

THE STATE OF THE GLOBAL PAPER INDUSTRY

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Shifting Seas: New Challenges and Opportunities for Forests, People and the Climate



Environmental Paper Network

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EXECUTIVE SUMMARY

THE STATE OF THE GLOBAL PAPER INDUSTRY • 2018

The Environmental Paper Network is a global coalition of civil society organisations working together to achieve our *Global Paper Vision*. The introduction to this collective Vision states:

We share a common vision of a forest, pulp and paper industry that contributes to a clean, healthy, just and sustainable future for all life on earth. We seek a world with new consumption patterns that meet the needs of all people while eliminating waste and over-consumption, where paper production is less reliant on virgin fibre and not associated with loss of biodiversity or forests, maximises use of recycled materials, respects human rights including local people's land rights, provides employment and has social impacts that are beneficial, conflict-free and fair. We seek the successful transition to pulp and paper that is part of the solution to climate change and is made from responsibly sourced fibres, using entirely low-carbon, renewable energy, with water that is as clean after paper production as before, producing zero waste and zero emissions. We seek full transparency and partnerships with diverse stakeholders to successfully implement this vision.

The State of the Global Paper Industry 2018 provides a snapshot of how the world's pulp and paper industry is performing today, relative to each of the goals of the *Global Paper Vision*. It also looks to the future, and the social and environmental risks and opportunities facing the global pulp and paper industry. Each chapter offers insight on key issues in the coming years.

In looking at the full range of social and environmental issues facing the industry at present and in the future, the report identifies several key themes:

- paper consumption is at unsustainable levels and globally it is steadily increasing, particularly in Asia, while remaining at unequal levels of access in some parts of the world, particularly Africa.
- the industry is expanding, especially in Asia and South America, and the challenges of this geographic shift and expansion in a resource-constrained world are appearing across all priorities of the *Global Paper Vision*.
- the industry has substantial climate change impacts, from its raw material sourcing in forests, through production, to the end of life of its products, so the opportunities for reducing greenhouse gas emissions through better land management and fibre choices need to be urgently seized. Stakeholders must collectively bring forests to the forefront of action to address climate change.
- there are significant gaps in data availability globally across topics and between regions, and there is often a challenge in comparing data when it does exist due to lack of standardisation in measuring and reporting.
- corporate leadership potential in the marketplace is strong, growing, and helping drive change on the ground, but execution and progress on voluntary commitments is lagging in many cases. Additional urgency and transparency are needed to find collaborative solutions at a pace that is sufficient to address the climate change and extinction crises.

REDUCE GLOBAL PAPER CONSUMPTION AND PROMOTE FAIR ACCESS TO PAPER

The *Global Paper Vision*'s first goal is to reduce global paper consumption and promote fair access to paper. However, paper use is steadily increasing, year on year, and recently exceeded 400 million tonnes per year¹. More than half of this consumption occurs in China, the USA and Japan, with a further quarter in Europe². The entire continent of Africa accounts for just 2% of global paper use³. The global average is 55 kg per person per year, while regionally the consumption of people in North America is the highest, registering four times that (215 kg/person)⁴. While paper consumption is declining slightly in North America, it is notably rising in Asia and driving planned expansion of the industry. More than half the paper used globally is for packaging, with volumes on the increase⁵, so this sector has the greatest opportunity for efficiency and waste reduction. This report highlights how packaging and tissue products are driving sector growth and require global solutions.

MAXIMISE RECYCLED FIBRE CONTENT

The Vision's second goal is to maximise recycled fibre content. Today, global paper production is shifting geographically, resulting in declines in North America and Europe, while many countries around the world build up new paper industries. Asia alone is now providing nearly 50% of the world's pulp and

paper, opening up new paper markets to large populations that had little access to paper in the past. This stimulates more production, which in turn threatens increased environmental destruction. Recycling is key to rapidly reducing the paper industry's production footprint so that it can both benefit far more of the world's population while preserving environmental quality. While recovered paper's market share within the paper industry has been increasing⁶, there is still a large percentage of paper production that uses no recycled content at all.

In addition, currently recycled fibre use in products is by no means uniform: while many newsprint and packaging grades have more than 50% recycled content⁷, printing and writing paper has a global average of only 8% recycled content⁸, so there is still much room for improvement. By more effectively controlling contamination and implementing more robust recycling systems in developing countries, the amount of recycled fibre that could be used could still be nearly doubled before it reaches the upper limit of technical potential⁹. The report also finds wide variation in data collection and highlights a great need for more comparable accounting for recycling rates. In part this requires more standardised global reporting methods.

ENSURE SOCIAL RESPONSIBILITY

The third goal is to ensure social responsibility. Indigenous peoples continue to struggle to have their rights respected in all pulpwood-producing regions, from the boreal and temperate forests of the northern hemisphere to forest regions in Africa, Southeast Asia and South America. Examples include conflict from operations of Asia Pulp & Paper and Asia Pacific Resources International Ltd. in Indonesia, Fibria in Brazil, the

Navigator Company (Portucel) in Mozambique, and various paper companies in Canada. There are similar conflicts in other countries, including Chile, Uruguay, Thailand, India and South Africa, where eucalyptus or acacia are grown in extensive pulpwood plantations, thereby displacing forests and communities, lowering water tables, and negatively impacting rural communities. Companies and governments have a responsibility to ensure Free, Prior and Informed Consent (FPIC)¹⁰ is granted before commencing operations and to ensure that negative impacts are mitigated and compensated. Progressive paper companies respect the right of affected communities to reject plantations and mills, and seek to work with them as allies and beneficiaries and supporting their economic diversification.

SOURCE FIBRE RESPONSIBLY

The fourth goal is to source fibre responsibly. In 2014, around 172 million tonnes of pulp was produced globally from virgin fibre¹¹, with substantially more than half of this produced in North America and Europe, although new mill developments are focused in South America and Asia (including Russia)¹². Around 13 million tonnes of pulp come from (mostly agricultural) alternatives to wood¹³, but there are worrying declines in this sector, despite some growth in North America. Agricultural waste fibre in China used to account for more than 50% of its pulp, but there has been a recent massive shift towards wood-based paper making: Chinese non-wood pulp production peaked in 2004 at 10.5 million tonnes but has since fallen to just 3.5 million tonnes in 2015¹⁴. A worrying trend is the ongoing rate of deforestation: according to the Food and Agriculture Organization of the United

Nations (FAO), between 2010 and 2015 there was an annual forest loss of 7.6 million hectares and an annual gain of 4.3 million hectares per year, resulting in a net annual decrease in forest area of 3.3 million hectares¹⁵. However, FAO considers “planted forests” or industrial timber plantations as forests; thus it doesn’t take into account the massive loss of natural forests by conversion to pulp plantations. Even more worrying is the global loss of intact forest landscapes, down by 7.2% since the year 2000, with the rate of loss tripling between 2003 and 2013¹⁶, the leading driver (responsible for 37% of the loss) being timber harvesting, including for papermaking.

It is not all bad news: there has been a significant decline in illegal logging and Forest Stewardship Council certification of forestry lands is increasing meaningfully, though this is not uncontroversial. In September 2017, the forest area under FSC certified management covered 197,817,395 ha¹⁷, about 9% globally of forest area in permanent forest land use¹⁸. Overall, fibre sourcing for paper remains a very sensitive matter, with risks and opportunities for the world’s forests in the coming years. Companies purchasing paper should understand the sources of fibre for their paper, commit to avoiding deforestation, put in place strong measures to make sure that their commitments are effective all the way to the forest, and always consider alternatives to virgin fibre.

REDUCE GREENHOUSE GAS EMISSIONS

The fifth goal is to reduce greenhouse gas emissions, which for paper and packaging result mainly from land use change, production and disposal. The burning of trees for energy for pulping is the single biggest source of emissions by the industry

(40%), with other causes of concern being the massive carbon emissions from the destruction of peatlands (particularly in Indonesia) and emission of methane from landfilled paper¹⁹. Peatland protection and restoration, protection of High Carbon Stock Forests²⁰ and responsible afforestation globally is essential to meeting new international climate targets, and requires the partnership of responsible paper producers. In production performance, there are some gains in efficiency on a global scale²¹. However, mill technology can make a difference: mills in Southern Europe, North America and South America are generally more fossil fuel-intensive than Swedish and Finnish mills²². A key solution is the utilisation of recycled paper, which has half or less climate impact than virgin paper²³. Considerably more attention needs to be paid to the climate change mitigation potential in paper lifecycles. It is critical to do an honest and scientifically supported accounting of carbon fluxes in paper’s full cradle to grave life cycle, and reduce all emissions – fossil, biogenic and from land use change. And it is crucial that the industry support strong climate action by governments worldwide.

ENSURE CLEAN PRODUCTION

The sixth goal is to ensure clean production. The pulp and paper industry is one of the world’s biggest polluters, as well as one of the heaviest users of fresh water (making one A4 sheet of paper uses as much as 20 litres of water) and energy (using 4% of world energy). It is chemically intensive, with toxic chemicals discharged as effluent into waterways where they pollute rivers, harm ecosystems, bio-accumulate, and eventually enter the food chain.

The use of chlorine for bleaching is particularly problematic, but use of Total Chlorine Free (TCF) technology is rare and declining, despite its benefits in reducing both pollution and water usage compared to Elemental Chlorine Free (ECF) technology. Pulp and paper mills also release air pollutants in the form of fine particulate matter (PM2.5), nitrogen and sulphur oxides which can also affect public health. The report finds a need and opportunity for the North American industry to modernise and implement cleaner technologies to match mill emission levels of mills in other regions.

important role in our global societies, benefiting education, sanitation and democracy. We believe that transformation of the pulp and paper sector is achievable if all stakeholders will work with us to push for the necessary change outlined in our *Global Paper Vision*. We hope this report and the trends it highlights brings urgency to the social and environmental challenges and opportunities for the global pulp and paper industry, and that it will lead to accelerated actions to achieve long-term solutions.

ENSURE TRANSPARENCY AND INTEGRITY

The final goal is to ensure transparency and integrity. Recent years have seen a welcome surge in transparency tools, both binding and non-binding (including The Carbon Disclosure Index, the Forest 500, the New York Declaration on Forests and WWF's Environmental Paper Company Index), and an increased level of disclosure by pulp and paper manufacturers and retailers on forest sourcing. Meanwhile, there continues to be a lack of transparency and accountability regarding the other pillars of the *Global Paper Vision*. Better reporting and disclosure is needed. Financiers are particularly lacking in this area, as the top financiers all scored low on a review of the environmental and social safeguards they had in place²⁴. In addition, the report finds pulp and paper companies in Asia, Latin America and Africa lag behind the world on progress toward greater transparency.

It is clear from this broad spectrum of cross-cutting issues that the global pulp and paper sector and its relevant stakeholders have much progress to make to achieve the ethical and sustainable future we all need. Paper has a fundamentally

INTRODUCTION

The Environmental Paper Network (EPN) is a world-wide network of more than 140 civil society organisations working together towards the *Global Paper Vision*. This Vision expresses our common goal to create transformational change in the pulp and paper industry and wider society, so that paper production and use contributes to a clean, healthy, just and sustainable future for life on earth.

The Environmental Paper Network periodically produces a State of the Paper Industry Report to track trends in the production and consumption of pulp and paper and to monitor progress towards the Vision. This 2018 report is the third such document and our first global assessment of the industry. We invited experts to share data, insights and recommendations regarding the key issues and opportunities for the industry and civil society into the crucial years ahead for the world's forests and the global climate.

The *Global Paper Vision* calls upon the global paper industry, consumers, retailers, governments, investors and non-governmental organisations (NGOs) to commit to urgent actions encompassing the following priorities, addressing the entirety of the paper life-cycle by:

- 1 • reducing global paper consumption and promote fair access to paper**
- 2 • maximising recycled fibre content**
- 3 • ensuring social responsibility**
- 4 • sourcing fibre responsibly**
- 5 • reducing greenhouse gas emissions**
- 6 • ensuring clean production**
- 7 • ensuring transparency and integrity**

The global pulp and paper industry has a major impact on the earth's resources, its inhabitants and our climate, which can be directed towards progress or further degradation. By publishing this review of key data points and qualitative indicators for measuring progress towards the *Global Paper Vision*, we aim to increase understanding and awareness of these impacts and stimulate dialogue. We hope this will compel urgent action by all stakeholders to work collectively to accelerate the social and environmental transformation of the pulp and paper industry.

1

REDUCING PAPER CONSUMPTION & ENSURING FAIR ACCESS

Lead Author: Mandy Haggith, Co-ordinator of EPN-International

THE NEED TO REDUCE

We start from the recognition that paper has many powerful benefits to human society, through education, communication, security and hygiene. The *Global Paper Vision* sees a future where our global population's use of this valuable commodity does not cause environmental or social harm, and where all people have a fair share of the resource. At present, paper production has wide-ranging negative impacts on forests and other ecosystems, water and air quality, ground water availability and the global climate, and many local communities. Furthermore, paper consumption is highly inequitable, with extremely high and wasteful levels in some countries contrasting with vanishingly small consumption levels in others. We need to find ways for everyone to have fair access to paper resources without increasing overall demand, which would heighten the pressure on resources. To achieve this, it is necessary that people who use more than the global average reduce their consumption levels.

Therefore the first pillar of the *Global Paper Vision* is to 'Reduce Global Paper Consumption and Promote Fair Access to Paper' and calls on industry, consumers, retailers, governments, investors and non-governmental organisations (NGOs) to commit to actions encompassing the following priorities:

- encourage high-utility, low-volume paper use and find ways for people currently below the paper poverty line to share the benefits paper can bring. (The paper poverty line is 30 kg/year, the level of paper use UNESCO states is necessary for education and democratic involvement in society.)
- develop and promote creative and innovative systems, designs and technologies that reduce the consumption of fibre and maximise efficiency.

- proactively work with consumers to educate them in eliminating unnecessary paper consumption.
- explore alternatives to paper, but understand and avoid negative impacts, including greenhouse gas emissions, from plastic, digital and other alternatives.

THE GLOBAL PICTURE SHOWS INEQUALITY

Paper use increases year on year and has quadrupled over the past 50 years¹. In 2014, global paper production hit 400 million tonnes per year for the first time² (ironically the same year that atmospheric CO2 levels exceeded 400 parts per million). More than half of this paper is consumed in China (106 million tonnes), the USA (71 million tonnes), and Japan (27 million tonnes), with a further quarter in Europe (92 million tonnes). The entire continent of Africa accounts for just 2% of global paper use, consuming a mere 8 million tonnes per year. Oceania and Latin America between them account for around 8%³.

Exploration of per capita consumption figures reveals a more nuanced story. The global average is 55 kg per person per year. North American consumption is four times that (215 kg) while the African average is just 7 kg. China's average per capita consumption is just higher than the global average at 76 kg. Eastern European levels are similar to China's (77 kg) with the Western European average being almost double that (147 kg). Seven of the ten countries with the largest per capita consumption are in Europe⁴.

