The Biofore Company UPM

UPM Kaukas

Environmental and Societal Responsibility 2017

UPM Kaukas

UPM Kaukas mills are located on the shores of Lake Saimaa in the city of Lappeenranta, in south-east Finland. The mill site houses a pulp and paper mill, a biorefinery and a sawmill, and UPM's largest R&D centre; the wood sourcing management of UPM Forest and the Lappeenranta forest service office are also based at Kaukas. This EMAS report covers the environmental aspects of the Kaukas pulp and paper mill, and social responsibility for the entire mill.

The Kaukas mills form a unique bio forestry integrated mill that produces pulp, magazine paper, sawn timber, biofuels and energy from renewable raw materials. In addition to UPM's mills, the site houses a biomass power plant operated by Kaukaan Voima Oy, producing heat and electricity for the mills and the neighbouring community. Some 80% of the energy produced by Kaukaan Voima is generated using renewable biomass.

Having several mills operating in the same area offers many benefits, and an integrated mill site enables efficient control of environmental issues. The short distance between the mills facilitates cooperation, decreases the need for transport and allows the mill effluents to be treated by a shared biological treatment plant. Sustainably sourced wood, the integrated mill's high level of energy self-sufficiency and recycling of by-products into raw materials are important cornerstones of our operation.

Production capacity	314,000 tonnes of coated magazine paper 740,000 tonnes of softwood and birch pulp 510,000 m^3 of sawn redwood and whitewood 100,000 tonnes of renewable diesel and naphtha
Personnel	Paper mill 256, pulp mill 298, sawmill 131, biorefinery 79, UPM Forest 32, Research Centre 143. UPM Lappeenranta has roughly 1000 employees in total.
Products	**Magazine papers** (MWC, LWC) UPM Star, UPM Valor, UPM Ultra **Pulp** UPM Betula, UPM Conifer, UPM Conifer Reinforcement **Wood products** UPM Timber, UPM Plus **Bio fuels** UPM BioVerno diesel, UPM BioVerno naphtha
Certificates	EMAS – EU Eco-Management and Audit Scheme ISO 14001 – Environmental Management System ETJ+ – Energy Efficiency System ISO 9001 – Quality Management System PEFC™ – Chain of Custody – Programme for the Endorsement of Forest Certification FSC® – Chain of Custody – Forest Stewardship Council OHSAS 18011 – Occupational Health and Safety System ISCC EU – International Sustainability and Carbon Certification ISCC PLUS – International Sustainability and Carbon Certification RSB EU RED – Roundtable on Sustainable Biomaterials Finland's national sustainability scheme ISO 22000 – Food Safety Management System All certificates can be found from UPM's Certificate Finder (available at www.upm.com/responsibility)
Environmental labels	UPM's pulps have been approved for use in paper products that bear the EU Ecolabel and Nordic Ecolabel. The papers have been awarded the EU Ecolabel FI/11/001. For more information on PEFC products, please visit www.pefc.fi For more information on FSC products, please visit http://fi.fsc.org

UPM Kaukas Environmental and Societal Responsibility 2017 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 2017. The annually updated mill supplements and the UPM Corporate Environmental Statement together form the joint EMAS Statement of UPM Corporation. The next Corporate Environmental Statement and also this supplement will be published in 2019.

UPM leads the forest-based bioindustry into a sustainable, innovation-driven, and exciting 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 19,100 people and its annual sales are approximately EUR 10 billion. UPM shares are listed on NASDAQ OMX Helsinki. UPM – The Biofore Company – www.upm.com

FSC www.fsc.org FSC® C014719
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EU Ecolabel www.ecolabel.eu
EU Ecolabel : FI/011/001

Review of the year 2017

UPM Kaukas is a pioneer of circular economy. It uses wood-based raw materials efficiently and produces added-value goods even from waste materials.

Our environmental impact has remained almost unchanged since the 2000s, and in 2017, our operations were material-efficient and we used raw materials scrupulously. Production volumes increased both at the paper and the pulp mill, which also meant that our emissions to waterways were slightly higher than in the previous year. Air emissions were unchanged. The environmental permit of the Kaukas integrated mill, reviewed by the Regional State Administrative Agency of Southern Finland in 2015, was still being processed by the Supreme Administrative Court and thus was not yet legally valid.

