

# ENVIRONMENTAL AND SOCIAL RESPONSIBILITY Performance in 2016





### UPM Kaukas

UPM Kaukas mills are located on the shores of Lake Saimaa in the city of Lappeenranta in South-East Finland. The mill area is home to a pulp and paper mill, a biorefinery, a sawmill, a biofuel power plant (Kaukaan Voima Oy), UPM's Northern Europe research and development centre and UPM Wood sourcing and forestry, Eastern Finland Integrate Area.

The pulp mill produces bleached softwood and birch pulp. The paper mill manufactures coated magazine paper. The Kaukas sawmill produces sawn pine and spruce timber for the construction and joinery industries. The biorefinery manufactures renewable diesel from tall oil to be used as traffic fuel.

Kaukaan Voima Oy's biofuel power plant generates heat and electricity for the Kaukas mills and the power company Lappeenrannan Energia Oy. 80% of the energy produced by Kaukaan Voima is generated using renewable biofuels.

The integrated mill site enables the efficient use of wood-based raw materials, the energy supply and logistics. The Kaukas mills operate under a shared environmental permit, which includes permits for wastewater treatment, waste management and landfill operations. The EMAS scheme covers the Kaukas pulp and paper mills.

Production capacity	314,000 tonnes coated magazine paper 740,000 tonnes softwood and harwood pulp 530,000 m <sup>3</sup> of sawn redwood and whitewood 100,000 tonnes renewable biofuel			
Personnel	Paper mill 241, pulp mill 304. Approximately 1,000 employees work for the UPM mills and joint services in Lappeenranta.			
Products	Magazine papers (MWC, LWC): UPM Star UPM Valor UPM Ultra UPM Cote	<b>Pulp</b> UPM Betula UPM Conifer UPM Conifer Reinforcement	Sawn timber UPM Timber UPM Plus Biofuels UPM BioVerno	
Certificates	EMAS – EU Eco-Management and Audit Scheme ISO 14001 – Environmental Management System Standard ETJ+ – Energy Efficiency System ISO 9001 – Quality Management System Standard PEFC™ Programme for the Endorsement of Forest Certification FSC® – Chain of Custody - Forest Stewardship Council ® OHSAS 18001 - Occupational Health and Safety Management ISCC-EU (International Sustainability and Carbon Certification) - UPM BioVerno			
	All certificates can be found from UPM's Certificate Finder (available at www.upm.com/responsibility)			
Environmental labels	UPM pulp products have the approval for use in EU Ecolabel and Nordic Ecolabel paper products. Papers are awarded with EU Ecolabel			

Through the renewing of the bio and forest industries, **UPM** is building a sustainable future across six business areas: UPM Biorefining, UPM Energy, UPM Raflatac, UPM Specialty Papers, UPM Paper ENA and UPM Plywood. Our products are made of renewable raw materials and are recyclable. We serve our customers worldwide. The group employs around 19,300 people and its annual sales are approximately EUR 10 billion. UPM shares are listed on NASDAQ OMX Helsinki. UPM – The Biofore Company – www.upm.fi



UPM Kaukas Environmental performance in 2016 is a supplement to the Corporate Environmental Statement of UPM's pulp and paper mills (available at www.upm.com) and provides mill-specific environmental performance data and trends for the year 2016. The annually updated mill supplements and the UPM Corporate Environmental Statement together form the joint EMAS Statement of UPM Corporation. The next updated Corporate Environmental Statement and also this supplement will be published in 2018.



The mark of responsible forestry For FSC products, visit http://fi.fsc.org





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### Kaukas paper and pulp mill operations 2016

Safety is an integral part of operations at UPM Kaukas. Last year, 16 accidents leading to an employee being absent from work occurred at Kaukas. This is a significant reduction compared to the number of accidents that occurred at the beginning of the millennium. Over the years, more attention has been paid to anticipatory observations and human factors, which has had a clear impact on the number of accidents. The 2012–2014 Step Change in Safety initiative has also played a major role in improving occupational safety. In 2016, UPM Kaukas successfully adopted the One Safety model and reporting tool, which encourages everyone to report near-miss events, regardless of their severity. The system even enables external contractors and suppliers to report their observations when they are working at UPM premises.