Figure 1: Per capita paper consumption, by region

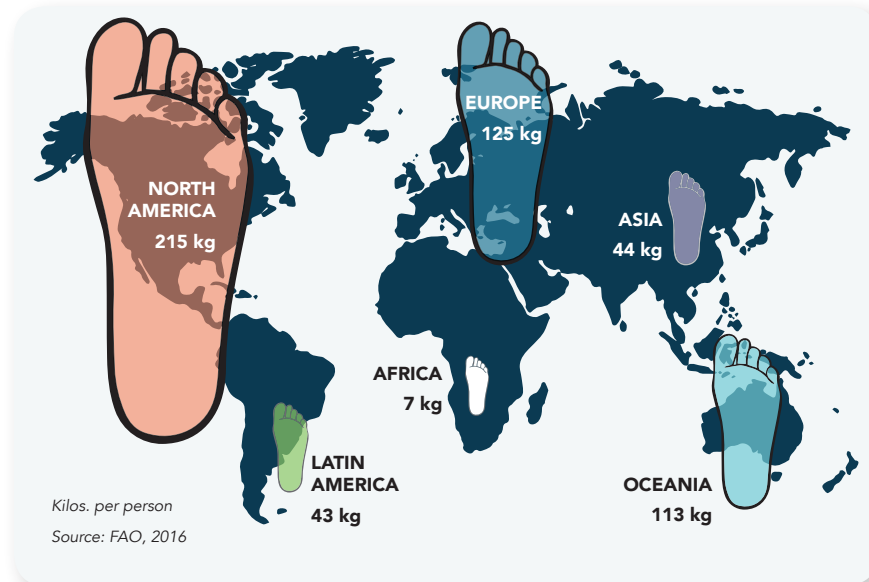
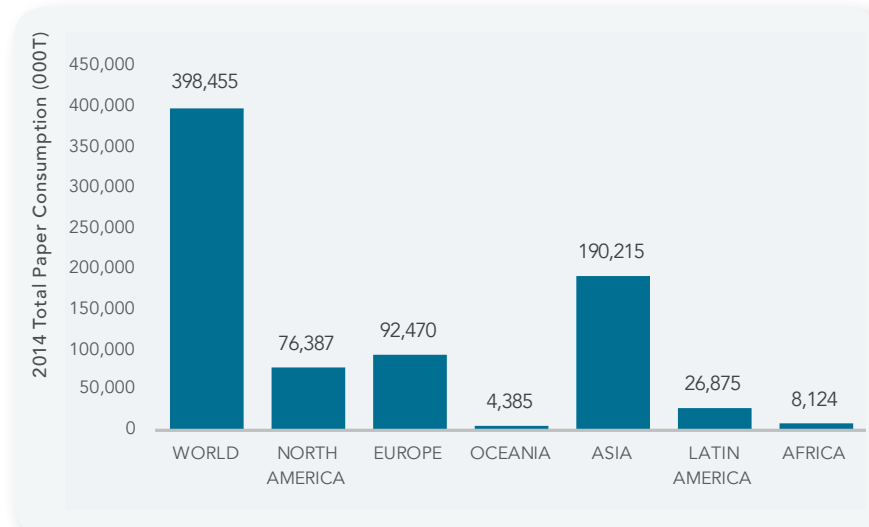


Figure 2: Total paper consumption, by region



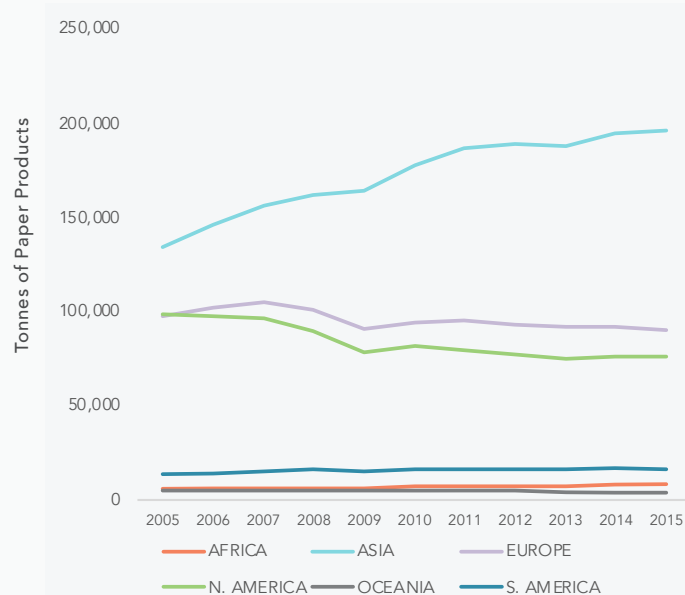
Source: FAO, 2016

Twenty-six countries have more than double the global average of per capita paper consumption (in kg per person per year)⁵:

- Luxembourg (277)
- Germany (251)
- Austria (249)
- Slovenia (247)
- Belgium (241)
- USA (222)
- Japan (214)
- Finland (200)
- Denmark (198)
- New Zealand (189)
- Republic of Korea (186)
- Netherlands (183)
- Italy (170)
- Sweden (165)
- Canada (150)
- Spain (149)
- Australia (146)
- UK (145)
- Poland (143)
- France (137)
- Cayman Islands (135)
- Switzerland (132)
- United Arab Emirates (130)
- Czech Republic (126)
- Slovakia (118)
- Croatia (111)

In some countries, per capita paper use is so meagre that it registers in the statistics as effectively zero; all of these countries except Afghanistan are in Africa, namely Burundi, Democratic Republic of Congo, Eritrea, Guinea, Liberia, Sierra Leone and Somalia. Asia has the fastest growth rates in consumption. In markets such as India, the country's per capita consumption level is just 9kg. Were it to increase to the global average, its high population numbers would cause a 15% spike in global consumption, requiring an additional 60 million tonnes of paper per year⁶. Managing the pressures of that growth is a real concern, as shown in the diagram below:

Figure 3: Total paper consumption, 2005–2015, by region

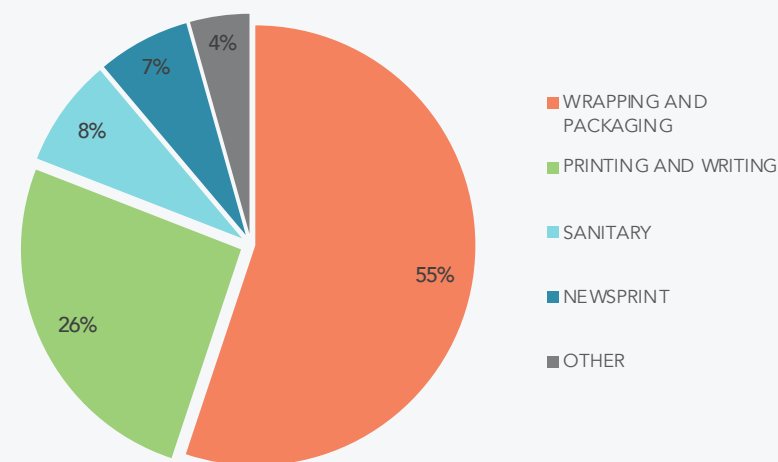


Source: FAO⁷

WHAT PAPER IS USED FOR

More than half of the paper used globally is for packaging (cartonboard and containerboard), and this area has been increasing consistently in recent years (see figure below). In some countries in Europe and North America in particular, there have been substantial reductions in consumption of printing and writing paper, which globally represents about a quarter of paper use by volume. And globally use of both newsprint and printing papers have reduced since 2010. The most rapid growth is in sanitary paper (tissue), although it accounts for less than 10% of global volume at present.

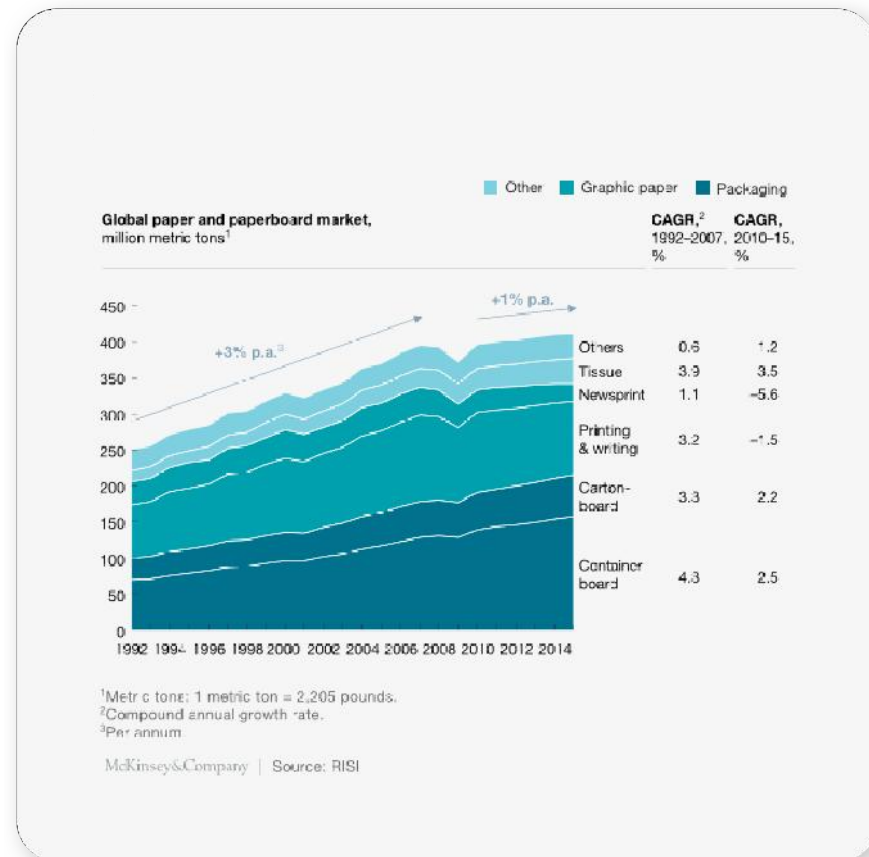
Figure 4: Global consumption by paper category, in tonnes



Source: Pulp and Paper International⁸

How paper use is changing, by sector, is illustrated in the figure below.

Figure 5: Global paper and paperboard market, million metric tons



Source: McKinsey and Company/RISI⁹

CONSIDERING PAPER UTILITY

When seeking to reduce paper consumption a helpful concept is 'paper utility.' Some paper applications have considerable social benefits, and therefore high utility. Other applications have either no social benefits, a highly limited lifespan or much more durable alternatives (or more than one of these). They are therefore deemed to be low utility. In surveys of opinion of the utility of different paper applications, the results have assigned high utility to such items as legal papers, passports, money, medical records, toilet paper and books, and low utility to unread magazines, unwanted direct mail (junk mail), excessive packaging and throwaway cups.

Reducing use in paper applications that are high volume and low utility can make a big impact, while not causing disadvantage. Excessive packaging, therefore, is an example of a good place to look for efficiencies. Reducing use of paper napkins, on the other hand, being low utility but also relatively low volume, will make less impact, while reducing the use of books, which are fairly high volume but also high utility, could be unpopular and limit the sharing of information by people that have no access to digital devices.

EXAMPLES OF SUCCESSFUL PAPER USE EFFICIENCY¹²

- Outdoor clothing company Patagonia offered their customers a reduced and more sustainable packaging of goods which reduced costs, eliminated tonnes of waste and surprisingly increased sales. At first, they packaged goods in a plastic bag with a cardboard tag, which cost them 20 U.S. cents per unit. Later, they shifted to paper

packaging, similar to a mini grocery store bag with a lower environmental impact and reduced costs of 16 cents a unit. Finally, they just rolled up the bare garment and wrapped it with a recycled cardboard card and two rubber bands, costing only 6 cents. As an added advantage, the exposed packaging allowed customers to touch the product, which seemed to benefit sales.

- When Duchy Originals redesigned its chocolate boxes, light-weighting them to cut volumes by 48% and in the process rebranding them as sustainable and elegant, sales rocketed. This single redesign saved 8.9 tonnes of packaging, equivalent to 231 trees, 890,000 litres of water, 58 tonnes of carbon emissions and 10.7 tonnes of other air, water and solid pollution.
- The supermarket chain Sainsbury's reduced its toilet roll tube diameter by 11mm, which reduced overall volumes to such an extent that it could do 500 fewer large vehicle transportation journeys per year, wiping 140 tonnes off its annual carbon emissions¹⁰.
- Hewlett-Packard proved that more packaging doesn't mean better protection for the goods inside. The company redesigned its packaging for printers, replacing heavily buffered cardboard boxes by partly transparent reusable cases. It cut overall packaging volume by 90%, and breakages fell by 5%, because people could see what they were handling and treated the goods more carefully¹¹.
- Vodafone, one of the world's largest telecommunications companies, reduced paper usage between 2009 and 2012 from 33 million sheets of paper per year to just 6.5 million, an almost 80% reduction equivalent to more than 3000 trees, saving the company £3.5 million per year. It did this

by running 'A Page a Day' employee campaign, monitoring paper use and setting a target of keeping it to just one page a day; cutting the number of printers in offices to just one printer for every 125 employees; hot-desking (the practice in an office of allocating desks to workers when they are required or on a rotating system, rather than giving each worker their own desk); and focusing efforts on its 25 biggest paper users to find ways they could change their printing behaviours.

- The UK retail and banking Co-operative Group has achieved astonishing paper efficiencies by transforming the way its staff work, encouraging new, flexible work routines that make the most of digital technology and releasing them from desk-bound paper-heavy information systems. They have encouraged their staff to 'cleanse' their work areas of paper, digitally archiving large amounts of material and reducing paper use in the organisation by a staggering 71%. What makes the Co-op's story even more amazing are the additional financial savings that brought about by this change. When they moved into a new building, their new paper-light office practices meant that they could reduce the scale of the building by one whole floor, saving them £20 million.
- Finance company Standard Life ran a consultation of its more than 1.5 million shareholders, which revealed that only 6% of them wanted to receive its paper mailings and that by posting out its annual report the company was actually reducing the favourability of its image among its own members. The company cut its paper use by 50% in three years.

- Europe's biggest environmental NGO, the Royal Society for the Protection of Birds, decided to get paper-conscious. The organisation measured its baseline paper usage and achieved a 22% reduction in just three months with simple measures like print-review and double-sided printing.
- The UK Post Office redesigned its customer till receipts, saving 750,000 rolls a year which, if put end-to-end, would stretch 149,000 km – a distance half way to the moon.

AVOID NEGATIVE DISPLACEMENT EFFECTS

An area that needs further investigation is the risk that badly conceived paper saving efforts can simply displace the impacts of paper use and cause problems through the use of alternative materials. An example would be the replacement of a paper bag with a non-recyclable plastic one. The answer to the question 'paper or plastic' must more often be 'neither'.

A major topic of research is 'paper versus digital'. Many graphic and writing paper applications, from books and magazines to bills and corporate reports, are shifting from hard copy on paper to electronic form. The paper versions of such items have well-known impacts (accountable using the Paper Calculator life-cycle tool, for example) whereas in many cases the footprint of their electronic alternative is less certain. Life-cycle assessments of some commodities, for example of books, have compared the energy or climate change costs of paper and electronic alternatives, drawing conclusions about how many e-books need to be read on an e-reader before the unit energy costs are less than the paper option. Few of such studies adequately address the full life-cycle impacts of digital devices, including all the minerals used in their production and post-disposal impacts. Paper saving concepts should be assessed both for their known and unknown impacts.

