responsible use of water

Only a small portion of the water used in production leaves the process as effluent and has to be replaced with fresh water. All effluents are cleaned before being released into watercourses.

Water is an essential resource for pulp and paper production and is also needed for cooling machinery. In production it is used as a diluting agent and transport medium. Fibres, fillers and additives have to be strongly diluted in order to form a smooth sheet of high quality paper. Compounds from wood fibres dissolve during manufacturing and a small proportion of the chemicals and other raw materials used in the process remain in the water. Cooling water is not contaminated at all and can be discharged directly into the river or used in production.

Water reduction is an ongoing target for all UPM mills. Using less water also means using less electricity, chemicals and thermal energy. Process water is used several times and only a small portion of the water ends up as effluent, which has to be replaced with fresh water. The fresh water is purified water from rivers and lakes or groundwater taken from wells. A small quantity of water is used for steam production at the power plants and purified in order to meet stringent purity requirements.

Improving waste water treatment plants

All waste water is treated in mechanical and biological effluent treatment plants before being released into watercourses. Most mills have their own effluent treatment plants or the waste water is led to a municipal or external effluent treatment plant. The biological treatment stage is an excellent controller of waste water quality, because the organisms in the biological treatment stage are sensitive to harmful compounds. Biological treatment also removes harmful compounds from waste water.

Emission levels in waste waters are regularly monitored and reviewed, both internally and by relevant authorities. In some regions, the potential harmful effects of effluent on fish and other aquatic organisms are also assessed by conducting comprehensive receiving water studies.

Learn more about water management at
upm.com/responsibility

The UPM Changshu paper mill has been awarded State Level Water Efficiency Front Runner by the Chinese government for several consecutive years. The mill has made substantial improvements in water efficiency, decreasing year after year its process wastewater volume and COD effluent load. Most of the progress has been achieved by continuous optimization of the process in order to replace fresh water with clean process water, in many applications.

Yesterday's waste is today's raw material

Reducing the amount of solid waste and increasing circularity are key objectives at all UPM mills.

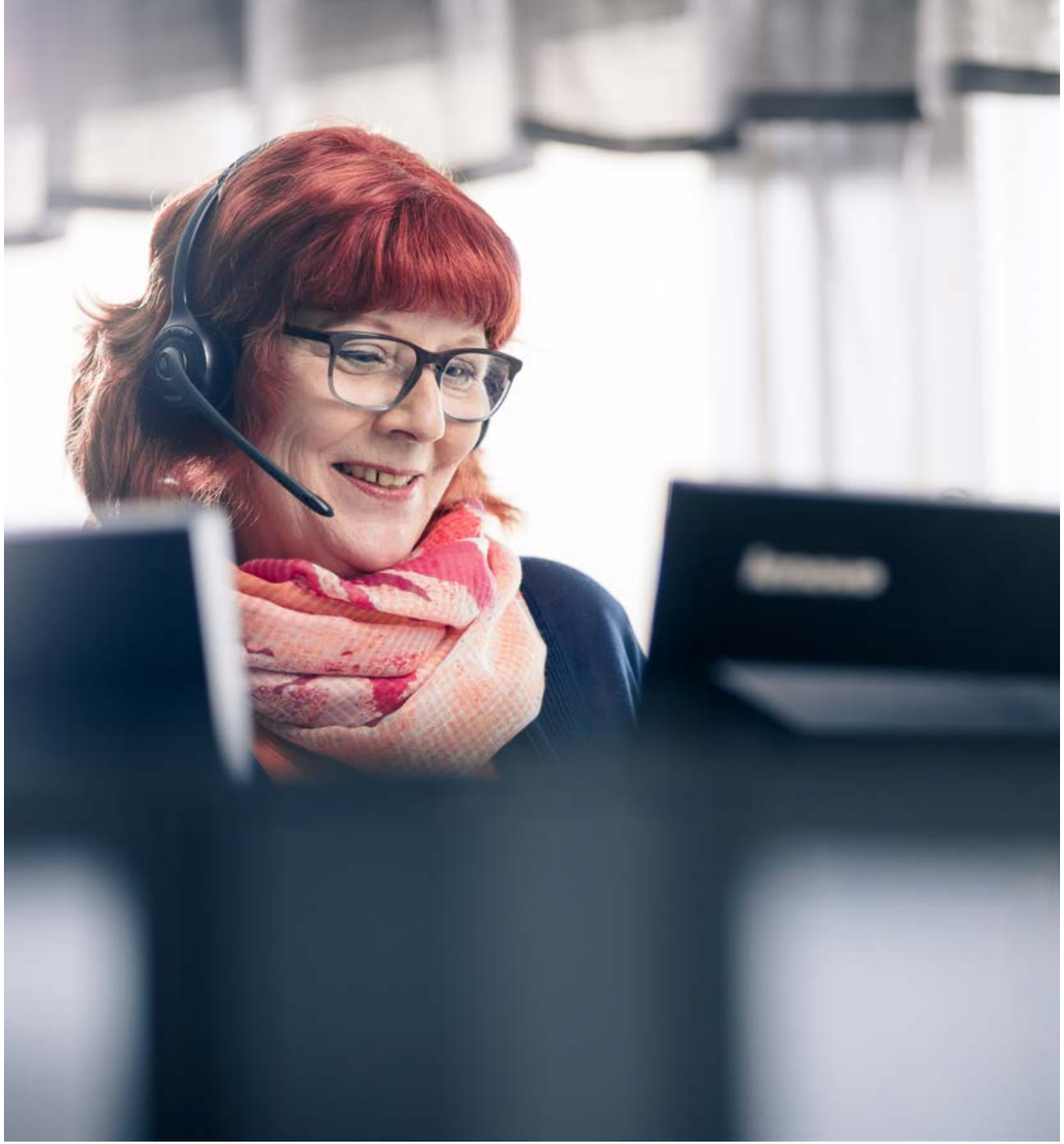
All UPM's mills have made efforts to reduce the volume of solid waste and to improve handling by sorting the waste at source. A large part of the process waste is utilised either as raw material or in energy generation. The volume of solid waste taken to landfill sites has decreased significantly over the past years as a result of higher efficiency in production processes and increased utilization opportunities. UPM has a target to become a Zero Solid Process Waste to Landfill company globally by 2030. This means that UPM will not deposit any process waste at landfill sites, and no process waste will be incinerated without energy recovery.