During 2017 the operations of the UPM Kaukas mills essentially complied with the currently valid environmental permit and the BAT document published in 2014. Under normal conditions, mill site odours are well under control, and we had no disturbances while burning malodorous gases. These odours can still develop under exceptional circumstances and our air emissions exceeded the daily permit limits three times. We received 32 contacts related to odours from people living in nearby areas, and had one case related to noise. The majority of feedback concerns the odours generated by the effluent treatment plant and by the raw materials and fuels stored at the site.

The integrated mill's environmental goals included the improvement of energy efficiency, reduction of fossil carbon dioxide emissions, reduction of the pulp mill's water consumption rate and specific emissions to water, as well as improving material efficiency at the paper mill. Both the paper mill and the pulp mill met their energy efficiency goals well. The pulp mill produced a surplus of energy, and the amount of energy needed to produce a tonne of paper was lower than in the previous year. Due to the increase in production volumes, it was not possible to decrease the consumption of water at the pulp mill, and the specific emissions to water increased slightly. We used less fossil fuels than last year, resulting in lower CO_2 emissions.

A record production year at the pulp mill

As there was no annual maintenance shutdown at the pulp mill, production reached a record level. Compared to the previous years, the recovery boiler produced more energy from black liquor, and, as a consequence, the CO_2 emissions were reduced along with a decrease in natural gas use. The pulp mill's sulphur compound and nitrogen oxide emissions to air also decreased. The amount of malodorous sulphur compounds decreased as the pulp mill's additional mass cooker was out of use, and we had less disturbances in the collection and processing of malodorous gases. Particle emissions grew due to the increase of the recovery boiler production and because particle filters were run at the upper limits of their capacity.

Water emissions of biological (BOD) and chemical (COD) oxygen consumption increased. For these parameters, the treatment plant reduction rate stayed on the same level than the last months of 2016 throughout the year. The emission rate of halogenated organic compounds (AOX) likewise remained unchanged from the previous year, resulting in a lower rate per each produced tonne of pulp. Of all nutrient emissions, the amount of nitrogen emissions was unchanged while the total emissions of phosphorus increased.

The paper mill used their materials efficiently

The paper mill produces coated offset and rotogravure papers. Their environmental goals aim to improve the material efficiency and energy efficiency of production by striving to keep the quantities of materials exiting the process as low as possible, for instance. Material efficiency is monitored by the quantity of fibre in the water directed to the effluent treatment plant and the coating colour sludge eliminated from the process. The mill has set internal target limits for these parameters.

In 2017, solid emissions to the effluent treatment plant were 19% lower than in the previous year, and we reached our internal goal of 9.5 tonnes per day. The average fibre waste was 6.3 tonnes per day. The quantity of coating colour sludge eliminated from the process continued to decrease from the previous year and was 38%; in fact, we have been able to reduce this parameter by a total of 90% over the past three years. No coating colour sludge was taken to landfill, as we are able to utilise all the sludge we produce.

The quantity of effluent from the paper mill was slightly lower in 2017 compared to the previous year. The level exceeds the target value specified in the BAT document, but process changes are needed to reduce the consumption of water significantly.

Teuvo Solismaa
General Manager, UPM Kaukas

Minna Maunus-Tiihonen
Environmental Manager

UPM Kaukas

Responsibility figures 2017

Air

Fossil carbon dioxide emissions at UPM Kaukas were

23%

lower than in the previous year.

Emissions to air per each tonne of produced pulp decreased for many emission components.

Diffuse emissions were measured and leaks monitored by applying drone technology.

Water

The consumption of water per each tonne of product decreased in pulp production by

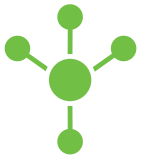
4%

and in paper production by

7%.

We took the first step in utilising recycled nutrients at the treatment plant by undertaking tests in the summer.

Supply chain



97%

of the value of raw materials used by the integrated mill come from suppliers who have approved the UPM Supplier and Third Party Code.

Waste

Waste sorting has improved.

0%

of organic waste ends up in landfills.

We are conducting research projects to find new reuse applications for green liquor dregs and sludges.

Community

We offered internships to

51

students in upper-secondary vocational schools. Collaboration with schools and educational institutions was active.

Consumption impact

The local consumption impact generated by the integrated mill is approximately

EUR 50.3 million

The consumption impact throughout the whole of Finland is approximately

EUR 102 million

Taxes

The local tax impact of the mill integrate is approximately

EUR 33 million

including real estate tax, estimated tax on salaries and estimated corporate income tax based on number of employees*.