Other paper applications where savings could conceivably have displacement impacts include: replacement of paper napkins and hand towels by electrical dryers or washable towels, replacement of paper packaging by plastics, and replacement of viscose and rayon clothes with cotton, wool or other textiles. A well-studied example is the replacement of throwaway paper cups with reusable plastic, metal or ceramic vessels, where the life-cycle assessments include the impacts of multiple washes which conclude that the displacement effect is hugely positive.¹³

KEY ISSUES AND OPPORTUNITIES FOR THE FUTURE

- There is growing recognition of the need to avoid single-use paper products (apart from for sanitary purposes). As an icon of wasteful paper use, throwaway cups have been the centre of attention over the past year. The launch of the EPN's 'Cupifesto' in September 2016 has been followed by concerted action by our member organisations around the world. There is a movement of 'cup conscious cafes' who encourage their customers to bring or use reusable vessels, several cities in Germany adopting municipal cup-sharing schemes, many drinks chains offering discounts for customers who bring their own cups, political discussion about charges or taxes, and considerable media interest in the issue. Widespread changes in behaviour away from throwaway cups could signal a sea-change in acceptance of such a valuable resource as paper being used for disposable items where there are good alternatives.
- Packaging, representing half of all paper consumption globally, is by far the biggest single opportunity for reducing paper consumption. In particular the enormous

volumes of corrugated boxes, fueled by rapid growth of online retail, and demonstrate a need to find reusable alternatives. In some contexts, reusable packing boxes are already gaining ground.

- As several of the examples above have shown, paper efficiencies can bring many knock-on benefits: light-weight packaging can increase product sales, reduce breakages and cut transport emissions; reducing junk mail can improve a company's credibility and reputation; administrative paper saving can save considerable money, storage space, postage and time, as well as reducing pressure on trees, water, the atmosphere and local communities.
- A key issue that has not been widely appreciated is the climate change impact of paper use, and therefore the opportunity that exists for paper efficiencies to contribute to greenhouse gas emissions cuts. The 'degrowth' and 'transition' movements are both highlight the cultural and behaviour shifts required for a lower-carbon future. More credible life-cycle assessments of paper products will help to highlight the emissions savings that can result from paper saving.

2

MAXIMISING RECYCLED FIBRE CONTENT

Lead Author: Susan Kinsella, Executive Director, Conservatree

THE FUTURE OF PAPER RECYCLING

A successful recycled paper fibre system is a circular system that needs:

- sufficient and appropriate recycled fibre sources.
- efficient and effective industrial recycling infrastructure.
- demand for recycled content products.
- incentives that favour reusing and recycling resources.

The *Global Paper Vision* lists seven steps that advance the system towards meeting the goals above. Each of these steps offers an opportunity for progress that then supports improvements in other areas as well. The Vision recommends industry, consumers, retailers, governments, investors and non-governmental organisations (NGOs) commit to actions encompassing the following priorities:

- maximise recycled fibre content in all grades of paper and paper products, maximise post-consumer fibre content, and develop additional 100% recycled paper products.
- minimise waste by maximising reusability and recyclability in appropriate products.
- proactively support recycled paper manufacturing, including improved collection systems of recyclable paper.
- increase the use of other recovered materials (e.g. sustainably grown and harvested agricultural residues and post-industrial recycled paper) as fibre sources in paper.
- rarely manufacture paper solely from virgin tree fibre.

- maximise fibre efficiency through product design and lowering basis weights of paper, whenever possible.
- eliminate incentives that favour use of natural resources over reused or recycled resources, or that favour disposal or incineration over recycling.

Several of the *Global Paper Vision* steps are showing gains, especially in sourcing fibres and building infrastructure.

Incorporating recycled fibre content is becoming ever more critical for meeting paper production challenges, strengthening the circular economy, and minimising the paper industry's production footprint. The ongoing expansion of new market demand and global paper production requires prioritising recycling capacity, continually increasing and fine tuning paper's recycled fibre content, eliminating factors that degrade recyclability, and eventually doubling the amount currently in use.

At the same time, nations must collaborate on creating consistent data in order to measure and compare their progress accurately and analyse the most effective next steps.

RAPIDLY SHIFTING PAPER MANUFACTURING IMPACTS

In 1970, paper manufacturers in the US, Canada, Western Europe and Japan produced more than 85% of the world's paper¹, that was then used predominantly by businesses and citizens in those countries. Today, the global production percentage in North America and Europe is falling, while many countries around the world are building up new paper industries. Asia has now moved

up to produce nearly 50% of pulp and paper globally, increasing from only 15% in 1970. China alone, with its rapid build-up of capacity over the past two decades, has taken over as the leading

paper producer², providing more than 25% of the world's paper³. The USA, long the global leader in paper production, moved to second place in 2009⁴.

Figure 1: Paper and paperboard annual production, in 000 MTs and by percentage of world production⁵

REGION	1970	1980	1990	2000	2010	2015
WORLD	128,029	174,186	238,238	323,139	399,795	406,295
AFRICA	908	1,572	2,766	2,916	3,824	3,563
	1%	1%	1%	1%	1%	1%
NORTH AMERICA*	57,370	72,545	88,431	107,406	88,519	82,984
	45%	42%	37%	33%	22%	20%
LATIN AMERICA & CARRIBEAN*	3,759	7,149	10,805	14,194	20,721	21,157
	3%	4%	4.5%	4%	5%	5%
ASIA	19,035	32,074	54,708	94,984	174,622	190,618
	15%	18%	23%	29%	44%	47%
EUROPE	38,741	50,057	68,057	99,921	108,037	104,076
	30%	29%	28.50%	31%	27%	26%
OCEANIA	1,514	2,061	2,813	3,718	4,072	3,898
	1%	1%	1%	1%	1%	1%
USSR	6,701	8,729	10,657			
	5%	5%	4.5%			

* 'North America' included Central America through 2005 in FAO's Statistics: Forest Products Yearbooks. Later Yearbooks shifted Central America to a category of 'Latin America & Caribbean.' Pre-2006 statistics are adjusted in this table to limit 'North America' to USA and Canada, with Central American statistics shifted to 'South America.' USSR is separated out in the Yearbooks for 1970, 1980 and 1990, but in 2000, 2010 and 2015 the 'Russian Federation' is included with Europe.

This geographic shift has brought several welcome advances, including new recycled paper mills and progress in recycled paper technology. It has also opened the markets for paper to large populations that had little access to it in the past, especially in China and India. This new demand is in turn stimulating ever-increasing production. Global paper production has doubled since 1985, reaching more than 406 million tonnes in 2015^{6,7}. It is projected to continue growing to meet global demand by 1.1% per year, to 482 million metric tonnes in 2030⁸.

CAN THE PLANET ABSORB CONTINUALLY ESCALATING PRODUCTION?

The thought of increasing paper production by nearly another 20% within less than 15 years raises alarms about even more resource destruction, not only of forests but also of water sources, as well as raw materials used to make industrial chemicals and necessary additives. It raises urgent questions about what will provide the energy required and whether there will be even more greenhouse gases and air pollution.

But these are all factors that can be mitigated by increasing recycled paper production. And that is beginning to happen. Pöyry reports that recovered paper’s market share within the paper industry has increased 28% over the past 35 years, to 233 million metric tonnes in 2014. Wood pulp’s market share has declined by a corresponding 27%, to 167 million tonnes⁹. If recycled paper production continues to increase its share globally, it can become the key to rapidly reducing the paper industry’s production footprint. In this way, paper production can both benefit far more of the world’s population while preserving environmental quality.

RECYCLED PAPER: KEY TO MINIMISING THE PAPER PRODUCTION FOOTPRINT

According to the Environmental Paper Network’s Paper Calculator¹⁰, producing papers with high recycled content results in significant environmental benefits on almost every metric.

Figure 2: Environmental comparison of recycled paper to virgin paper

	1 metric tonne of 100% RECYCLED PAPER instead of virgin paper	1 metric tonne of 100% RECYCLED NEWSPRINT instead of virgin paper
	SAVES	SAVES
FRESH WOOD AND EQUIVALENT TREES	4.4 metric tonnes of wood, equivalent to 26 trees	2.3 metric tonnes of wood, equivalent to 14 trees
TOTAL ENERGY	39%	23%
GREENHOUSE GASES	58%	64%
WATER USAGE	9%	25%
OCEAN ACIDIFICATION	56%	74%
HAZARDOUS AIR POLLUTANTS (HAP)	13%	46%
MERCURY EMISSIONS	20%	38%
DIOXIN EMISSIONS	26%	93%

COMPARING RECYCLED PULP TO VIRGIN PULP PRODUCTION

Comparing pulp choices for the same product reveals the benefit of using recycled fibre as well. For example, a short ton of pulp for making most printing and office papers in North America requires more than 4 tons of fresh trees. But that same ton of pulp only requires 1.4 tons of recovered paper, extending its efficiency even when accounting for the loss of fibre in the recycling process. Most importantly, using recycled fibre reduces the need for wood fibre, thereby helping to protect forests.

*Figure 3: Tons of fibre input required to make one ton of pulp¹¹
(in short tons)*

TYPE OF PULP	VOLUME OF REQUIRED MATERIAL	VOLUME EFFICIENCY
Virgin Chemical (Kraft)	4.4 tons of fresh trees ¹²	23%
Virgin Mechanical (Groundwood)	2.2 tons of fresh trees	45%
Recycled	1.4 tons of recovered paper	71%

Recycled pulp efficiency can be further improved by increasing the quality of the recovered paper input materials. High-quality sorting reduces the number of non-recyclables in the incoming bales (e.g. non-paper such as glass, plastics, metals), as well as paper materials that are inappropriate for the specific pulping process (e.g. newsprint or corrugated boxes that cannot be used for high-grade deinked pulp but are welcome for use in pulp for many other paper products).

RECOVERED PAPER COLLECTION SYSTEMS, ESSENTIAL FOR ESTABLISHING A CIRCULAR ECONOMY

Maximising the use of recycled fibre in the global paper production system means making sure that recycling mills can get the right kinds of recovered fibres, in large enough quantities, for the specific products they are making. That means that many countries have to increase – and in some cases, initiate – recycling collection processes to meet the escalating demand. Fortunately, that is happening and recycled fibre collection is reaching high levels in many areas of the world. The information and data firm, RISI, reports that in 2012, 57% of the paper and paperboard produced globally was recovered and recycled. It projected that recovery to increase to 64% by 2028¹³.

In 2015, the World Business Council for Sustainable Development reported that the recovery of paper and paperboard in developed countries is approaching the maximum that can be practically achieved, noting that it is nearing 70% in the USA, over 70% in Europe, and nearly 80% in Japan¹⁴. Collection programmes cannot reach 100% because some paper is not recyclable (such as tissue) or becomes contaminated, may be used for other purposes (such as animal bedding), or may be too scattered to easily collect, such as in some rural or remote areas.

Of course, collected fibre is not actually recycled until it is incorporated into new products, so collection programmes need markets that will direct the materials into recycled product manufacturing. In the past, China's recycling mills imported enormous quantities, primarily from countries in North America and Europe. At the same time, however, China has been building up its own internal wastepaper collection system and increasingly

implementing import rules that escalate requirements for high-quality materials, even when that reduces the volume¹⁵. Now, announcing its intention to focus on improving its environmental quality, China has announced even more stringent quality requirements under its National Sword policy, effectively shutting out much of the fibre imports that had been welcomed in the past and leaving wastepaper exporters around the world scrambling to find new markets¹⁶.

The International Council of Forest & Paper Associations (ICFPA) reports the global recovery rate as a combination of paper mill utilisation of recovered paper compared to global paper and paperboard consumption. On one hand, this calculation counts recovered paper that actually goes into new paper production

and therefore truly is recycled, rather than also including recovered paper that may have been incinerated instead. On the other hand, it does not necessarily represent the amount of fibre included in a region's actual paper production, because much of it may be exported for use in other countries' paper mills.

ICFPA notes that it cannot provide consistent recycling rate data from its members around the world because they each use different definitions and methodologies. Developing consistent comparisons would allow data collection to provide increasingly accurate and nuanced representations.

Figure 4: Selected recycling rates for 2013 (calculated by comparing collection to utilisation¹⁷)

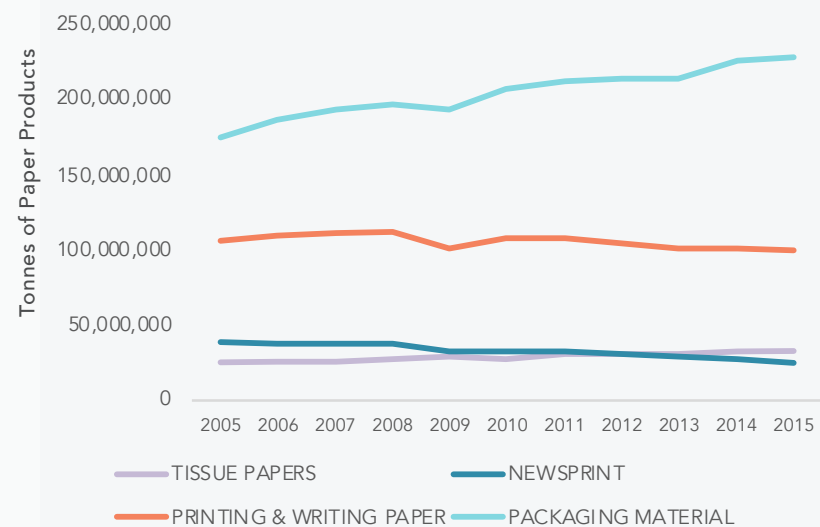
	PAPER RECYCLING RATE	NOTES
WORLDWIDE (RISI) ¹⁸	57.9%	Percentage of recovered paper used by paper and paperboard mills as a percent of global paper and paperboard consumption.
AUSTRALIA	85%	Approximately half used domestically, with the balance exported to Asia.
JAPAN	80.4%	Promotes development of lighter paper and recycled products, research and development.
EUROPE (REPORT FROM CEPI)	72%	Paper fibre is recycled an average of 3.5 times, compared to world average of 2.4.
CANADA	70%	Decreased slightly since 2011, as the use of newsprint and graphic paper declines.
UNITED STATES	64%	The American Forest & Paper Association's goal for 2020 is 70% paper recovery. In 2016 it reported 67.2%. ¹⁹
SOUTH AFRICA	61%	Working towards a circular economy to reduce landfills and recover valuable raw materials.
BRAZIL	48%	Helped develop recycling cooperatives, improving quality of life, income, and social inclusion for participants.
CHINA	44.7%	China reports a wastepaper utilisation rate in its mills of 72%.

In addition, the recycling data available does not indicate the quality of the materials collected, which affects how much ultimately must be discarded. For example, many USA recycling programmes collect paper commingled with bottles, cans and other recyclables, and then produce poorly sorted paper bales. This hinders paper recycling when mills receive types of paper they cannot use, or even non-paper contaminants such as glass and plastic²⁰. It also increases the costs and challenges at mills, such as those producing printing and writing paper, that require specific types of paper (e.g. collected office paper) that instead were shipped in bales of mixed papers to mills that did not require them. Poor sorting obscures an accurate assessment of the availability of specific grades of recovered paper. As an example, many paper industry experts are reporting that the amount of recovered office paper is dwindling and likely to become insufficient for paper production in the future. But a large percentage of the amount available is 'hidden' in those mixed paper bales and then becomes inaccessible for printing and writing mills that cannot use the mixed bales. More accurate recovered paper sorting would free up much of the recovered office paper to be sent to the appropriate mills.

HOW RECOVERED PAPER IS USED BY PAPER MILLS

The global demand for newsprint has been declining over the past ten years (see Figure 5). More recently, demand for printing and writing/graphic paper has also been declining in North America and Europe. But the demand for tissue paper and paperboard products has been growing, particularly in emerging markets such as China and India, with urbanisation and the development of a new middle class²¹.

Figure 5: Global paper product consumption, 2005–2015, by selected product types



Source: FAO Yearbook Statistics: Forest Products, Food and Agriculture Organization of the United Nations, 2005–2015

More than 50% of papermaking fibre reportedly comes from recovered fibre²². But reporting only a single composite data point hides the fact that different grades of paper and paper products average very different typical recycled content rates. Globally, many newsprint and packaging grades have relatively high recycled content percentages, often over 50%. Tissue products average approximately one-third recycled fibre²³. The fact that many mills world-wide are using recycled fibre today is good news.