Landfill sites for depositing solid waste account for the most significant environmental impact in waste management. The environmental impacts of UPM landfill sites are being monitored in accordance with permits and regulations issued by the relevant authorities.

Ash generated as side stream in the bioenergy production can be utilized as forest fertilizer, when it fulfils the criteria set in the fertilizer regulation. This way the nutrients from wood are recirculated back to the forest.

MAIN WASTE FRACTIONS	SOURCE	USAGE OR DISPOSAL
Ash	Power plants	• Most of the ash is utilized e.g. in earth construction, in the cement industry or as fertilizer
Organic process residues such as bark and fibre residues and fibre sludge	Wood and recovered paper processing, effluent treatment	• Mainly used as fuel by mill power plants • Fibrous residues which are not incinerated are composted or utilized e.g. for soil amendment or in brick industry
Lime and green liquor dregs	Chemical pulping	• Large proportion of lime is utilized e.g. as liming agent. • Part of the green liquor dregs is utilized in field construction or as sulphur reducing agent. • The rest is mainly landfilled
Other solid waste	Recovered paper processing, packaging of incoming materials (mainly metal, board or plastic waste)	• Sorted and utilised whenever possible • Non-usable waste fractions taken to landfill sites or municipal waste incineration plants
Hazardous wastes	Maintenance (mainly oil or oil contaminated equipment)	• Forwarded to licensed hazardous waste treatment facilities • Compliance with relevant statutory requirements documented

APPENDICES



Our committed professionals make sure that our stakeholders have accurate and compliant information available at the right time for the needed purpose.

UPM Responsibility Statement

1. PURPOSE AND SCOPE

The Statement complements what is stated in the UPM Code of Conduct, with a focus on environmental impacts, energy and resource efficiency, product safety, responsibility in investments, mergers and acquisitions, and engagement with stakeholders and society. The Statement additionally covers responsible sourcing and working conditions, with reference to the respective separate rules governing these areas. The purpose of this Statement is to describe UPM's approach in these matters, defining principles and commitments relevant to all UPM operations. The respective managements are responsible for ensuring that these principles and commitments are observed properly.

UPM's businesses may issue more detailed guidelines and instructions under this Statement.

2. GOVERNANCE

The UPM Code of Conduct, the UPM Biofore Strategy, the UPM 2030 Responsibility Targets as well as the UPM Values form the foundation of the Company's businesses. UPM believes that responsible management of economic, social and environmental issues is vital to achieving long-term business success.