#### **Environmental year 2016**

The environmental impact of the UPM Kaukas integrated mill site has remained almost unchanged since 2000. Most water and air emission categories were similar in 2016 as in previous years. Operations were material efficient and raw materials were used very carefully. Compared to the previous year, the pulp production volume increased and the paper production volume decreased. The use of fossil fuels decreased, and less waste was taken to landfill. A decision from the Regional State Administrative Agency of Southern Finland regarding the Kaukas integrated mill site environmental permit review was obtained in 2015, but

it is not yet legally valid. The case is still being processed by the Vaasa Administrative Court.

The operations of the UPM Kaukas mills complied with the currently valid environmental permit and the BAT document published in 2014. In normal conditions, mill site odours are well under control, and disturbances have not occurred in the process of burning malodorous gases, other than in some exceptional situations. Of the 16 cases where UPM Kaukas was contacted due to matters related to the environment, 13 concerned odours and three concerned noise. Most of these cases were related to the annual maintenance shut-down at the pulp mill in September. Unpleasant odours occur when the pulp mill is shut down and started up again. An exceptionally strong odour of sulphur compounds spread to a vast area in the northeastern part of Lappeenranta during the inspection of a chemical sewer performed in connection with the pulp mill shut-down. Steam discharges related to the shut-down also caused loud noises in the vicinity of the mill site.

The integrated mill site's environmental objectives included adopting a new waste management model, reducing water consumption in pulp and paper production, reducing fossil carbon dioxide emissions and improving energy efficiency. The objectives also included verifying that operations comply with the new environmental permit and complying with the new permit when it becomes legally valid. The mill site performed well in achieving the objectives. A new waste management model was implemented in 2016. Less waste was taken to landfill, and did not include any organic waste. Water consumption was reduced in paper production processes, and the pulp mill's water consumption remained at the same level as in 2015. The consumption of fossil fuels decreased, which reduced the mill site's fossil carbon dioxide emissions. Specific consumption of steam decreased in both pulp and paper production, which improved energy efficiency. Unlike under normal conditions, the pulp mill was not self-sufficient in electricity in 2016 because the recovery boiler turbine was out of use for several weeks due to maintenance work. The new environmental permit did not become valid in 2016, but the mill site is already compliant with it.

The recording of environmental observations and deviations increased in spring 2016 as UPM's new One Safety tool was introduced. The environmental risk assessments of the mills were also updated and transferred to the new tool.

#### Pulp mill

The year 2016 was relatively normal in pulp production. The planned annual maintenance and investment shutdown was performed in the autumn, and investment increased the drying capacity of the pulp mill. The emission levels of the pulp mill are stable when the mill runs at the designed steady, unchanging speed. Exceptional situations have an impact on emissions to both air and water.

Malodorous sulphur compound emissions to air decreased. This was due to the fact that gases from the tall oil plant, which were previously discharged into the air, were now burned in the lime kiln. There were also fewer disturbances in the burning process for malodorous gases than in previous years. All other airborne emissions, measured as specific emissions, remained unchanged.

Water emissions increased in terms of halogenated organic compounds (AOX) and chemical oxygen demand (COD). For these parameters, the reduction rate of the treatment plant was lower during the second half of the year due to the combined effect of sludge balance and temperature. Nutrient emissions decreased compared to the previous year.

Fossil carbon dioxide emissions were also reduced compared to the previous year because a larger amount of the natural gas used to fuel the lime kiln was replaced with the biorefinery's pitch oil.

#### Paper mill

The year 2016 was the paper mill's first full year with one paper machine, so paper production decreased compared to the previous year. The environmental impact of the paper mill was smaller than that of the pulp mill. The paper mill aims to manufacture coated offset and rotogravure paper in a material and energy efficient manner. The mill has internal targets for solids emissions at the wastewater treatment plant, the consumption of process water and the amount of coating colour sludge no longer usable in the paper manufacturing process. Previously, coating colour sludge was taken to landfill, but it is now reused in landfill closure work.