At the same time, there is still a large percentage of paper production that uses no recycled content at all. A prime example is printing and writing paper, which is estimated to have a global average of only 8% recycled content²⁴ even though, according to FAO, it still accounts for one-quarter of the paper made worldwide²⁵.

Figure 6: Average percentage of recycled pulp included in several paper grades globally^{26,27}

PAPER GRADE	PERCENT OF WORLD PRODUCTION	AVERAGED PERCENTAGE OF RECYCLED PULP
Paperboard, Wrapping and Packaging Paper	57%	56%
Printing & Writing	25%	8%
Sanitary & Household Tissue	8%	34%
Newsprint	6%	68%
Other	4%	27%

Even when recently developing paper industries are using high levels of recovered fibre in grades such as newsprint and packaging, they generally use very little in their printing and writing grades. China is even importing virgin wood pulp from South American mills, halfway around the world, in order to make printing and writing papers from virgin fibre. In the United States, despite many copy paper and printing paper brands with 100% recycled content, the overall grade of printing and writing paper used only 6% recycled fibre in 2006²⁸ and there has been little improvement since then. Unfortunately, most new and planned paper mills worldwide making printing and writing paper, including copy paper, appear to include little to no recycled content at all.

Why does this matter? Most printing and writing grades are made with chemical pulp, which Figure 3 showed requires 4.4 short tons of fresh trees to make one short ton of pulp. Its production also results in the greatest negative environmental impacts of all the paper grades across almost all indicators. This is why including high levels of recycled fibre in printing and writing papers is essential as the foundation for minimising paper production's footprint.

In addition, despite generally high recycled content levels in paperboard grades overall, there are some grades in this market sector that share a similar profile to printing and writing papers, including using low averages of recycled pulp while creating high negative environmental impacts in their production. These grades, which include packaging for cosmetics, pharmaceuticals, and high-end toys, should also be targeted for increased recycled content.

THE NEED FOR MORE ACCURATE METRICS

As the collection of recycling data increases worldwide, the need for improvement becomes more pressing. Currently, there is no standardisation for determining what gets counted and what does not, and there are wide divergences underlying the data reported. When data are aggregated across too many categories or are not collected in comparable processes or according to parallel logic, results are often misleading. In contrast, high-quality, comprehensive and consistent reporting can reveal serious gaps in the recycling system as well as highlight breakthrough opportunities for more tightly increasing sustainability.

To give just one example, the FAO statistics reported for 2015²⁹ might lead one to assume that recycling is already succeeding at high rates. After all, they show 2015 world paper and paperboard production at 406,295,000 tonnes and recovered paper production at 225,106,000 tonnes, for what appears to be a rate of 55% recovered paper use. But this comparison is misleading, for several reasons:

- it compares finished paper products at the end of the manufacturing process with raw collection data for recovered materials that have not yet been turned into recycled pulp. Therefore, it compares two dissimilar parts of the process and then does not accurately report the amount of the recovered material that will actually be recycled, since it does not account for the losses that occur between these two different production stages. It also does not record such inefficiency factors for the collected paper prior to arriving at the mill, such as sorting, processing, contamination, and misdirection (sending to the wrong type of mill, especially in mixed bales).
- terms, definitions, and understandings are inconsistent between different geographic regions regarding such essential concepts as what counts as recovered paper, or as consumption, or what should be included in calculating the recycling rate.
- as Van Ewijk et al³⁰ discuss, the simple comparison of recovered paper collection to total paper production suggests a one-to-one replacement ratio. But this does not reflect differences in pulping efficiencies between wood fibre and recycled fibres (see Figure 3).
- using an aggregated recycling rate disguises the very significant differences in typical use of recycled content in

different grades, and the significant differences between each grade's production impact on the environment.

SUMMING UP

- Over the past 50 years, paper production dominance has been shifting from North America and Western Europe to Asia, especially China. This shift has opened paper markets to enormous populations that had little access to it in the past, stimulating ever-increasing demand for paper.
- Increasing the use of recycled fibre reduces paper's production footprint so that it can provide its benefits to far more of the world's population than before, while preserving environmental quality.
- While recycling mills are increasing worldwide, there is still much more room for growth in recycling capacity, particularly in printing and writing mills.
- Disaggregating recycling metrics reveals critical, but otherwise hidden, data points such as recovered fibre sorting quality and the wide variations in recycled content between different paper grades, in order to pinpoint lagging areas that need improvement.
- Recovered fibre collection systems are increasing around the world but global definitions, data collection and reporting methods need standardisation in order to reliably track progress, success and needs.

NEXT STEPS

Recycling is a whole, circular system that requires reciprocal systems and infrastructure. Even in North America, which began large-scale community recycling programmes nearly 50 years ago, the system still needs better management and integration. So it is no surprise that much more is needed at the global level for the paper recycling system to function optimally in supplying paper mills, including:

- setting increasingly high goals for including recycled content in every paper grade, with new and retrofitted mills incorporating technologies and designs to accept and utilise it.
- careful examination of material efficiency potentials to maximise recycled content even in products that are already at relatively high levels.
- a focus on well-sorted recycling streams appropriate to the needs of each type of paper mill, to eliminate contamination (e.g. nonfibre materials) and outthrows (fibre materials unsuitable for a specific mill).
- cost-effective collection methods for reliably supplying paper mills with the types and quantities of recovered paper that they require, whether through imports or development of local recycling collection programmes.
- ensuring that recovered paper is kept within the recycling system, where it can potentially be recycled several times and reduce production impacts every time, rather than being diverted to incineration or landfills.

- continual evaluation of opportunities to recycle, reduce or eliminate additives and chemicals used in the system as well as waste products that are produced.
- a comprehensive, consistent, global system of standardised recycling terms, definitions, metrics, and reporting methods such as for calculating recovered paper collection and recycling rates, as well as for measuring and describing recycled content in finished products.

The global paper industry already has a head start on incorporating recycled content into its production methods, although there are also large gaps and inconsistencies. By more effectively controlling contamination, the amount of recovered paper that could be incorporated can still be nearly doubled before it reaches its upper-limit technical potential³¹.

Rethinking traditional assumptions about ultimately unnecessary limitations on recycling, plus creating incentives that encourage rigorous pursuit of the best material efficiencies, will help the industry significantly reduce its production footprint. By maximising recycling, the global paper industry will be better able to support rising standards of living worldwide while implementing environmentally and economically sustainable production methods.

3

ENSURING SOCIAL RESPONSIBILITY

Lead Author: Patrick Anderson, Forest Peoples Programme

INTRODUCTION

The pulp and paper industry is supplied by more than one hundred million hectares of forests. In addition, pulpwood plantations cover tens of millions of hectares of former forest lands, largely in the tropics. In most cases these plantations were established without respect for the rights of forest dependent communities, including many indigenous peoples.

Indigenous peoples have the right, recognised in international law, to give or withhold consent to planned developments that will affect them, and more and more pulp and paper companies are committing to respect these rights along with the rights of local communities affected by their operations. Implementation of these social commitments and proposed remedies for past harms are, however, proceeding slowly. Meanwhile the industry continues to expand throughout the tropics, dislocating and impoverishing indigenous peoples and local communities.

Everyone involved in the production and supply of pulp and paper products needs to take responsibility for the social impacts of their purchases and production. This starts with adopting policies to respect human rights and to require suppliers to report on how they respect human rights. Customers must investigate their suppliers and stop purchases when negative social consequences of pulp and paper production are revealed, unless the companies are able to address the problems. Investors in the sector should also undertake such due diligence.

The *Global Paper Vision* calls on industry, consumers, retailers, governments, investors and non-governmental organisations (NGOs) to commit to actions encompassing the following priorities:

- recognise, respect and protect human rights, and comply with and proactively develop fundamental employment and social standards¹ and relevant international agreements² for the protection of human rights.
- ensure free, prior and informed consent (FPIC)³ of local peoples and communities in the areas from which raw materials originate and where production takes place.
- recognise, respect and protect the legal and customary rights of indigenous peoples and local communities to control their traditional lands and protect their cultural identity.
- recognise, respect and protect local communities' rights to a healthy environment, and their rights to participation as a primary stakeholder in land-use planning.
- recognise, respect and protect workers', including subcontractors' workers', rights to beneficial employment and a safe working environment.
- promote community ownership, worker ownership and the development of paper manufacturing facilities that are scaled appropriately for local communities, and a diversity of small- and medium-sized enterprises in the paper sector.
- respect and support local economies based on a long-term social and environmental vision built with local communities and businesses.

LAND RIGHTS STRUGGLES

Indigenous peoples continue to struggle to have their rights respected in all pulpwood producing regions, from the boreal and temperate forests of the northern hemisphere⁴, to forest regions in Africa, Southeast Asia and South America.

In Brazil, conflicts continue over land acquisition for eucalyptus pulpwood plantations which have taken over the lands of dozens of indigenous peoples. More than 7.5 million hectares of eucalyptus plantations now grow in Brazil in vast monocultures⁵. They are termed 'green deserts' by their opponents who note that as well as taking over community lands, these plantations consume vast quantities of water, causing adjacent streams and agricultural lands to dry up, damaging water quality and aquatic systems. In the state of Espírito Santo, its plantations are the subject of long-standing land rights disputes with indigenous peoples and local communities⁶. Recent expansion of the pulp industry has mostly occurred in lesser developed states, in Brazil's interior, where land is cheaper, governance is weaker and civil society faces larger challenges in defending basic rights.

In the state of Mato Grosso do Sul, in just ten years, two pulp companies installed pulp production capacity of over 4.5 million tonnes per year (mt/y). This has led to a very rapid expansion of eucalypts plantations, which now cover close to 1 million hectares. This land use change has caused a rural exodus, as few jobs are created in the plantations. The communities that do persist, surrounded by plantations, suffer from water shortage and the contamination of their gardens by the agro-toxics used in the plantations. Another large mill has been built on the border of the Amazon; in Maranhão, one of Brazil's poorest states. As it tries to secure areas for its plantations, the company is accused of grabbing land of several traditional communities, destroying their gardens and water supplies and intimidating people to leave their land.

In Chile pulp and paper companies are involved in bitter conflicts with indigenous and traditional people who claim the land that these companies obtained from the government during the military dictatorship of Pinochet. After democracy returned in 1990, the Mapuche started to reclaim their rights, which include the recognition of their cultural identity, the demand for land, and the demand for autonomy. Over the years, the conflict has intensified, with groups that claim to represent the Mapuche resorting to more violent protests, which include the burning of timber trucks. The government has responded with anti-terrorist legislation against the Mapuche and by militarising certain areas, to protect the companies. Apart from the land conflicts, there are also conflicts in Chile due to water shortage caused by the plantations, the pollution caused by the mills, and the huge plantation fires that Chile has suffered in recent years.

In Indonesia over the last thirty years, 10 million hectares of forest lands have been licensed out by the national government for pulpwood plantations without consideration of the thousands of communities who traditionally own and manage those areas. An additional 10 million hectares (equivalent to the area of South Korea) of pulpwood plantations is planned for expansion in the coming decade. Concessions and related supply areas controlled by the two biggest paper companies in Indonesia, Asia Pulp and Paper (APP) and Asia Pacific Resources International Holdings Ltd (APRIL), cover almost 5 million hectares. In 2013, APP announced a Forest Conservation Policy, committing to protect its remaining forests and respect the rights of local communities. APP has admitted that its operations are in conflict with more than 400 communities, and it has begun efforts to resolve them. So far, however, few communities have been compensated for loss of their lands.

Meanwhile, conflicts continue. In February 2015, Indra Pelani, a community leader from Jambi, Sumatra whose community lost its land to APP, was kidnapped and murdered by security guards working for a security firm contracted by APP. Indra's community had recently occupied their customary lands which the government had leased to APP for pulpwood plantation development. Despite APP's promises following Indra Pelani's murder, the community is yet to regain its lands from APP's operations. Indonesian NGOs that support community struggles are still urging paper buyers not to purchase from APP and APRIL until the companies resolve outstanding conflicts⁷.

In Mozambique, Portucel Moçambique (controlled by The Navigator Company, based in Portugal) is planning to build a pulp mill in Ile-Namarroi, in Zambézia, with an annual production capacity of 1.5 million tonnes, as well as a biomass power generation plant. The plant is expected to be operational by 2023. In 2010, 173,000 hectares in the Zambézia region was granted to Portucel Mozambique by the national government to establish eucalyptus plantations, and in 2011, Portucel obtained a further 183,000 hectares in the Manica province. In September 2015, Portucel Moçambique opened the largest tree nursery in Africa with a capacity of more than 12 million trees a year.

The Portucel project impacts 200 communities and according to the national farmers union, União Nacional dos Camponeses and ADECRU, it affects 25,000 households directly, and twice as many indirectly. Land that is critical for food security and traditional life has been taken from local communities without their consent; consultation meetings have not been held in the traditional language; there has been pressure on communities not to voice concerns; the promises of jobs in exchange for land has never materialised; and compensation for land has been minimal or lacking entirely. Some communities have been forced to relocate to make way for plantations, and authorities have

failed to follow-up on complaints. The plantations are already causing water stress on adjacent agricultural lands⁸. There are similar problems in other countries, including Chile, Uruguay, Thailand, India and South Africa, where eucalyptus or acacia are grown in extensive pulpwood plantations, displacing forests and violating community rights, lowering water tables, and negatively impacting rural communities⁹.

Land rights conflicts are not restricted to the tropics. In northern Quebec, Canada, the Cree First Nation of Waswanipi is struggling to protect its last intact forest within their traditional subsistence hunting territory. According to the Waswanipi Cree, 90% of their ancestral forests in the Broadback River Valley has been cleared or degraded by logging and carved into pieces by 33,000 km of forestry roads. Only three of the 62 traditional trap lines, which are their primary means of livelihood, remain untouched by forestry operations. The Broadback River Valley is the last stretch of intact forest where the Waswanipi Cree can catch sturgeon and walleye salmon and hunt for moose, as countless generations before them have done.

The valley is threatened by proposals for further roads and logging. While the Cree have guaranteed legal rights to hunt, fish, trap, and harvest within their traditional territories, they have been unable to protect the Broadback River Valley. Protection of this intact forest will enable the community to continue these subsistence activities and preserve their way of life into the future. The community is asking the forest and paper industry to adjust its plans and agree with the Waswanipi Cree on where to harvest the forest. It is the Cree's hope that the government of Quebec will take leadership in finding a forestry solution that respects their rights on their ancestral lands¹⁰.

RURAL ECONOMIC IMPACTS

China is the largest paper producer in the world. Its paper used to be largely made from agricultural residues. All over China, farmers used to sell the residues from harvesting rice, maize and sugar cane to pulp mills, and this was an important aspect of their rural economies. The Chinese state has closed thousands of small paper mills that used these residues, whilst encouraging the construction of dozens of new pulp mills that exclusively uses wood fibre. The shift from agricultural waste to wood fibre has caused the loss of up to a million jobs. There is an alternative: China could ensure that new mills also use agricultural residues and continue its role as a world leader in 'ag fibre', making sustainable paper from the waste products of arable farming¹¹.

Researchers in the south-eastern states of the USA have established that the paper industry is threatening local economies because small land owners are often paid less for their wood than bigger forestry operations. Where the paper industry is concentrated in a few hands, the well-being of rural communities decreases, with higher levels of poverty and unemployment and lower expenditures on public education than areas where growing trees for the paper industry is not a dominant land use¹².