UPM strives to ensure full compliance with the UPM Code of Conduct and other corporate policies. To ensure compliance and mitigate risks, UPM performs risk assessments, provides training, and carries out monitoring at regular intervals.

UPM has defined its Responsibility Targets for 2030 along with specific measures to be taken and performance indicators for monitoring the progress. Monitoring is carried out at least once a year, and targets are updated as deemed necessary. All UPM operations are responsible for committing to the Company's 2030 Responsibility Targets and for setting their own targets in line with and, if relevant, in addition to company-wide targets.

All employees must be made aware of responsibility-related issues in their day-to-day-work. Any action that can potentially affect people or the environment negatively must be considered carefully.

UPM employees shall report any complaints or concerns relating to the violation of the UPM Code of Conduct, related policies or rules or applicable laws to their manager or to a representative of UPM Legal, UPM Human Resources or UPM Internal Audit, or use (also anonymously) UPM's Report Misconduct channel. The channel is also available for external stakeholders to report any violation of law or UPM policies (e.g. UPM Supplier and Third-Party Code). The UPM Report Misconduct channel is operated by an independent external service provider.

References:
UPM Report Misconduct channel

3. WORKING CONDITIONS

The topic is covered in the following documents:
UPM Human Resources Rules
UPM Safety Rules

4. RESPONSIBLE SOURCING

The UPM Supplier and Third-Party Code defines the minimum level of performance that UPM requires from all of its suppliers and third-parties, such as agents, advisers, joint venture partners, local partners or distributors acting on behalf of UPM. UPM also requires all its suppliers to promote the same requirements in their own supply chains. All suppliers working on our premises must be introduced to UPM's safety requirements.

There are area-specific requirements for certain materials or services. These include the following:

- All wood sourced for UPM products shall originate from sustainably managed forests and from legal sources and shall be covered by a third-party verified chain of custody. UPM aims to use certified fibre to the highest possible degree and promotes a global increase in the use of certified wood. The company's wood sourcing actions do not cause deforestation, nor do they threaten the rights of indigenous people. UPM does not use genetically modified trees or

wood originating from rainforests. UPM additionally expects its wood suppliers to commit to promoting biodiversity.
- UPM requires all its suppliers to be fully compliant with local regulations on chemicals and product safety.

Suppliers shall be assessed systematically and regularly from an economic, social and environmental perspective. When risks are identified, suppliers shall be evaluated in more detail through surveys, supplier audits and/or joint development plans. If any discrepancies are discovered, the supplier shall be required to take corrective measures.

References:
UPM Supplier and Third-Party Code
UPM Requirements for Suppliers of Wood
UPM Requirements for Pulp suppliers

5. ENVIRONMENTAL IMPACTS

UPM complies with all applicable environmental laws. Deviations from environmental permit limits or obligations as well as other nonconformities must be followed up and reported, both on site and Company level. Measures must be taken to avoid reoccurrence and future deviations.

UPM pays close attention to how its operations impact the air, climate, water, land and biodiversity, aiming to minimise any adverse effects. This means reducing emissions to air and water as well as minimising both non-hazardous and hazardous waste. Through its land use and forest management practices, the Company ensures that it minimises adverse effects and contributes positively to biodiversity and climate.

All operations continuously measure and assess their direct and indirect environmental loads and impacts and promote the use of best available techniques and methods. All operations manage their environmental performance systematically based on the principle of continuous improvement. Chemicals are always handled safely. ISO 14001 environmental management system certification is required for all UPM operations. UPM's Clean Run concept must be implemented in all operations.

6. ENERGY AND RESOURCE EFFICIENCY

UPM uses energy, raw materials, water and other resources in a responsible manner and works to continuously improve its energy and resource efficiency. All operations are expected to design and optimise their processes for maximum energy and resource efficiency, using the best available techniques and methods. The Company promotes a circular economy approach by using materials recovered from production processes and by developing recycling options for side streams and residues of production processes.

7. PRODUCT STEWARDSHIP

UPM product stewardship takes into account the entire product lifecycle. UPM ensures that its products are safe for their designed application and meet all applicable regulatory requirements. Product safety must be prioritised by everyone involved, all the way from product development, raw material sourcing and production to delivery, use and disposal.

UPM promotes recyclability through the value chain and the use of recycled content in its products. The Company is committed to replacing potentially hazardous chemicals with safer alternatives wherever this is feasible.

UPM aims to develop products that have positive contribution to society.

8. INVESTMENTS, MERGERS AND ACQUISITIONS

In all investments made by UPM, due attention is paid to legal compliance, safety, environmental, social and human rights aspects. The respective impacts are evaluated in line with UPM's internal criteria.