*Approximately 30% of corporate income tax goes to municipalities, which is split between each municipality according to their share of business activities and forests operations.

Health

Over 10%

of the personnel took part in the wellbeing training course run throughout the year.

The Kaukas personnel sports club, Kaukaan Lyly, was founded in 1940. Fully 100% of employees are members, and retired employees and family members also belong to the club.

Renewable raw material

The Kaukas integrated mill processes over

5 million m^3

of wood every year to produce various goods. This process provides work and income to harvesting machine operators, log truck operators, forest workers and other forestry professionals, as well as income from wood sales to forest owners.

Safety

At the Kaukas integrated mill, we had eight incidents requiring absence from work, which was

50%

lower than in the previous year.

Energy

The share of biofuels at UPM Kaukas was

92%

of all fuels used.

The consumption of energy per tonne of produced pulp and paper decreased.

Employment

UPM Lappeenranta had

1,023 employees

including summer trainees. The indirect local impact of employment was approximately 1,046 persons.

In addition to these, on average

386

contractor employees work at the site daily.

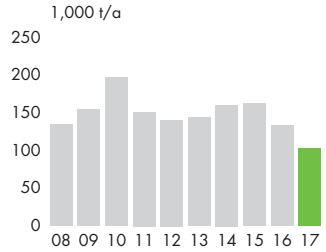
Air

Emissions to air at the Kaukas mills generally complied with permit conditions, except for three instances where the daily limits were exceeded. The nitrogen oxide emissions of the pulp mill's auxiliary boiler exceeded the limits in March, and particle and malodorous sulphur emissions caused by a malfunction of the lime kiln exceeded the limits in the summer. Over the course of the year, the total quantity of sulphur dioxide (SO_2), malodorous sulphur compounds (TRS) and nitrogen oxides (NO_x) was lower than in the previous year, as were the specific emissions. The amount of particulate emissions (TSP) grew. Diffuse emissions and accidental emissions decreased in 2017 compared to the previous year. The share of fossil carbon dioxide emissions of all carbon dioxide emissions remained below 5%, and fossil carbon dioxide emissions occurring as specific emissions from pulp production decreased by 80%. Some of the natural gas used as lime kiln fuel was replaced with pitch oil, which is a biorefinery residue and a renewable fuel.

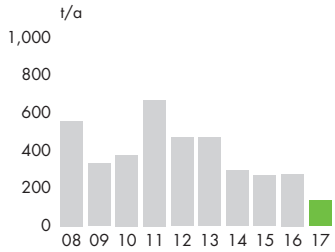
Any malodorous gases from the effluent treatment process are not normally measured. In the spring of 2017, our nearest neighbours contacted us about smells from the treatment plant, and thus we decided to measure malodorous gas concentrations over the summer. We acted swiftly on the results of our investigations and set up measures to decrease the smells in the autumn. This work will continue in 2018.

Weak malodorous gases were collected and burnt 99.9% of the time and the strong ones 100% of the time. The following annual emission graphs present the total annual air emissions from UPM Kaukas mills' pulp and energy production. These figures also include UPM's share of Kaukaan Voima's emissions. All emissions to air from the pulp mill were within the reference values of the BAT document published in 2014.

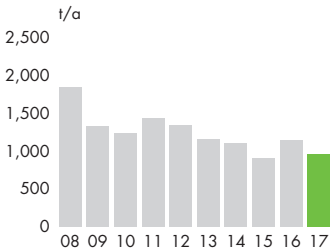
Fossil carbon dioxide, CO_2



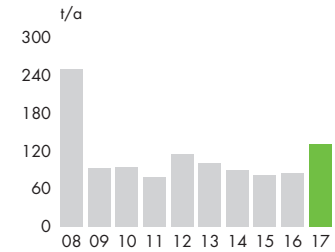
Sulphur dioxide, SO_2



Nitrogen oxides, NO_x



Particulates, TSP



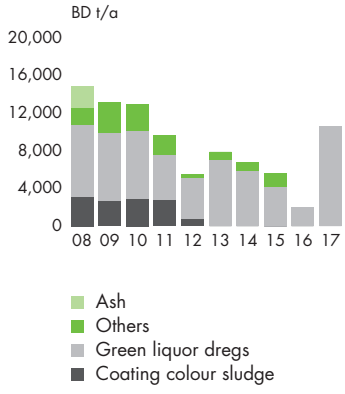
In addition to UPM Kaukas emissions, the emissions to air include the share of the energy used by the integrated mill from Kaukaan Voima.