HEALTH IMPACTS

The use of toxic chemicals for pulping and bleaching paper and dangerous pesticides and herbicides on fibre plantations can cause serious negative impacts on the health of paper company workers and communities downstream from mills. The paper industry is responsible for the release of persistent toxic pollutants into the environment including chlorine, mercury, lead and phosphorus, resulting in a legacy of health problems including cancers, nerve disorders and fertility problems.

Chlorine bleaching of paper is still widespread and, although there has been some progress in shifting away from the use of elemental chlorine, the use of any chlorine-based chemicals in paper production can result in toxic compounds such as dioxins and furans entering the environment. Dioxins and furans cause cancer and are implicated in a range of other health problems including reproductive failure, diabetes, hyperactivity, allergies, immune and endocrine system problems. See the "Cleaner Production" chapter of this report for more on this issue.

WATER RIGHTS

The paper industry uses enormous quantities of water, more than 10% of all freshwater consumed in some nations, and causes widespread water pollution. Not surprisingly, this leads to disputes about water resources and water quality. When the government of Uruguay allowed Finnish company Botnia to build a pulp mill taking water from and discharging into the Uruguay River, it caused a cross-border conflict with Argentina. In June 2006, the Argentine government took the Uruguayan government to the International Court of Justice (ICJ) in The Hague, for failure to notify them about potential pollution from the mill. Argentina accused Botnia of breaching the Organisation for Economic Cooperation and Development (OECD) guidelines, the 1975 Statute of the River Uruguay and the Equator Principles - guidelines for assessing social and environmental risk based on standards set by the International Finance Corporation, the World Bank's private sector lending arm. In addition to the legal conflict, there were massive protests in Uruguay by communities alarmed at the prospect of water pollution and the loss of farm land to eucalyptus plantations to provide the pulp mill with fibre¹³.

The ICJ ruled that although Uruguay failed to inform Argentina of the operations, the mill did not significantly pollute the river, so closing the pulp mill was not necessary. Uruguay allowed the mill to increase production from 1.1 million tonnes a year to 1.3 million tonnes in 2013. Argentina has threatened to take Uruguay to the International Court of Justice for the increase in production, despite its previous legal loss.

BETTER PRACTICE

There are bound to be economic and social impacts on local communities when pulp and paper companies begin operations in their area. Companies therefore have a responsibility to seek community consent before commencing operations, to ensure that negative impacts are mitigated and compensated. Governments often ignore the fact that logging and plantation licenses conflict with local community rights and resource use. This means that responsible companies must do more than just follow legal requirements. Progressive paper companies respect the rights of affected communities, including the right to reject plantations and mills on their lands, and seek to work with communities as allies and beneficiaries, and support their economic diversification.

In some parts of Canada where First Nations have more secure land rights as a result of treaty arrangements, there are inspiring examples of the paper industry working with the native people to plan how the forest resources can be used to maximise benefits and reduce negative impacts. For example, in Nitassinan in Eastern Quebec and Labrador, Canada, the Innu First Nation has led a collaborative, ecosystem-based planning process that has guaranteed that traditional livelihoods are not threatened by forestry operations. This was achieved after a long history of conflict, when in 2001 the Government of Labrador and Newfoundland reached a Forest Process Agreement with the

Innu Nation, empowering them to have full participation in forest planning. The resulting Forest Guardians process involved scientists, Innu elders, local communities, and forestry technicians working together to develop a long-term ecosystem-based forest management plan. This kind of process addresses conflicts, builds trust and ensures that fibre supplies will be sustainable. It demonstrates that collaboration and co-operation between the state, forestry and paper industries and indigenous peoples and forest communities is possible and the best way forward for all concerned¹⁴.

KEY ISSUES AND OPPORTUNITIES FOR THE FUTURE

Companies in the pulp and paper sector must respect and comply with United Nations (UN) declarations and conventions for the protection of human rights: the UN Declaration on the Rights of Indigenous Peoples; the International Labour Organisation (ILO) Convention 169 for the Protection of the Rights of Indigenous Peoples; the General Declaration of Human Rights (1948); the UN Convention for the Elimination of all Forms of Racial Discrimination (1966); the International Agreement on Economics, Social and Cultural Rights (1966); and the International Agreement on Civil and Political Rights (1966).

The right of indigenous peoples and local communities to give or withhold their free and prior-informed consent (FPIC) to proposed developments must be respected in areas where pulpwood plantations and paper production are planned. Companies and governments must recognise and respect indigenous peoples' right to control their traditional lands and protect their cultural identity, their right to a healthy environment, and their right to FPIC.

Companies must also respect the rights of workers, including subcontractors' workers, to beneficial employment and a safe working environment. These include the ILO Fundamental Work Rights: freedom of association; the right to organise and to collective bargaining; the abolition of forced labour; the elimination of child labour; and the prohibition of discrimination in employment and occupation (equality of opportunity and treatment).

The industry should respect and support local economies and businesses, reversing the trend towards ever-larger industrial units and promoting community-ownership and a diversity of small- and medium-sized enterprises in the paper sector. Production systems must not hinder local food production or jeopardise environmental services or ecosystem assets, such as water quality, and their equitable use.

Companies should recognise that they are part of a larger land use system and should take into account the indirect effects of their land use. They should carry out independent social impact assessments of all new developments, including the impacts of their fibre sourcing policies and procedures, and apply the results of these assessments.

Investors should withhold support unless the above conditions can be demonstrated to have taken place and refuse to subsidise unsustainable developments. Financers and investors who want to invest ethically in the global pulp and paper industry should not enter into partnerships with companies that have poor social and environmental records and should adopt binding social and environmental standards, requiring independent social audits, not only relying on company information¹⁵.

4

RESPONSIBLE FIBRE SOURCING

Lead Author: Sergio Baffoni, Forest Campaign Coordinator, EPN-International

INTRODUCTION

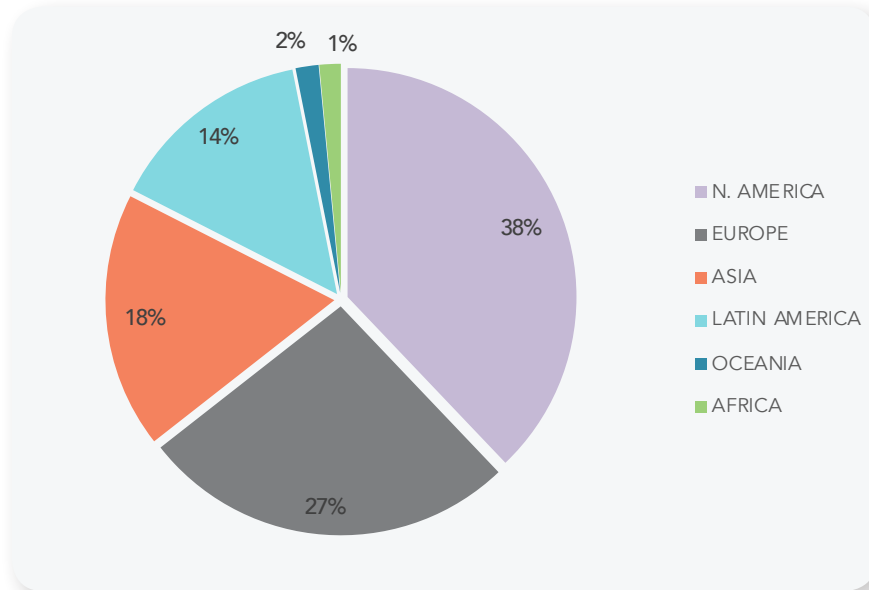
Fibre sourcing is one of the most complex issues addressed in the *Global Paper Vision*. The global market in wood fibre has little transparency and is a significant driver of deforestation and human rights violations. This pillar calls on industry, consumers, retailers, governments, investors and non-governmental organisations (NGOs) to commit to actions encompassing the following priorities:

- end sourcing of fibre from unknown and illegal sources, suppliers or operations.
- end the use of fibre from, and avoid suppliers associated with loss of, endangered forests and high conservation value forests, ecosystems and habitats.
- end the use of fibre from, and avoid suppliers associated with, conversion of natural forests or other high conservation value ecosystems into plantations for paper fibre.
- end the use of fibre from, and avoid suppliers associated with, loss or degradation of peatlands and high carbon stock forests.
- end the use of fibre, and avoid suppliers, associated with human or labour rights violations.
- source any virgin wood fibre for paper from forest managers that have credible, independent, third-party certification for employing the most environmentally and socially responsible forest management and restoration practices. Forest Stewardship Council (FSC) is currently the only international certification programme that comes close to meeting this goal.
- avoid sourcing from and promoting misleading and environmentally irresponsible forest certification programmes.
- support the development and use of sustainably grown and harvested alternative crops for paper where credible analysis indicates that they are environmentally and socially preferable to other virgin fibre sources and do not lead to loss of necessary food crops or high conservation value ecosystems.
- eliminate use of toxic, bio-accumulative or persistent pesticides and herbicides in fibre production.
- refuse fibre from genetically modified organisms.
- replace 'far' with 'near,' using sustainably produced, locally sourced fibre and minimising transportation wherever possible.

GLOBAL PULP PRODUCTION

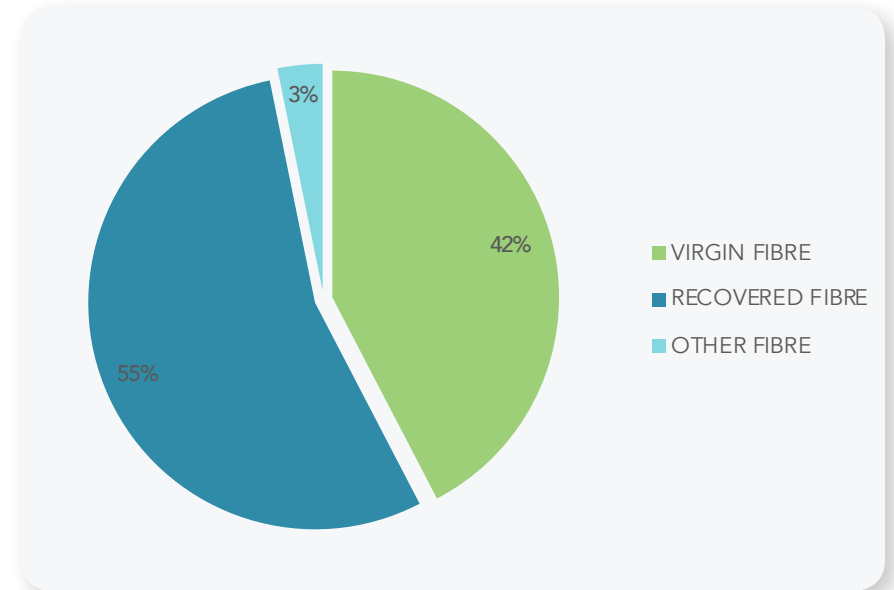
In 2014, around 172 million tonnes of pulp were produced globally from virgin fibre (172,926,000 tonnes). The main pulp producers are North America (65.4 million tonnes) and Europe (45.8 million tonnes), followed by Asia (31.2 million tonnes), Latin America (24.8 million tonnes), Oceania (2.8 million tonnes) and Africa (2.6 million tonnes)¹. While in some countries such as Canada and Russia pulp is mostly sourced from natural forests, in South America, Asia, and the Southeastern United States most of the virgin fibre comes from pulpwood plantations, established by converting natural forests and other habitats. The conversion has been driven either by pulp fibre production or by other commodities such as palm oil, beef, soy, etc.

Figure 1: Global pulp production by regions (2014)²



A significant share of the world's pulp is still produced from virgin tree fibre: 172 million tonnes of virgin fibre compared with 221 million tonnes of recovered paper and 13 million tonnes from other fibre³. While there is a growing use of recovered paper, the use of natural fibres other than wood is declining.

Figure 2: Global pulp production, by fibre source (2014)⁴



A disappointing trend is the decline in use of agricultural waste fibres. China, where paper was invented, is an interesting case study. Chinese papermaking traditionally used agricultural waste and, until mid-1990s, the share of non-wood pulp used to make paper was over 50%. However, over the past two decades China has shifted massively towards wood based paper making⁵. According to Hawkins Wright, Chinese non-wood pulp production peaked in 2004 at 10.5 million tonnes but has since fallen to just 3.5 million tonnes in 2015⁶. Driven by pollution reduction initiatives that targeted old-technology, small-scale local agricultural waste paper mills, China lost 7.5 million tonnes of straw-pulp capacity between 2006 and 2011. This has largely replaced by new wood-pulp capacity⁷. RISI predicts a further decline in China by 2020⁸.

Fortunately, new, modern agricultural waste pulp mills with lower emissions technology are in the planning stage or under construction in other regions of the world. This could alter the trend away from agricultural wastes on a global scale. More information can be found in the side bar on agricultural residues.

KEY ISSUES OF CONCERN

A. Shrinking natural forest landscapes from deforestation and forest degradation

Deforestation is the removal of natural forests to convert it to other uses, including when natural forest is converted to intensively managed tree plantations. Degradation is the exploitation of a natural forest over the threshold of its natural capacity of full regeneration, including when natural forest is converted to intensively managed secondary forest. The paper industry consumes around a third of the timber industrially logged globally, and its increasing appetite for wood fibre has been a key challenge in stopping deforestation. However, many in the industry have made voluntary commitments to zero deforestation and other responsible supply chain

Understanding the Data: Forest Loss, No Gain

In its last Global Forest Resources Assessment 2015, FAO noted “an encouraging tendency towards a reduction in the rates of forest loss”. According to FAO, between 2010 and 2015 there was an annual loss of 7.6 million hectares and an annual gain of 4.3 million hectares per year, resulting in a net annual decrease in forest area of 3.3 million hectares. However, FAO considers “planted forests” or industrial timber plantations in their definition of forests, thus, it doesn’t take into account; the natural forest conversion to plantations and deforestation caused by pulp plantation expansion, a phenomenon that in Indonesia has resulted in the loss of millions of hectares of rainforest during the last two decades.

Agricultural residue fibre offers solutions

Author: Neva Murtha, Canopy

To achieve the goals of the *Global Paper Vision* the solutions must include diversifying the fibre basket with low carbon and biodiversity options such as agricultural residue fibres.

But what does this mean in practice? It means there is opportunity to support innovation that helps reduce the pulp and paper footprint in carbon and biodiversity rich natural forest ecosystems with alternative fibres, including wheat straw left over from the grain harvest, and a range of other agricultural fibres.

Twenty years ago, eight to ten percent of paper globally was made from “agri-fibres”¹ while today it’s closer to 3%², with China and India still leading the world in production of papers with these fibres. While North America spent the last century investing in wood pulping, its vast agricultural heartlands are untapped resources for this paper fibre – until recently.

Every year in North America millions of tonnes of agricultural residue, like wheat straw and other fibres, have been going unused or burned as a waste product in many regions, creating other environmental and climate impacts, while forests are logged to make disposable paper products. These agricultural fibres when used in paper can provide the new fibre in the system the paper industry says is needed and is currently supplied by trees.

requirements, and have the opportunity to contribute substantial leadership to the successful reversal of this trend.

Pulp mills need high volumes of timber to operate. In some regions, especially in the northern hemisphere, paper is still produced by logging natural forests, with worrying impacts, especially in the slow-growing boreal forests. In other regions, mostly in the southern hemisphere, increasing paper production is driving a rapid expansion of pulp plantations that is wiping out some of the world's last rainforests and other critical habitat.