In 2016, the solids emissions at the wastewater treatment plant were approximately one-third lower than in the previous year, and the internal target was achieved. One of the reasons for this positive development is the 2015 process change made to the fibre sorting of the paper machine. Process water consumption exceeded the internal target value and the target value specified in the new BAT document. The change in the water balance of the mill, resulting from the other paper machine being shut down, affected the consumption. Nevertheless, the consumption of process water was 10% lower than in 2015. The optimisation of the mill's water consumption was designed based on having two machine lines. Closing the water circulation in the current situation will require significant capital expenditure.

The amount of coating colour sludge removed from the process was almost 70% lower than in 2015. The target was achieved, and all of the coating colour sludge is able to be reused in the closure of landfills.

#### Air

The airborne emissions from the Kaukas mills remained at a similar level in 2016 to the previous year. The mill site's total sulphur dioxide (SO2), particulate (TSP) and nitrogen oxide (NOx) emissions to air increased from the previous year, but the specific emissions remained unchanged. Emissions of malodorous sulphur compounds (TRS) decreased compared to the previous year. These emissions cover TRS compounds from the flue gases of the recovery boiler, malodorous gas boiler and lime kiln, diffuse emissions and accidental emissions. Diffuse emissions come from sources that are not included in the recovery of malodorous gases. Accidental emissions occur in exceptional situations where emissions are released into the air without treatment. Diffuse emissions and



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Minna Maunus-Tiihonen Environmental Manager

NITROGEN OXIDES, NO,



accidental emissions decreased in 2016 compared to the previous year. Since spring 2016, the malodorous gases of the tall oil plant have been burned in the lime kiln, which has resulted in reductions to most diffuse emissions and TRS emissions.

Fossil carbon dioxide emissions accounted for less than 5% of all carbon dioxide emissions, and the emission level was reduced by approximately 10% compared to the previous year. Some of the natural gas used as lime kiln fuel was replaced with pitch oil, a residue from the biorefinery.

An experimental method was used to study the dispersion of malodorous gases in autumn 2016. The project was implemented with an external partner and involved the use of new technology. Sensors installed in a remote-controlled helicopter were used to measure the concentrations of different components at various sources of malodorous gases. Measurements were carried out at different dis-



PARTICULATES t/a 300 240 180 120 60 0 07 08 09 10 11 12 13 14 15 tances from the gas sources to determine how rapidly the concentrations dropped. The helicopter was used at the wastewater treatment plant, the sludge treatment process and the pulp mill's birch fibre line.

It was recorded that 99% of weak malodorous gases and 100% of strong malodorous gases were recovered and burned. UPM Kaukas' total annual air emissions from pulp and energy production are presented in the following graphs. The proportion of the Kaukaan Voima total emissions estimated for UPM is included in the figures.

In 2016, all emissions to air from the pulp mill were within the reference values of the BAT document published in autumn 2014.

#### Waste

Around 21,700 tonnes of waste (as dry matter) was generated at the Kaukas pulp and paper mill in 2016. This amount includes around 18,700 tonnes of process waste and around 3000 tonnes of other recyclable waste. These figures also include UPM's share of Kaukaan Voima's process waste. At the Tuosa landfill, 1900 tonnes of waste was deposited for final disposal – down 65% from the previous year. The remaining process waste was reused or stored for future reuse purposes. Reuse applications included energy production (sludge from wastewater treatment plant and fibre sludge), earth construction (bottom ash, fly ash and green liquor dregs), compost raw material and aeration material (debarking reject sand) and soil conditioner (lime sludge and lime).

Green liquor dregs form the biggest and currently almost the only waste category deposited at the landfill. Green liquor dregs are a by-product of the chemical circulation of the pulp mill, and as the production volume of pulp fluctuates, the amount of green liquor dregs fluctuates as well. Only a few reuse applications exist for green liquor dregs, but some of it was mixed with ash and used in earth construction (field base), as in previous years. The amount of waste taken to landfill saw a significant reduction as the ban on taking organic waste to landfill came into effect in January 2016.

A new waste management operating model was introduced at the Kaukas mills in 2016, and related training was organised for employees. Waste sorting guidelines were updated, waste containers were labelled and sorting instructions were added to the containers. The number of external service providers was also reduced, and this centralised approach has resulted in better sorting results. The amount of waste transported outside the mill increased partly due to the new operating model, since mixed mill waste that was previously taken to the mill's own landfill is now recycled in accordance with the new operating model.