Waste

The mills generated around 24,300 tonnes of waste (dry matter), of which some 20,750 tonnes was process waste and some 3550 tonnes recyclable waste, including UPM's share of Kaukaan Voima's process waste. Waste taken to the Tuosa landfill amounted to 10,600 tonnes, which was five times the amount of waste compared to 2016. The most significant waste component taken to landfill, green liquor dregs, is a by-product of the chemical circulation of the pulp mill. As the production increased, the amount of green liquor dregs increased as well. However, some of it could be mixed with ash and used in earth construction (field base), as we have done previously.

Some 56% of waste was reused. Reuse applications included earth construction (bottom ash, fly ash and green liquor dregs), compost raw material, aeration material (debarking reject sand) and soil conditioner (lime sludge and lime).

Waste taken to Tuosa



The tonnes in the graph are given as dry weights.

Water

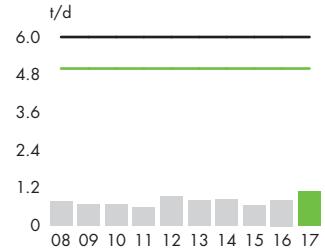
Pulp and paper production used 86 million cubic metres of water, of which 47% was process water purified by the biological treatment plant. The consumption of water increased from the previous year, mainly because of the pulp mill's increased production.

The effluent load to the lake increased in terms of biological oxygen demand (BOD), chemical oxygen demand (COD) and solids (TSS). The nitrogen (N) load remained unchanged from the previous year, the phosphorus (P) load grew and the halogenated organic compound (AOX) load decreased slightly. The pulp and paper mills' effluent loads remained within the load limit ranges specified in the BAT document published in 2014. For phosphorus, the result was excellent as it was below the BAT level, while the performance of the biological treatment plant has been good in recent years. The treatment plant's operation is reported in terms of its treatment efficiency, or reduction of various substances. In 2017 the BOD reduction rate was 99%, while the COD reduction rate was 76%. The solids reduction rate stood at 93%.

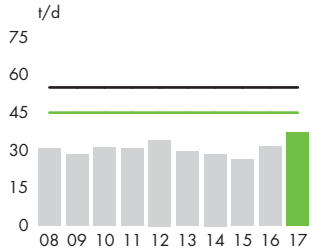
Testing at the effluent treatment plant in the summer of 2017 replaced some of the synthetic nutrients with recycled nutrients. The test run was successful but the tested nutrients were too mild to replace the entire nutrition amount. However, these tests represented a step towards UPM's goal of ensuring that all treatment plant nutrients are completely recycled by 2030.

Reducing water consumption is one of the mill site's multiannual environmental objectives. The specific consumption of process water decreased by roughly 4% in pulp production and by 7% in paper production. We still aim to reduce the use of water but any significant level changes would require changes in processes.