It should be of global concern that deforestation is concentrated in the most biologically diverse and carbon-rich habitats: the loss of natural forest continues to run at the unsustainable pace of 7.6 million hectares per year. And while annual forest loss was 0.13% in 2015, in the same year natural forests decreased more quickly, at 0.24%⁹. According to satellite-based monitoring, deforestation increased 9% in 2011–2014 compared to the 2001–2010, notably driven by increase of natural forest loss in Brazil¹⁰.

Another issue of grave concern is the loss of Intact Forest Landscapes (IFL), mosaics of forest and other natural ecosystems with almost no linear disturbance (i.e. roads), no considerable human impact, and a minimum area of 500 km². Although the world's remaining IFLs comprise only 20% of tropical forest area, they account for 40% of the total above-ground tropical forest carbon, and they are disappearing quickly.

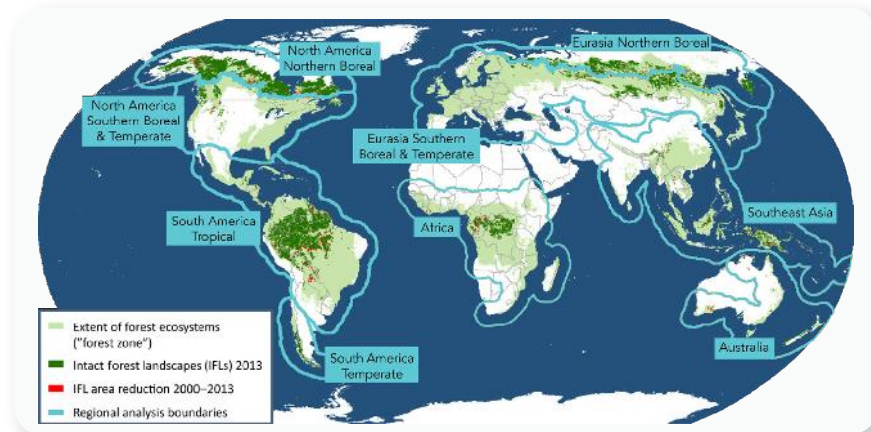
Through environmental not-for-profit Canopy and its Second Harvest initiative, corporations such as Staples, EarthColor and over one hundred fashion brands have expressed clear interest in buying agricultural residue paper, packaging and/or textiles as they become available. Canopy has been a leading advocate for agricultural residue fibre while supporting market growth for these papers.

Canopy's market survey of 180 companies representing combined sales of more than \$100 billion USD has identified 1.4 million short tons of unmet demand for a range of printing and writing grade papers alone. Learn more about the Second Harvest project at <http://canopyplanet.org/solutions/straw-pulp-and-paper/>

North America has been the focus of several notable and positive developments since the last EPN State of the Paper Industry Report. In 2015, Kimberly-Clark Corporation launched a line of products that incorporates fibres such as wheat straw and bamboo, into some of their most well-known towel and tissue product brands. These innovative offerings required the development of an entirely new supply chain to directly obtain wheat straw from U.S. farmers and the creation of a first-of-its-kind manufacturing process for converting plant fibre into pulp³.

There are strong signs that that new supply chain is beginning to be developed. Late in the summer of 2017, Columbia Pulp broke ground in southeast Washington, USA for what is currently slated to be the largest wheat straw pulp mill in the world, producing

Figure 3: Intact Forest Landscapes, 2013



IFLs are critical for stabilising terrestrial carbon storage, harbouring biodiversity, regulating hydrological regimes, and providing other ecosystem functions. The IFL mapping team (Greenpeace, Global Forest Watch, WWF Russia, Transparent World, The Global Land Analysis and Discovery laboratory in the Department of Geographical Sciences at the University of Maryland) used stratified sampling to identify the primary causes of the IFL area reduction.

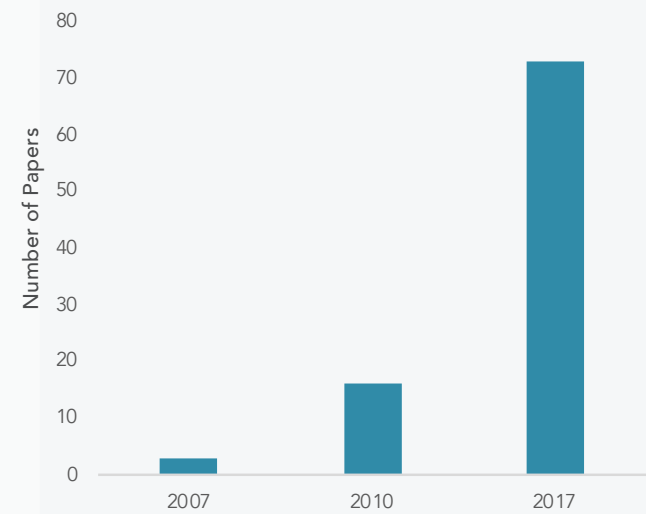
The latest mapping of IFLs shows that their global extent has been reduced by 7.2% since the year 2000. The increasing rate of global IFL area reduction is largely driven by the tripling of IFL tropical forest loss in 2011–2013 compared to that in 2001–2003¹¹.

At the global level, the leading fragmentation and alteration causes were timber harvesting, including for papermaking (37% of global IFL area reduction), agricultural expansion (27.7%) and wildfire often spread from infrastructure and logging sites (21.2%). It is interesting to note that three countries that comprise 52% of the total reduction of IFL area are major producers of pulp and paper: Russia (179,000 km² of IFL area lost), Brazil (157,000 km²) and Canada (142,000 km²).

140,000 short tons of unbleached pulp annually.

There are at least three other North American wheat straw and/or other agricultural residue fibre pulp mill projects that are currently working to break ground in the next few years, and products with agricultural residue fibre are expected to continue to become much more widely available.

Figure A: Number of papers with agricultural residues or other tree-free fibres⁴ available in North America⁵



B. The climate connection

Deforestation and degradation are not the only consideration in sourcing fibre responsibly. Climate change and the carbon footprint of fibre, paper and suppliers are also critical considerations. For a long time the paper industry has been linked to climate impacts because the pulp production has an extremely high rate of energy consumption. Furthermore, when discarded in landfills, paper releases methane, a potent greenhouse gas. In recent years, the climate impacts of forest management have come more into focus. While some elements of the logging industry promote the idea that planting trees removes carbon from the atmosphere, recent research shows that land use change related to pulp fibre production is actually a significant source of greenhouse gas (GHG) emissions. It is well known that forest degradation due to improper logging practices can result in net loss of carbon, but it is now becoming clearer that even plantations can have significant impact on the climate.

An important case is the Indonesian pulp and paper industry, which has boomed since the 1990s by rapidly expanding pulp plantations into peat swamp forests: logging them, draining them and converting them into acacia plantations. Drained peat is a particularly high source of greenhouse gas emissions through its oxidation and increased susceptibility to burning. As a result, GHG emissions from the Indonesian pulp and paper sector are estimated at 88 million tonnes of CO₂ per year from peat oxidation, which is more than Finland, indeed more than the total GHG emissions of 39 countries in the world, and equivalent to more than 20 large coal-fired power stations¹². (See Chapter 5 of this report for further discussion).

C. Illegal logging

Over the past few decades, illegal logging and related trade has been one of the drivers of deforestation, but fortunately recent efforts to improve governance have resulted in a significant decline in illegal logging. These include legislation improvements in Europe (European Union Trade Regulation (EUTR)¹³), in the USA (revised Lacey Act¹⁴), in Australia (Illegal Logging Prohibition Act¹⁵) and several other paper producing countries. Despite this substantial progress, in 2013 more than 80 million cubic metres of timber were illegally produced in the nine producer countries analysed by British think-tank Chatham House¹⁶. According to a 2014 Chatham House paper, the export of paper or pulp with considerable risk of illegality is high in Indonesia (70–80%), Russia (10%), China (10%) and Brazil (2%)¹⁷. Recent efforts by different governments to curb the illegal logging trade have likely helped to dramatically reduce these numbers, but have, but have not eradicated illegality. Illegal logging practices are constantly changing to adapt to new legislation, becoming more sophisticated and more difficult to detect. As a result, the risk of sourcing wood fibre of illegal or uncertain origin, while much less widespread, still remains a relevant factor. An example is the EUTR legal loophole that excludes printed products, allowing illegally logged fibre to be ‘laundered’ through countries such as China, via packaging producers and printers. Therefore, robust analysis of chain-of-custody is critical to prevent paper buyers from becoming involved in the trade of illegal goods.

D. Genetically modified trees plantings and trials

Genetically Modified (GM) organisms are one of the most controversial issues in paper sourcing especially because sufficient risk assessment is very difficult due to the complexities involved¹⁸. These include the complexity of trees as organisms; their large habitats and numerous interactions; their low level

of domestication; their long life-span; their ability to spread seeds and pollen over great distances (including across national borders); and their deep interrelation with soil fungi and microorganisms.

Recent years have marked an expansion of GM tree trials. In order to deal with the increasing demand for pulp fibres and the shrinking availability of land to expand plantations, the paper industry, especially in South America and China, has sped up the development of transgenic trees that can offer a higher yield or higher productivity. According to the FAO, in 2010 the majority of field trials were in the United States. However, planting of GM trees was also taking place in Australia, Canada, Chile, France, Italy, Japan, New Zealand and South Africa¹⁹. But according to the NGOs network World Rainforest Movement (WRM), GM trees field trials have now expanded to Australia, Belgium, Brazil, Canada, China, Denmark, Finland, Germany, India, Indonesia, Israel, Malaysia, Poland, Spain, Sweden, Thailand and the United Kingdom²⁰, and are leading to conflicts with local communities and environmental groups²¹.

Figure 4: Genetically modified tree planting and trials



Protests against GM tree expansion have been recorded in the United States²², in Chile²³, in Belgium²⁴ and especially in Brazil, where field trials of fast growing GM eucalyptus expanded quickly under the direct initiative of the paper industry: in April 2015, FuturaGene, a biotechnology company controlled by pulp and paper giant Suzano Papel e Celulose S.A.²⁵ gained approval of its GM eucalyptus for commercial use in Brazil,²⁶ despite many concerns²⁷. The expansion of field trials and the approval of transgenic eucalyptus led to conflicts with local communities and farmers²⁸.

Due to the impossibility of doing a full socio-economic and ecological risk assessment of the effects of GM trees, the *Global Paper Vision* guides paper companies to refuse to source fibre from genetically modified organisms.

E. Human Rights, Land Grabbing and Labour Rights

Whether it is in sourcing decisions or in pursuit of landscape conservation initiatives, all stakeholders have a responsibility to address human rights and to employ best practices. These issues are discussed in detail in Chapter 3 of this report on the topic of Ensuring Social Responsibility.

MEASURES TOWARDS RESPONSIBLE FIBRE SOURCING

A. Opportunities for leadership and conservation

When stakeholders engage in the pursuit of conservation solutions and a responsible source of fibre, progress can be made towards the goals in the *Global Paper Vision*. An example of this is the landscape level conservation agreement for the Great Bear Rainforest in British Columbia, Canada, finalised in February 2016. This coastal temperate rainforest encompasses 6.4 million

hectares, over half of which is naturally covered by forests (3.6 million hectares). The Great Bear Rainforests is a sensitive, ecological gem, a home to many First Nations and a sought-after source of economically valuable, old-growth forests, with trees growing as old as one thousand years. After nearly twenty years of conflict, then collaboration to find a solution, the final Great Bear Rainforest conservation and human well-being framework was the result of a process involving First Nations, the Provincial government of British Columbia, environmental organisations, and forestry companies working towards a resolution. Large customers with responsible paper sourcing commitments contributed to both launching the process and to marketplace accountability for completion of the project. The final agreement protects 85% of the region's forests (3.1 million hectares), with logging in the remaining 15% (550,000 hectares) subject to the most stringent commercial logging standards in North America. The legal and policy framework increases aboriginal rights to shared decision-making over land use in their territories and includes measures to improve economic opportunities for the 26 First Nations that reside in the region through a greater share of timber rights (within the reduced logging scenario) and over \$130 million (CDN) in funds for non-extractive economic development and conservation management. This agreement is a visionary example of the long-term solutions that can be achieved, and offers a model that can be adapted in other endangered forest regions of the world needing to resolve conflict over land use, indigenous rights and large-scale conservation in places under pressure from the expanding extractive industries.

B. Deforestation- and degradation-free commitments

A recent WWF study noted that almost half of global production of the commodities that are driving deforestation are controlled by fewer than a hundred multinational companies, and moving these companies towards “no deforestation, no exploitation, no peat” policies that are fully implemented could make a decisive

contribution towards stopping deforestation²⁹. Recently, many major market actors, perhaps most notably the Consumer Good Forum (CGF) have committed to make their supply chain deforestation free, often in larger partnership such as the Tropical Forest Alliance 2020 (TFA 2020), or the New York Declaration on Forests (NYDF), with ambitious global targets to protect forests and end natural forest loss by 2030.

However, according to SupplyChange, only 43 (10%) out of the 415 companies with commitments have set company-wide targets that cover all commodities relevant to the company's portfolio³⁰. Most corporate commitments relate to a specific commodity or a single region, traceability systems are not always implemented, and often do not cover the full supply chain. Critical issues in implementing these commitments has been outlined by a recent FERN report³¹, while major implementation failures in specific cases have been investigated by RAN in its ‘Beyond Paper Promises’³² portal.

A key case study is the Indonesian paper industry, led by the two paper companies Asia Pulp and Paper (APP) and Asia Pacific Resources International Limited (APRIL), which between them represent more than 80% of Indonesian production. Both companies, after decades of forest destruction and land grabbing, have committed to address their impacts³³. These commitments have been a step forward and have led to some meaningful reforms; however, they are far from being fully implemented and the companies' plantation management are still linked to massive adverse social, environmental and climate impacts. Monitoring of these companies is ongoing as they are a litmus test of the industry's ability to implement the genuine transformation needed to achieve the *Global Paper Vision*.

C. Certification

Unilateral commitments are often difficult to evaluate and to monitor, which is why the *Global Paper Vision* requires that any virgin wood fibre for paper should be sourced from forest managers that have credible, independent, third-party certification for employing the most environmentally and socially responsible forest management and restoration practices.

The Forest Stewardship Council (FSC) is currently the only international certification programme that comes close to meeting this goal. Despite part of the industry still preferring weak and less demanding certification schemes, market demand is driving the growth of FSC.

As shown in Figure 5, as of September 2017, the forest area under FSC certified management covered 197,817,395 hectares³⁴. In North America, 79% of this total FSC certified area is in Canada. Using FAO data, this is almost half of certified forests (438,000,000) and about 9% of forest area in permanent forest land use, which covers 2,166,000,000 ha³⁵. Over 17% of timber harvested in plantations is FSC certified³⁶.

The volume of annual FSC-certified output in 2014 was 300,000,000 cubic metres. This represents 8% of total world wood production (including fuelwood), and 16.6% when compared only to industrial roundwood production³⁷.

FSC still remains the most robust certification scheme, despite a number of weaknesses, including the potential failure prevent indirect deforestation, protect local community rights, protect tropical peatlands and prevent fires in large scale plantations and to protect intact forest landscapes in Russia, the Canadian boreal, and in the Congo Basin.

See Figure 5 on page 43

FUTURE PRODUCTION

While North America (US and Canada) in 2015 (latest FAO stat data set) is still the largest pulp producer, followed by Asia, Europe, Latin America and Russia, new pulp milling capacity is being created mostly in South America (notably Brazil), Russia, Asia (mostly Indonesia), and Northern Europe. A pulp mill based on wood fibre needs to be located fairly close to timber sources (forests or plantations) in order to be economically viable, which potentially leads to overexploitation of forest in the surrounding areas. Normally, the sourcing area is not more than a 200 km radius, at least in the absence of railway or water connections (with the exception of the Chinese and Japanese markets, which use considerable volumes of imported woodchips³⁸).