In the case of major investments, both an environmental impact assessment and a social impact assessment must be carried out. If relevant for the investment in question, a more comprehensive safety risk assessment and an in-depth human rights assessment are also conducted. Details are defined in UPM's investment manual.

In all mergers and acquisitions, UPM similarly takes account of legal compliance, safety, environmental, social and human rights aspects as part of its evaluation and decision making.

9. ENGAGEMENT WITH STAKEHOLDERS AND SOCIETY

UPM's goal is to be a trusted partner. The Company identifies its relevant stakeholders and their expectations and engages in dialogue with them. UPM is committed to open communication and trust both inside the Company and with its stakeholders (e.g. non-governmental organisations, authorities, politicians or local communities).

UPM provides stakeholders and the public with accurate and reliable information on UPM's environmental and social performance and governance. Environmental product information is available for all UPM products.

Taxes are paid in accordance with local tax laws and regulations in the country in question. UPM pays corporate income taxes in the countries where added value is created and profit is generated.

UPM aims to contribute positively to the economic, environmental and social development of surrounding communities, and to minimise any negative impacts resulting from its current and future operations.

At all its locations, UPM promotes the development of local communities through various projects and initiatives, and discloses its activities openly. The UPM Biofore Share and Care programme consists of sponsorships, donations and employee volunteering within specifically defined focus areas.

References:
UPM Rules for Sponsorships, Donations and Employee volunteering
UPM Tax policy

Glossary

Activated sludge process
The activated sludge process is a biological treatment under controlled conditions that seeks the development of specific microbes and protozoa capable of aerobically oxidizing wastewater's organic matter.

AOX, Adsorbable organic halogen compounds
AOX represents the total amount of chlorine bound to organic compounds in waste water. Such compounds occur naturally, but are also formed in conjunction with the bleaching of chemical pulp. AOX should be limited to a level where it has minimum environmental impacts.

BAT, Best available techniques
The best available technology that allows for solutions that are technically, economically and environmentally the most efficient and advanced.

BOD, Biological oxygen demand
COD, Chemical oxygen demand
The effluent, or waste water of pulp and paper mills includes organic substances which consume oxygen during biodegradation. Low oxygen content in fresh and sea water can have an adverse effect on plant and animal life. BOD refers to the amount of oxygen consumed in the biological decomposition of organic compounds. COD refers to the amount of oxygen consumed in the complete chemical oxidation of organic compounds.

CO_2, Carbon dioxide
Combustion product of carbon. Fossil carbon dioxide emissions arise from fossil fuels like coal, oil and petrol.

Scope 1 CO_2 emissions
Direct fossil CO_2 emissions from on site fuel usage.

Scope 2 CO_2 emissions
Indirect fossil CO_2 emissions from the generation of purchased electricity, steam, heating and cooling.

CHP, Combined heat and power technology
Combined heat and power (CHP) production (or cogeneration) is when both electricity and heat are produced at a thermal power plant. The heat is used, for example, in industry or district heating, or as process steam.

Chain of Custody (COC)
An unbroken trail of documentation to guarantee the identity and integrity of the data used as, for example, in demonstrating the origin of wood.

Chemical pulp
Generic name for wood-based fibres separated from each other by "cooking" wood chips or plants in hot alkaline or acidic solutions of various chemicals.

Consumption impact
Consumption through net income generated by employees working at the plant and employees working at the value chain of the plant (typically working in other industries). Calculated using a model build by The Research Institute of the Finnish Economy (Etla).

Deinking
The process whereby the ink and impurities are removed from recovered paper.
Deinked pulp: see recycled fibre pulp.

EMAS, Eco-Management and Audit Scheme
Voluntary environmental management system for companies and other organisations to improve, evaluate and report on their environmental performance on an annual basis. The environmental review is approved by a third-party accredited EMAS verifier.

Forest certification
An independent review process that determines whether a forest is managed in a responsible manner. There are two global forest certification schemes: FSC® (Forest Stewardship Council®) and PEFC (Programme for the Endorsement of Forest Certification).

Graphic recovered paper
Mainly white paper collected from households, e.g. newspapers, magazines, catalogues and copy paper.

ISO 9001
Quality management system standard published by the International Organisation for Standardisation (ISO). This is a voluntary, international and third-party certified system.

ISO 14001
Environmental management system standard published by the International Organisation for Standardisation (ISO). This is a voluntary, international and third-party certified system.