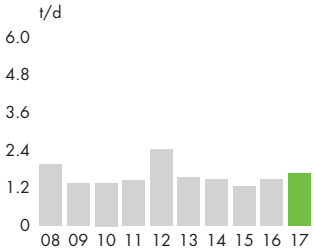
Biological oxygen demand, BOD_7



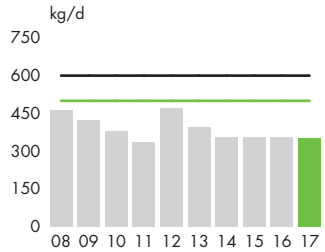
Chemical oxygen demand, COD



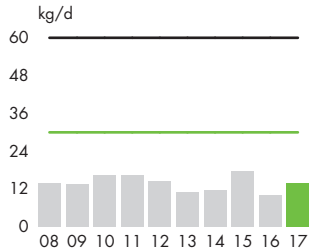
Solids, TSS



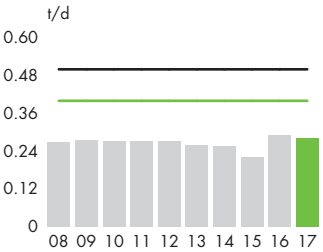
Nitrogen, N



Phosphorus, P



Adsorbable organic halogen compounds, AOX



– Monthly limit
– Annual permit

Societal responsibility

Ensuring the availability of knowledge and skills at the UPM Kaukas mills

We ensure that our personnel have all necessary and sufficient competencies and skills that enable us to reach our goals and objectives. Any personnel development needs are mainly mapped on the basis of reviews, annually set goals and other discovered development requirements. We have introduced supervisor training in all businesses during the past year. Wellbeing has increased by several percentage points over recent years, thanks to the joint annual programme aimed at promoting wellbeing at work. Our employees' average age is rather high in many units, and new skilled employees are trained regularly through apprenticeship training. Training programmes were launched both at the sawmill and pulp mill during 2017.

Safe at work every day

Safety is an integral part of operations at UPM Kaukas. In 2017, eight accidents leading to an employee being absent from work occurred at Kaukas, which is 50% less than in the previous year. We have paid more attention to anticipatory observation, improvement of working conditions and human factors, which has had a positive impact on the number of accidents. We regularly discuss current safety issues and handle safety-related matters in each morning meeting, weekly meetings and management team meetings. We promote good safety practices by, for instance, organising interactive safety meetings at the pulp and paper mill for each shift at least every other month, and start all guest presentations with safety information.

Local initiatives offer things to do and learn for younger and older children in Lappeenranta

Support for reading and learning and commitment to the local communities of our locations are an integral part of UPM's responsibility programme. We ran several projects for young people of various age groups at the Kaukas integrated mill during 2017.

Children's afternoon exercise clubs in Lappeenranta last autumn were coordinated by the Olympic committee, supported by UPM and other companies and run by local sports clubs. In addition to Kaukas school, pupils from Voisalmi and Skinnarila primary schools have been able to join exercise clubs free of charge or for a very small fee. The aim of these clubs is to encourage children to move and exercise and to offer them supervised social activities in the afternoons.

We provided over 550 sixth-year pupils from Lappeenranta an opportunity to learn more about commercial forest cycles last autumn. A forest walk with information points presented forestry work and its various stages to them, and they even got to plant seedlings.

Another initiative introduced lakes and rivers near their schools to seventh-year pupils in Lappeenranta. The aim of this project was to inspire primary school pupils to become interested in natural sciences and explore local waterways. The schools were given water research equipment and their research results will be saved in the archives of the Finnish Environmental Institute.

Young artists from Lappeenranta amazed us with their artistry in the craft competition organised by UPM Kaukas in the autumn. Approximately 500 children from preschool groups and years 1 and 2 took part. The aim of the "Suomi 100" (Finland 100) competition was to tell the children about Finland's history and the wood raw materials used at Kaukas.

The bird houses given as presents and awards at Kaukas come with a story about supporting local communities. Made out of sawn timber from Kaukas mills, the bird houses were commissioned from the local Laptuote association that employs people with learning difficulties, the long-term unemployed and other groups at risk of exclusion from the job market.

A business town familiarises children with society and working life

The Me & MyCity learning environment is situated in a property owned by UPM in Lappeenranta and is sponsored by various companies. It is a miniature

Sixth-year pupils from Lappeenranta learning about mixed-age forests.




town where sixth-year pupils can learn about society, entrepreneurship and working life. The children are assigned roles and jobs in the town. UPM, for instance, offers a role for a paper manufacturer who has to buy pulp or wood, and for a researcher working with biofuel projects.

Reading workshops, a bio time truck and lectures for older students

We also organised local projects for years 7 to 9 and older students from Lappeenranta in the autumn. Our "Sanat haltuun" reading workshop was an opportunity to improve reading skills for students attending technical vocational schools. Meanwhile, our Bioaika truck, presenting bio time technology, visited the port and Kimpinen High School. We also continued our forest ambassador activities similarly to the previous years. The ambassadors are forestry professionals who visit pupils in year 9 to tell them about work and study opportunities related to forests, as well as forestry innovations. Quest lectures at Lappeenranta University were likewise an integral part of operations for UPM Kaukas.

The largest private employer in Lappeenranta

UPM Kaukas employed roughly a thousand skilled workers in 2017. We had 175 seasonal summer employees, mainly from local educational institutions. We also offered internships to 51 students and commissioned several theses.