EPN research on pulp mill capacity expansion³⁹ identifies critical risks from this production shift:

- there is a very large concentration of new milling capacity in Brazil, especially in Mato Grosso do Sul in the Três Lagoas region⁴⁰, where large-scale eucalyptus plantations are pushing the cattle ranches that used the area further into the Pantanal (indirectly causing deforestation)⁴¹.
- in Asia, pulp expansion is threatening the last Indonesian rainforests, increasing emissions from peat management. There is also expansion in the Mekong region.
- expansion of pulp milling threatens the boreal forest of Siberian and European Russia.
- signs of new pulp mill capacity in Mozambique, and possibly Nigeria, associated with eucalyptus plantation expansion, highlights the growing risk of a new wave of land acquisition and social conflict for pulp in Africa.

See Figure 6 on page 44

Figure 5: Area of Forest Stewardship Council-certified forest, September 2017

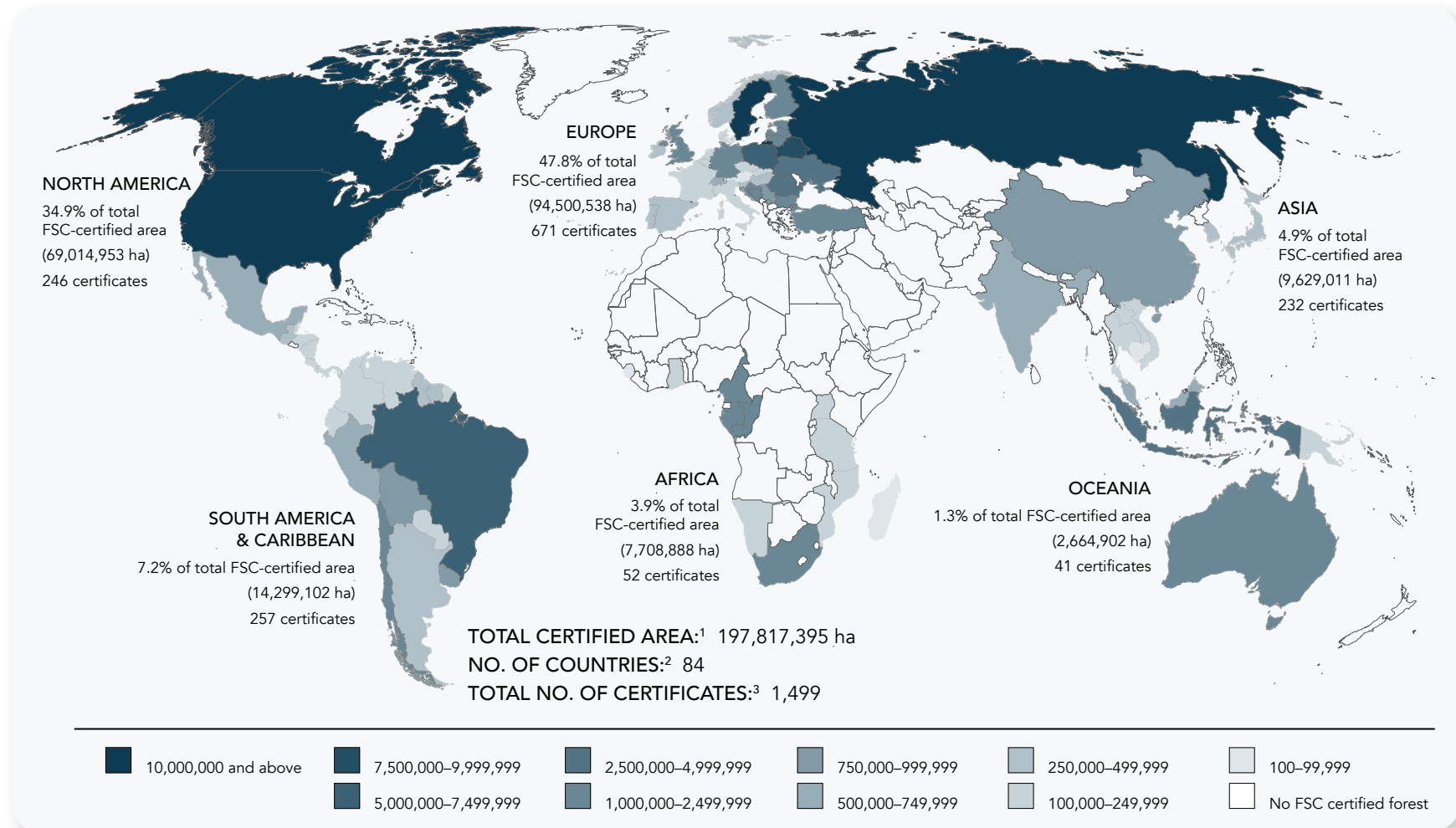
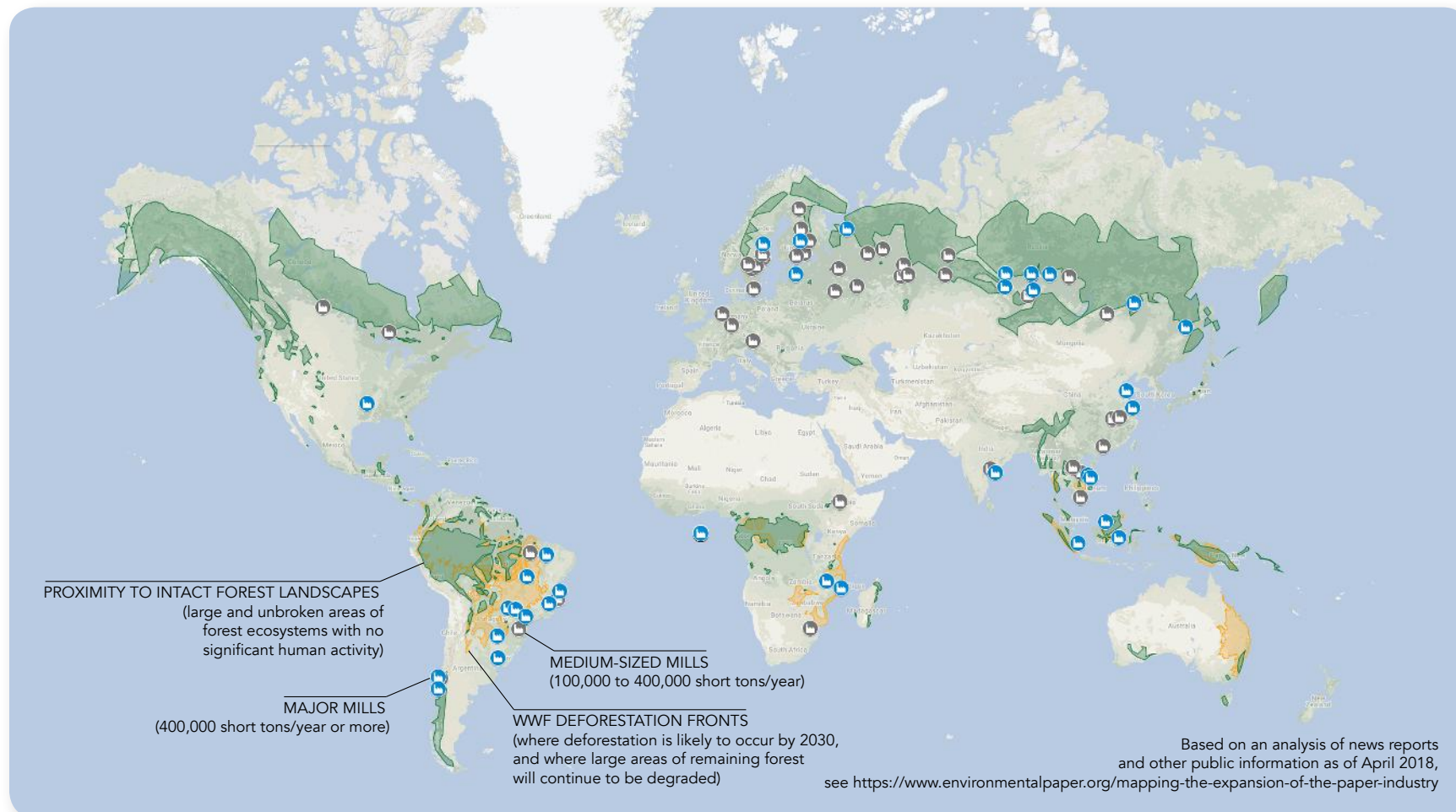


Figure 6: EPN mapping of planned or proposed new pulp milling capacity



KEY ISSUES AND OPPORTUNITIES FOR THE FUTURE

Wood fibre sourcing for paper remains a very sensitive matter and has a significant impact on environmental outcomes in regions around the world. As the global demand for wood products grows, increasing pressure is being placed on the world's forests and some key issues for the industry have been identified, including:

- the impacts of a global boom in pulp mill construction on communities and forest resources, particularly in the global South. Growth is especially strong in South America and in Southeast Asia, but industry expansion in new regions such as Africa are also planned.
- the role of natural and intact forests in reaching global climate agreement targets.
- the development of alternative fibres with proven reduced life cycle impacts.
- the protection of shrinking Intact Forest Landscapes.
- the role of Forest Stewardship Council certification, as it grows and simultaneously seeks to maintain the integrity of its standards.
- the association and interaction of fibre sourcing for pulp with different agricultural commodities driving deforestation and forest degradation, such as cattle ranching and palm oil plantations.
- the growth and risks of genetically modified tree cultivation for pulp and paper production.

Companies can demonstrate environmental leadership and impact the outcomes for the world's forest ecosystems by:

- understanding the sources of fibre for their pulp, paper and/or other forest products.
- establishing a formal policy committing to avoiding fibre, products and companies associated with deforestation, natural forest conversion, drainage of tropical peatlands, human rights violations, or lacking credible certification.
- choosing paper products and suppliers with strong environmental credentials. For example, a growing list of leadership paper products available in North America can be found on the EcoPaper Database at <http://epd.canopyplanet.org>.
- instituting strong measures to make sure that commitments are effective and result in improved and independently verified outcomes on the ground for communities, biodiversity and the climate.
- engaging in multi-stakeholder, landscape level conservation initiatives in endangered forest regions linked to company supply chains.

5

REDUCING GREENHOUSE GAS EMISSIONS

Lead Author: Jim Ford, Climate for Ideas

THE PAPER INDUSTRY AND CLIMATE CHANGE

The *Global Paper Vision*, lays out the critical areas for attention in the debate about climate change and the paper industry, and calls on industry, consumers, retailers, governments, investors and non-governmental organisations (NGOs) to commit to actions encompassing the following priorities:

- reduce total energy consumption and high-emission energy sources.
- change from fossil fuels and other high-emission energy sources, including from unsustainable biomass, to only responsibly produced low-emission biomass and other renewable energy sources.
- reduce soil emissions, particularly from peatlands and other high carbon stock soils.
- maintain and enhance carbon storage in managed forests and other ecosystems.
- promote technological innovations and design production systems that increase energy efficiency and reduce greenhouse gas emissions.
- apply greenhouse gas reduction goals and regular reporting which accurately accounts for the landscape and biogenic greenhouse gas emissions of paper production, including carbon debt.

With climate change, the world and global civilisation face a threat that surpasses all others. The release of carbon dioxide, methane and other greenhouse gases is increasing atmospheric concentrations of heat-trapping gases, while the disappearance of our once thick and extensive forests and the increased burning

Pulp and Paper on Tropical Peatlands **Author: Bas Tinhout, Wetlands International**

Emissions from drained and degrading peatlands (organic soils) amount to almost double the amount of CO₂ emissions from aviation, even when skyrocketing emissions from peat fires are not included. Peatlands cover only 3% of the global land surface while storing twice the amount of carbon as forests¹. Some 15% of these peatlands have been drained for agriculture, forestry and grazing, which leads to the release of the carbon stored in their soils. Degrading peatlands contribute no less than 5% to total global anthropogenic emissions. The largest emissions from peatlands are from Southeast Asia, especially Indonesia followed by the European Union. Many nations who are small emitters have relatively high emissions from peatlands in comparison to their emissions from energy and cement.²

In Indonesia, about 1.1 million hectares of peatlands are drained Acacia plantations for the production of pulp. Most of these plantations are from Asia Pulp and Paper (APP), Asia Pacific Resources International Limited (APRIL), or its subsidiaries. Using conservative estimates, these plantations will emit 80 million tonnes of CO₂ annually, which is the equivalent of 23 coal-fired power plants³. Unlike claims made by the industry, drainage-based plantations on peatlands cannot be managed sustainably⁴ and with best practices only reduce about 20% of the emissions⁵.

Dried out peatlands are susceptible for fires that return

of wood are accelerating the problem. Melting ice sheets, thawing permafrost, damaged peatlands and changing weather patterns are altering the atmosphere and creating feedback loops that are speeding climatic changes¹.

This threat has two essential dimensions: one long-term, the other short-term. The first involves the human-driven release of long-lived pollutants such as carbon dioxide (CO₂). These emissions come mostly from the use of fossil fuels and burning biomass for energy, as well as from harvesting, deforestation and lost productivity in forests. The second comes from the human-driven release of short-lived climate pollutants, especially methane².

The global pulp and paper industry both relies on and heavily impacts the world's forests, which, at the same time, are slowly being seen as having vast potential to help mitigate climate change. As a contributor to both of the dimensions described above, the industry has an essential role to play in any successful strategy to avoid the worst effects of a warming planet. Danna Smith of the Dogwood Alliance and Dr. Bill Moomaw of Tufts University have found that,

"If we halted deforestation, protected existing forests, and expanded and restored degraded forests, we could reduce annual emissions by 75% in the next half a century. If fossil fuels were rapidly phased out during this same time period, we could reduce the amount of carbon in the atmosphere, meet the goals of the Paris Agreement and avoid catastrophic climate change. But, we cannot solve the climate crisis without a major scale-up in forest protection and restoration across the planet³."

Industry reports give some picture of fossil fuel emissions and efficiency trends, and they reveal varied performance in different

in every dry season and are a huge contribution to GHG emissions. The dry season of 2015 caused more emissions from fires than annual emissions from Japan or Germany in just a few months and on some days, exceeded daily emissions of the US economy⁶. In that year, choking haze affected the health of millions of people, caused 100,000 premature deaths⁷ and an estimated 16 billion USD of economic losses⁸. Loss of soil carbon to oxidation and fires causes peatland subsidence. As many of these peatlands have their base at or below sea level, subsidence leads to flooding⁵ with disastrous consequences, including the loss of productivity. This subsidence is projected to occur in the Kampar Peninsula in Sumatra⁹, if peatlands are converted for paper fibre production as planned.