UPM's percentage of Kaukaan Voima's total emissions is included in air emission figures.

The weights included in the figure are dry weights.

#### Water

The Kaukas mill used a total of 75 million cubic metres of water in the manufacture of pulp and paper in 2016. Of this total, 49% was process water, which was treated at the biological effluent treatment plant before discharge. Water consumption at the mill site decreased year-on-year.

The effluent load to the lake increased in terms of biological oxygen demand (BOD), chemical oxygen demand (COD), halogenated organic compounds (AOX) and solids.

The nitrogen (N) load remained unchanged from the previous year and the phosphorus (P) load decreased. The effluent loads of both pulp and paper production remained within the limits specified in the BAT document. The only exception was the phosphorus load, which was in fact below the lower BAT level. The quality of natural water in the vicinity of the Kaukas mill site has been monitored for a considerable length time. In the summer of 2016, the quality of water was better than ever before in the monitoring period that began in 1982. The quality was assessed based on an index number. The most significant change in water quality occurred in 1992 when the biological treatment plant began its operations. Since 2000, the main factors affecting water quality have been better control of accidental emissions and improved reactions to exceptional situations.

The performance of the biological treatment plant has been good in recent years. The effluent load to the lake is greater in the summer months than during the rest of the year. This is due to temperature: the biological treatment process does not work as efficiently at 40 degrees Celsius as it does at slightly lower temperatures.

CHEMICAL OXYGEN DEMAND, COD

t/d

75

60

45

30

24

12

0

07 08 09 10 11 12 13 14 15 16

Wastewater is cooled at the treatment plant by using surface coolers and directing lake water into the treatment process.

The operation of the treatment plant is reported in terms of its efficiency in the treatment of various substances. This is called reduction. The plant's treatment efficiency has been stable over the past few years. In 2016, the BOD reduction rate was 99%, while the COD reduction rate was 78%. The solids reduction rate was 97%.

Reducing water consumption is one of the mill site's long-term environmental objectives. In pulp production, process water consumption remained unchanged in 2016 and in paper production it decreased by around 10%. In the long run, the goal is to keep reducing water consumption. Achieving significant changes in consumption levels will, however, require new investment.







#### ADSORBABLE ORGANIC HALOGEN COMPOUNDS, AOX





NITROGEN, N kg/d 750 600 450 300 150

– Permit – Monthly limit

0

07 08 09 10 11 12 13

15

14

### The Kaukas mill site as part of the local community

The principles of circular economy have been applied at the Kaukas bio forest industry integrated site for 120 years. In 1892, a factory manufacturing birch spools was established on the mill site. As the majority of the wood material was wasted when the spools were turned, a pulp mill was established in the same area to make use of the excess material. Now a sawmill, paper mill, bio power plant and a biorefinery established in 2015 continue this tradition of industrial symbiosis. All wood raw material brought to the Kaukas mill site is fully used either to produce products or to generate energy.

#### Providing information about jobs in the forest industry

We invest in the future by actively collaborating with local educational institutions. Our aim is to inform young people of jobs in the forest industry and encourage them to study process technology and pursue careers in the field.

In May, almost a hundred ninth-grade pupils visited various Kaukas mill units as part of an event called Process Day. We also participated in the Finnish Forest Industries Federation's forest ambassador campaign, which was designed to inform pupils in grades seven to nine of the forest industry and the job opportunities it provides. Our employees are often invited to visit different institutions to give lectures on the forest industry. Dozens of study visits were also organised at the mill site.

#### School children participate in studying the quality of our local waters

Kaukas representatives visited five different secondary schools in Lappeenranta as part of the 'Local waters' project and donated several bags full of water research equipment to the schools. The purpose of the project is to increase pupils' interest in natural sciences and particularly in water research. The results will be recorded in a national register maintained by the Finnish Environment Institute (SYKE), and the hands-on activities will improve pupils' understanding of the importance of clean water.

#### The largest private employer in Lappeenranta

In 2016, UPM Kaukas employed over a thousand professionals, and the majority of these employees had a permanent job.