ISO 22001
Food Safety management system standard published by the International Organisation for Standardisation (ISO). This is a voluntary, international and third-party certified system.

ISO 45001
Occupational Health and Safety management system standard published by the International Organisation for Standardisations (ISO). This is a voluntary, international and third-party certified system.

ISO 50001
Energy management system standard published by the International Organisation for Standardisation (ISO). This is a voluntary, international and third-party certified system.

Lost-time accident frequency (LTAF)
Lost-time accidents per million hours worked. Calculation is as follows: (The number of accidents at work resulting in absence or disability one or more days)/(Actual hours worked)*1,000,000. Lost time accident type excludes modified duties, medical treatments and first aid cases, but includes fatal accidents. UPM reports separately for workforce (including UPM employees and supervised workers) and contractors.

Mechanical pulp
Generic name for wood-based fibres separated from each other mechanically.

N, Nitrogen
P, Phosphorus
N and P are chemical elements essential for plant and animal life. Both substances occur naturally in wood and are often added as a nutrient in biological treatment plants. Excessive levels released into watercourses can cause nutrient enrichment, i.e., eutrophication, which accelerates the growth of algae and other vegetation.

NO_x, Nitrogen oxides
These gases are produced during combustion. In moist air, nitrogen oxides can form nitric acid which, in turn, is precipitated as "acid rain". This nitrogen-containing rain also has a fertilising effect, i.e. eutrophication.

Recycled fibre pulp
Fibres and fillers retrieved from recovered paper. If the recovered paper is deinked, the processed pulp is also called deinked pulp.

SO_2, Sulphur dioxide
This gas is generated by burning sulphur-containing fuels. On contact with moist air, SO_2 forms sulphuric acid, which contributes to "acid rain" and acidification.

Supplier Qualification
UPM suppliers are qualified against the UPM Supplier and Third Party Code that defines suppliers' minimum compliance requirements in terms of responsibility with regard to matters such as environmental impact, human rights, labour practices, health and safety, and product safety. Supplier spend in EMAS mill supplements covers all UPM business-to-business spend excluding wood and wood-based biomass sourcing. Wood sourcing figures are not currently available for each mills, but only for regions.

Sustainable forest management
In the longterm, a sustainably managed forest means that it is not harvested more than it grows. Sustainably managed forests maintain their biodiversity, productivity, regeneration capacity, vitality and their potential to fulfil (now and in the future), relevant ecological, economic and social functions, at local, national and global levels without damaging other ecosystems.

Total Recordable Injury Frequency (TRIF)
Recordable injuries per million hours worked. Calculation is as follows: ('LTA at work excluding contractors (number of LTAs which are one or more days)'+'Modified duty'+'Medical treatment')/'Actual hours worked (UPM)'*1,000,000. Total Recordable Injury type excludes first aid cases. UPM reports separately for workforce (including UPM employees and supervised workers) and contractors.

TRS, Total reduced sulphur
Reduced sulphur compounds that usually cause odour problems and that are released, for example, during chemical pulp production.

TSS, Total suspended solids
TSS are solid materials, including organic and inorganic, that are suspended in the water.

Validation statement

As accredited or licensed environmental verifiers,
- Inspecta Sertifiointi Oy (FI-V-0001) for UPM Changshu, UPM Fray Bentos, UPM Jämsänkoski, UPM Kaukas, UPM Kymi, UPM Pietarsaari, UPM Rauma and UPM Tervasaari
- Quality Austria Trainings, Zertifizierungs und Begutachtungs GmbH (AT-V-0004) for UPM Steyrermühl
- TÜV NORD CERT Umweltgutachter GmbH (DE-V-0263) for UPM Augsburg, UPM Ettringen, UPM Hürth, UPM Nordland, UPM Plattling and UPM Schongau

have examined the environmental management systems of each mill mentioned above, the information contained in the Environmental and Societal Responsibility 2021 statements, the information in the corporate part, as far as it concerns the respective mills, as well as the information used for the calculation of UPM Corporate level EMAS core indicators.

Following these examinations and the examination of the UPM Corporate Environmental and Societal Responsibility Statement 2021 on 15/07/2022 Inspecta Sertifiointi Oy as the coordinating environmental verifier of this common EMAS validation herewith confirms that the environmental management systems and this UPM Corporate Environmental and Societal Responsibility Statement 2021 together with the Environmental and Societal Responsibility 2021 statements comply with the requirements of the EU's EMAS regulation (EC) No. 1221/2009.

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