UPM Kaukas also plays a major role in the city of Lappeenranta as a generator of tax revenue. In addition to the taxes paid by UPM itself, the taxes paid by UPM employees have a local impact. The Kaukas mill site uses over 5 million cubic metres of wood, the majority of which is purchased from nearby areas. In addition to forest owners, the mill site provides work and livelihood to harvesting machine and log truck operators, forest workers and other forestry professionals.

Environmental parameters 2017

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	314,000 t
	Pulp	740,000 t
	– Softwood pulp	420,000 t
	– Birch pulp	320,000 t
Raw materials	Wood, cooking chemicals, bleaching chemicals, filler and coating pigments, paper manufacturing pigments	See UPM Corporate Environmental Statement for more information
Energy	Biofuels	92%
	Fossil fuels	8%
	Purchased electricity	See UPM Corporate Environmental Statement for more information
Emissions to air include UPM's share of Kaukaan Voima's emissions	Fossil carbon dioxide, CO_2	102,199 t
	Nitrogen oxides, NO_x	958 t
	Sulphur dioxide, SO_2	136 t
	Particulates, TSP	131 t
	Malodorous sulphur compounds, TRS	25 t
Water intake	Process and cooling water	85.6 milj. m^3
Discharges to water	Effluent	40.0 milj. m^3
	BOD_7	384 t
	COD	13,071 t
	Solids, TSS	595 t
	Phosphorus, P	4.9 t
	Nitrogen, N	125 t
	Adsorbable organic halogen compounds, AOX	102 t
Waste	Waste to landfill	10,585 t
	– Green liquor dregs	10,553 t
	– Mixed waste	32 t
	Reused waste	13,744 t
	– Debarking reject sand and stones	810 t
	– Green liquor dregs and lime	3,446 t
	– Ash from the lime kiln's electrostatic precipitator	210 t
	– Ash from the powerplant	5,712 t
	– Recycled cardboard and paper	1,782 t
	– Metals	422 t
	– Other individually collected waste	1,362 t
	Intermediate storage	0 t
	Hazardous waste	337 t
Size of mill area		200 ha

Performance against targets in 2017

TARGET	ACHIEVEMENT	COMMENTS
Paper mill material efficiency – Fibre waste <9.5 tonnes per day – Coating colour sludge waste <1.0 tonnes per day	Yes	The paper mill used materials efficiently, and both the fibre and coating colour sludge waste volumes remained lower than the target values.
Reducing specific emissions from the previous year at the pulp mill – COD and AOX kg/Adt <2016	Partly	COD emissions increased and AOX emissions decreased.
Reducing effluent volumes Pulp: –8% from the actual level of 2016	No	We did not manage to reduce effluent volumes, and there was no change in their level.
Reducing fossil carbon dioxide emissions – Decreased consumption of natural gas	Yes	The amount of fossil carbon dioxide emissions decreased along with the decline in the use of natural gas.
Improving energy efficiency – Pulp: ensuring energy self-sufficiency – Paper: reducing the specific consumption of energy	Yes	The pulp mill was self-sufficient in terms of energy, and the specific consumption of electricity and steam decreased at the paper mill.

Targets for 2018

TARGETS	SCHEDULE	MEASURES
Paper mill material efficiency	2018	– Fibre waste <9.0 tonnes per day – Coating colour sludge waste <1.0 tonnes per day
Reducing specific emissions from the previous year at the pulp mill	2018	COD and AOX kg/Adt <2017
Reducing effluent volumes	2018	– Pulp: <2017 outcome – Paper: <2017 outcome
Reducing fossil carbon dioxide emissions	2018	Reducing the consumption of natural gas
Improving energy efficiency	2018	– Pulp: ensuring energy self-sufficiency – Paper: reducing the specific consumption of energy
Drawing up a noise control plan	2018	The integrated mill will draw up a joint plan to reduce environmental noise.

EMAS
Verified environmental management
REG.NO. FI - 000058

Revalidation statement

As an accredited environmental verifier (FI-V-0001), Inspecta Sertifiointi Oy has examined the environmental management system and updated UPM Kaukas Environmental and Societal Responsibility 2017 report as well as the information concerning UPM Kaukas in the Updated UPM Corporate Environmental Statement 2017.

On the basis of this examination, the environmental verifier has herewith confirmed on 2018-03-26 that the environmental management system, the updated UPM Kaukas Environmental and Societal Responsibility 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.

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