During the summer we had 160 seasonal employees, mainly from local educational institutions. We also offered on-the-job learning positions for 47 vocational college students, one Biofore trainee and one Teknoloikka trainee. In addition to this, students completed several practical work projects and final projects commissioned by us. In autumn 2016, eight people started a two-year apprenticeship training programme at the Kaukas sawmill.

UPM Kaukas also plays a major role in Lappeenranta as a generator of tax revenue. In addition to the municipal share of corporation tax and the real estate tax paid by UPM, the taxes that UPM employees pay on their wages have a local impact. The purchasing power of employees working for UPM subcontractors and for UPM also maintains and increases the vitality of the city.

#### Local collaboration and sponsorship

For us, responsibility means everyday actions that benefit our employees, the local community and the environment. UPM Kaukas mainly sponsors children and young people through local schools and associations for the public good. Some of our financial support goes to sports clubs operating in Lappeenranta. One of the long-term projects for UPM Kaukas is supporting Suomen Meripelastusseura Etelä-Saimaa ry., an association that carries out rescue operations in the Pien-Saimaa area of Lake Saimaa and the southern parts of Lake Suur-Saimaa. UPM Kaukas annually organises UPM Kaukas Forum, a stakeholder event where local influential parties can discuss local projects and UPM's operations in Lappeenranta. Examples of our other activities include the collaboration with Green Energy Showroom, an active network of energy and environmental sector companies operating in South Karelia, and the collaboration with the local rescue department, water protection association and municipal environmental services.

# RESPONSIBILITY figures

# Pulp mill and paper mill

#### WASTE RECYCLING

new operating model

65% less waste to landfill



#### SAFETY

• the number of accidents at the paper and pulp mill has decreased by





over the past 10 years (67 accidents in 2006 and 10 accidents in 2016)

#### WATER

Phosphorus load to the lake lower than in 2015

- Positive developments in the state of the area of Lake Saimaa affected by the mill site during the 35-year monitoring period
- Paper mill's solids emissions 1/3 lower than in 2015

#### AIR

- the malodorous gases of the tall oil plant are burned in the lime kiln, which reduces odour emissions
- new technology was used to study the dispersion of malodorous gases
- malodorous sulphur compound emissions were



### ENERGY Biofuels were used to

of the paper and pulp mill's energy

#### **CERTIFIED WOOD**

of the wood raw material used in pulp and paper production

# Integrated mill site

#### **EMPLOYMENT EFFECT**

1175 jobs

at the mill site when jobs provided by subcontractors are included

- 160 summer jobs
- 2600 indirectly employed\*
- 1700 external employees in pulp mill maintenance shutdown



# LOCAL TAXES \* Eur 31-34 million

- estimated municipal tax on personnel wages
- municipal share of corporation tax
- real estate tax
- estimated effect indirect employment has on taxes

#### **INDIRECT EFFECT (PURCHASE POWER)**

- UPM Kaukas employees EUR 30 million
- consumption through indirect employment EUR 38–45 million
- stimulating effect of consumption on regional economy EUR 68–75 million

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# 5 million cubic metres of wood

into useful products. This provides work and income for

- harvesting machine operators
- log truck operators
- forest workers
- other forest professionals and income for forest owners



#### **BIOFUELS**

UPM's renewable diesel UPM BioVerno reduces greenhouse gas emissions by

80%

compared with fossil fuels

• The biofuel produced at the biorefinery in 2016 reduced CO<sub>2</sub> emissions by an amount equivalent to the emissions of 80,000 passenger cars

#### **KAUKAAN LYLY**

• sports club established in 1940



sports club established inof employees are members

• retired employees and family members also belong to the club



#### COLLABORATION WITH EDUCATIONAL INSTITUTIONS

47

students performing upper-secondary vocational education and training completed an on-the-job learning placement at the Kaukas pulp and paper mill or the research centre

• active collaboration with various schools and educational institutions

\* Source: City of Lappeenranta



## Environmental parameters 2016

The figures related to production as well as raw material and energy consumption are published as aggregated figures on group level in the UPM Corporate Environmental Statement.

Production capacity	Magazine paper Pulp - Softwood pulp - Hardwood pulp	314,000 t 740,000 t 420,000 t 320,000 t
Raw materials	Wood, cooking chemicals, bleaching chemicals, filler and coating pigments, pigments in paper	See UPM Corporate Environmental Statement for more information
Energy	Biofuels Fossil fuels Purchased electricity	88% 12% See UPM Corporate Environmental Statement for more information
Air emissions, including UPM's share of Kaukaan Voima emissions	Fossil carbon dioxide, CO <sub>2</sub> Nitrogen oxides, NO <sub>2</sub> Sulphur dioxide, SO <sub>2</sub> Dust particles Total reduced sulphur, TRS	133,095 t 1,147 t 232 t 85 t 33 t
Water consumption	Process and cooling water	74.9 million cubic metres
Emissions to water	Effluent BOD <sub>7</sub> COD Solids Phosphorus, P Nitrogen, N Adsorbable organic halogen compounds, AOX	36.5 million cubic metres 277 t 10,961 t 496 t 3.5 t 124 t 106 t
Waste*	Waste to landfill - Green liquor dregs - Mixed waste Reused waste - Barksand and stones - Green liquor dregs and lime - Fly ash and bottom ash - Recyclable carbon and paper - Metals - Other Intermediate storage - Fibre sludge - Lime kiln ash	1,941 t 1,938 t 3 t 17,987 t 796 t 6,504 t 7,721 t 1,994 t 576 t 396 t 1,811 t 813 t 998 t
Hazardous waste		89 t
Mill area		200 ha

The figures include the calculated share of Kaukas biofuel power plant emissions. \* Dry weight

### Performance against targets in 2016

TARGETS	ACHIEVED	COMMENTS
New waste management model in use - O tonnes of organic waste to landfill - less solid waste than in 2015 to landfill - paper fibre waste goal <9.5 t/d - paper coating colour sludge waste goal <1.0 t/d	Yes	New operating model introduced at the beginning of February 2016 - no organic waste to landfill - the amount of solid waste deposited at the landfill decreased by 70% compared to the previous year - paper mill average fibre waste 7.8 t/d - amount of coating colour sludge waste 0.9 t/d
Verifying that operations comply with the new environmental permit and complying with the new permit as it becomes legally valid	Partly	The new environmental permit did not become legally valid in 2016. Environmental reports have been specified and programmed and will be brought into use when the new permit becomes legally valid. Special reports have not yet been drafted. The mill site is ready to operate in compliance with the new permit.
Reducing the amount of effluents	Partly	Specific consumption of water at the pulp mill remained unchanged compared to the previous year. The target of reducing the consumption by 10% was not achieved. Specific consumption of water at the paper mill decreased by approximately 10%.
Reducing fossil carbon dioxide emissions	Yes	Fossil carbon dioxide emissions decreased both in pulp and energy production.
Improving energy efficiency	Partly	Specific consumption of steam decreased in both pulp and paper production. The pulp mill was not self-sufficient in terms of electricity production due to the maintenance of the recovery boiler turbine

### Environmental targets 2017

TARGETS	SCHEDULE	INDICATORS
Paper mill material efficiency	2017	- fibre waste <9.5 t/d - coating colour sludge waste <1.0 t/d
Reducing the specific emissions of the pulp mill compared to the previous year	2017	COD and AOX kg/Adt < 2016
Reducing the amount of effluents	2017	Pulp: -8% from the actual level of 2016
Reducing fossil carbon dioxide emissions	2017	Reducing consumption of natural gas
Improving energy efficiency	2017	Pulp: ensuring energy self-sufficiency Paper: reducing specific consumption of energy



#### Revalidation statement

As an accredited environmental verifier (FI-V-0001), Inspecta Sertificinti Oy has examined the environmental management system and updated UPM Kaukas Environmental Performance 2016 report as well as the information concerning UPM Kaukas in the Updated UPM Corporate Environmental Statement 2016. On the basis of this examination, the environmental verifier has herewith confirmed on 2017-04-07 that the environmental management system, the updated UPM Kaukas Environmental Performance report and the information concerning UPM Kaukas in the Updated UPM Corporate Environmental Statement are in compliance with the requirements of the EMAS Regulation (EC) No 1221/2009.



UPM leads the integration of bio and forest industries into a sustainable future characterised by innovation, responsibility and resource efficiency. www.upm.com

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