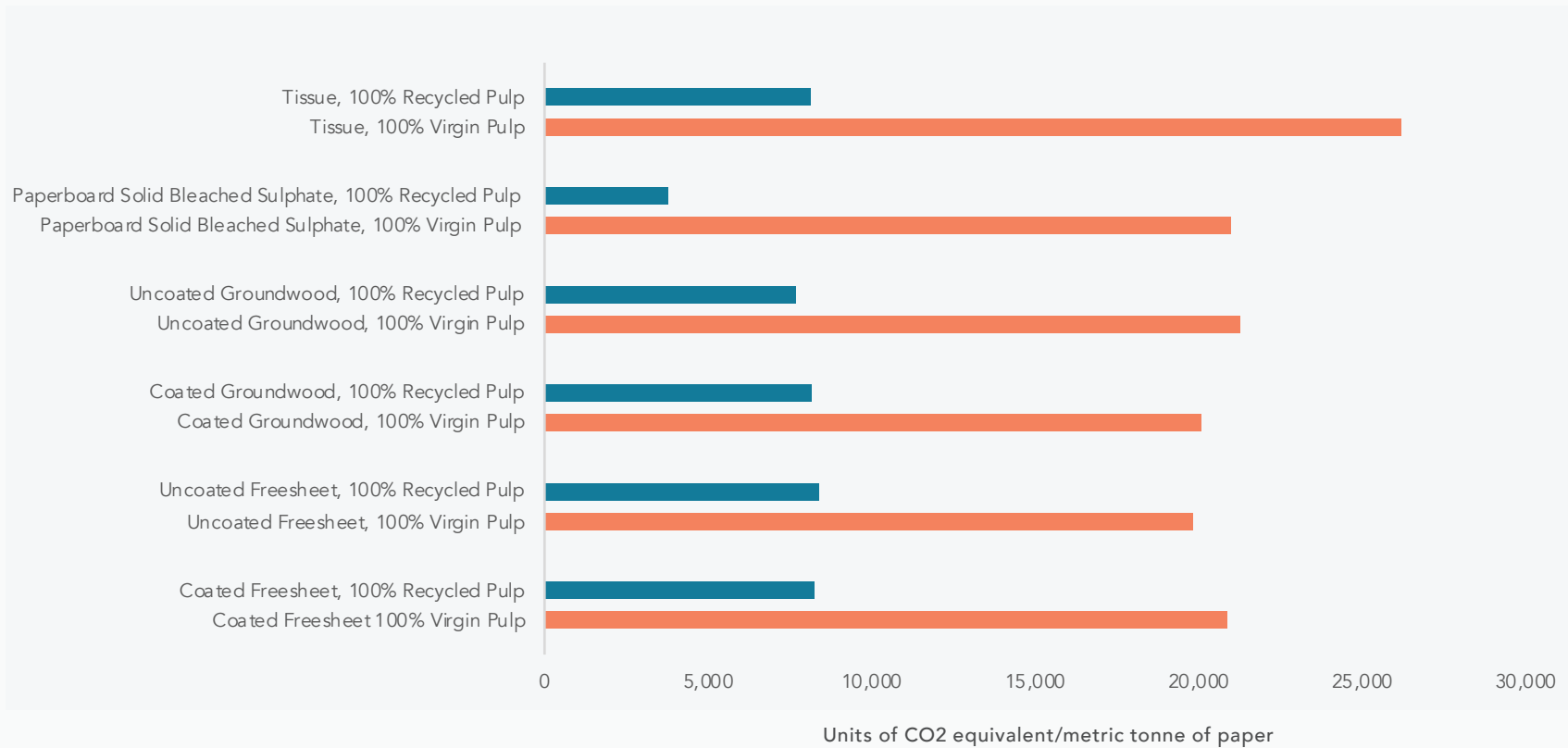
Emissions, fire and haze and subsidence and flooding can be reduced, however, by rewetting the drained peatlands. This can involve alternative forms of utilisation like paludiculture, the economic use of rewetted peatlands with alternative species¹⁰. Paludiculture prevents peatland degradation as it does not use drainage and offers an incentive for rewetting already degraded peatlands. Introducing paludiculture is an opportunity for inclusive economic growth in peat landscapes in which communities are actively involved in land use planning and management together with companies. The wet peatlands can be sustained in a productive state, which reduces pressure on remaining land, reduces off-site drainage impact to peat swamp forests, and conserves valuable wildlife habitat. The pulp and paper sector has shown insufficient commitment to tackle peatland-related issues³. The

regions. A study by Ekono, Inc.⁴ shows that mills in mainland Europe, North America and South America are generally more fossil fuel-intensive than Swedish and Finnish mills. However, data for all countries is not available, complete or reported in similar ways, making a detailed and complete assessment of the greenhouse gas emissions of the global paper industry difficult. It is possible, however, to determine that the greatest divergence between the performance of individual mills within regions occurs in mainland Europe and North America.

In North America, the EPN's Paper Calculator v4.0, to be released online in 2018, has calculated many environmental impacts from the production of different paper types. The most striking difference between climate impacts of various mills occurs between recycled and virgin wood-based mills. Recycled paper products have half or less the climate impact of virgin paper in all paper grades in the Paper Calculator. For tissue products, the difference is even greater: recycled products have a climate impact of around 30% that of tissue products made from virgin wood⁵.

sector has stopped developing new peatland areas but continues draining peatlands in their current plantations. As half of the sector's operations in Indonesia are on peatland, this is one of the most significant land use and climate management issues facing the industry. For example, the supply-base of the OKI Pulp and Paper Mill in South Sumatra depends 70% on peatlands, creating a huge risk to the already insufficient supply-base for sustainability¹³. APP has retired 7,000 hectares of pulp wood plantation of peat swamp forest restoration and planting alternative species (Paludiculture)¹⁴, an industry first and a step in the right direction. However, this only constitutes 2% of APPs total managed area according to business as usual³. The sector should actively conserve and restore all remaining peat swamp forests, plan to phase out drainage based uses of peatlands and introduce paludiculture, where appropriate.

Figure 1: Greenhouse gases/climate change impacts (units of CO2 equivalent/metric tonne of paper)



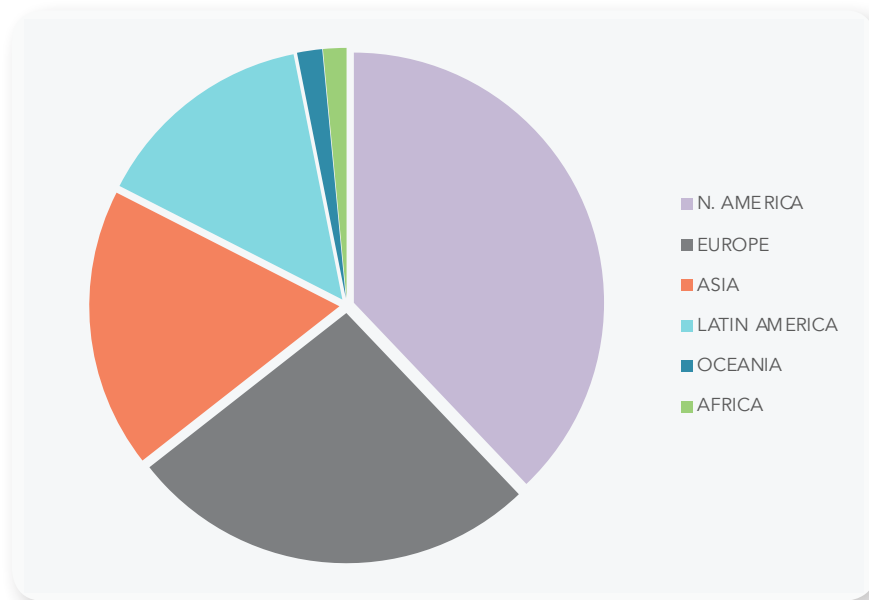
THE PAPER LIFE-CYCLE

As with any industrial sector Life-Cycle Assessment (LCA), a complete analysis should include all steps in a product's life-cycle including raw materials acquisition, manufacturing, distribution and end of life. Below we go step by step through the most significant steps in the paper life-cycle to identify climate impacts and the most impactful activities in the industry, and point to solutions on the horizon. Results from academic and industry studies have been reviewed to compile an assessment of the carbon footprint at each step of the life-cycle of paper production. These results allow for the following conclusions regarding the distribution of climate change impacts throughout the life-cycle of a given product. Note that the disparity among reporting methods and analysis methodologies means that the figures below should be taken as indicative. A thorough and credible, globally comprehensive life-cycle analysis of the full range of paper products does not yet exist. Upon completing our review⁶, we found:

- the direct and equivalent emissions from forest landscape impacts, including the release of carbon from trees (as CO₂) and forest ecosystems, in addition to the loss of sequestration due to harvest and the regrowth of trees post-harvest, constitutes around 11.7% of paper production and consumption's climate impact.
- the burning of organic material sourced from trees for energy in the pulp and paper manufacturing process, including the parts of the tree that are not usable for paper, such as bark, constitutes around 40.3%.
- fossil fuel energy use in the pulp and paper manufacturing process constitutes around 21.7%.

- printing and converting, or turning of sheets of paper into products, constitutes around 7.2%.
- landfilling of paper constitutes around 10.6%, largely the result of methane emissions.
- all other impacts such as harvesting vehicle emissions and transport constitute around 8.5%.

Figure 2: Assessed carbon footprint of the steps in the life-cycle of paper production



CARBON BALANCE IMPACTS OF FOREST HARVEST

Harvesting forests for paper products can lead to the release of carbon stored in the landscape via the loss of biomass and increased decomposition rates⁷. Furthermore, the removal

of mature trees from a stand results in up to several decades of lower sequestration rates at the harvested site⁸, and an opportunity cost compared to the carbon that could have been sequestered if the trees had not been cut. Some wood products do store a portion of their carbon in long-term carbon 'pools,' but for paper products, such as books, this is a very small minority of their carbon, even in the short term⁹.

Take for example a recent scientific study by Harris et al.¹⁰ on the impacts of harvest and other disturbances in U.S. forests, which concludes:

"The highest fractional contribution of C loss in all states was from harvest [...], and 64% of these losses were from logging residues [both above- (19%) and below ground (23%)] and mill residues (22%) [compared with losses from other disturbances, such as forest fires]. Across all wood product classes, the production of pulpwood resulted in the highest forest C losses (26 Tg C year⁻¹), followed by saw logs (18 Tg C year⁻¹) [...]."

That is, it is logging for the forest products and paper industries that contributes to the greatest forest carbon losses from forest ecosystems of any impact category, ahead of disturbances caused by insect infestations, and forest fires.

This is a global phenomenon. An analysis of data by the Natural Resources Defense Council also found high net emissions in the boreal forests of Canada. There, clearcutting is responsible for an estimated 26 million metric tonnes of carbon dioxide emissions annually—an amount equivalent to the annual emissions of 5.5 million vehicles. An average of over 400,000 hectares (1 million acres) of logging with clearcutting practices occurs across the boreal each year¹¹.

Emissions from land use can be particularly high from degrading tropical peatland forests, which can be found in high concentration in Indonesia. As the Sidebar to this chapter discusses, about 1.1 million hectares of peatlands in Indonesia are drained acacia plantations for the production of pulp, and are estimated to emit 80 million tonnes of CO₂ annually¹².

There are two issues regarding harvest and climate impact. The first is carbon storage of forests – how much carbon is stored in the forest and how much is released to the atmosphere. The second is carbon sequestration – the rate at which carbon is removed from the atmosphere and taken up by forests in the form of trees, leaves and soils. In temperate zones, where most wood for paper originates, and where rotations are often 30–50 years, very young or recently planted forests can take decades to return to the rate of sequestration of older forests¹³ [see Figure 3], and can take a century to get back to the level of carbon storage present at the time of harvest. On a landscape level, regular harvest lowers storage across that landscape and creates a resulting greater quantity of carbon dioxide in the atmosphere, even with selective harvest and best management practices^{14,15,16} [see Figure 4]. In the last decade numerous peer-reviewed studies have confirmed this, including a recent paper in *Global Change Biology* entitled, ‘Large-scale bioenergy from additional harvest of forest biomass is neither sustainable nor greenhouse gas neutral.’ The study’s authors write, “The notion of carbon-neutrality is based on the assumption that CO₂ emissions from bioenergy use are balanced by plant growth, but this reasoning makes a ‘baseline error’ by neglecting the plant growth and consequent C-sequestration that would occur in the absence of bioenergy production¹⁷.”

Figure 3: Rates of carbon accumulation in forests at different ages since disturbance

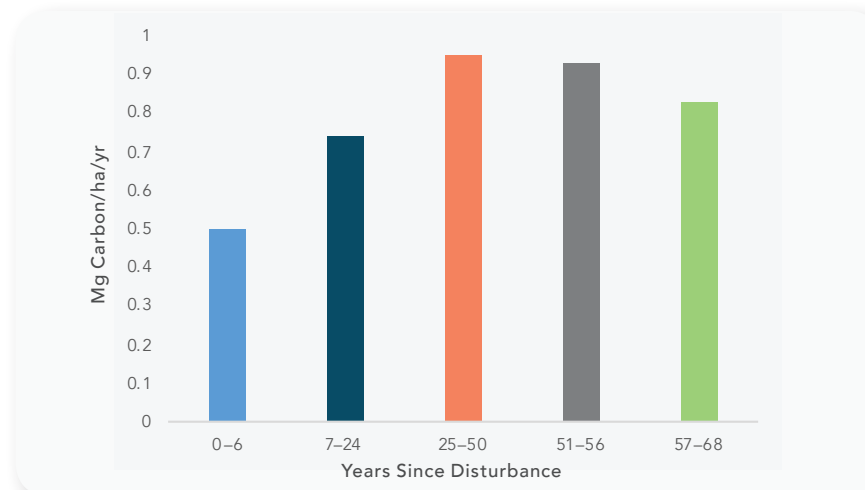
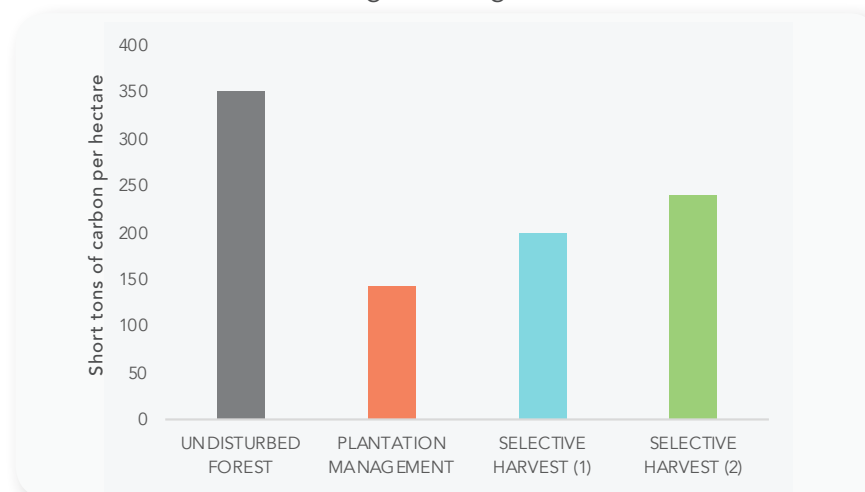


Figure 4: Storage per hectare under different management scenarios, using Edinburgh Forest Model.



ENERGY USED IN PRODUCTION/ MANUFACTURE

Papermaking is an extremely energy intensive industry. The Energy Information Agency (EIA) reports in its *Energy Outlook 2016* (Chapter 7) that pulp and paper manufacturing accounts for 6% of all delivered energy consumption in the US¹⁸. This is behind chemicals (~18%), iron and steel (~10%), and oil and gas refining (~7%). Delivered energy are those fuels and electricity purchased by the mills in question and does not include the energy produced by the burning of wood and wood by-products produced at the mill, which may more than double total energy consumption for the sector.

The paper industry has doubled down on the problematic assumption that bioenergy is carbon-neutral (which in this context involves the burning of trees, woodchips, sawdust, pulping liquors, etc at mills to produce the energy used by the mill). In fact, using more bioenergy means an increase, not a decrease, in emissions of carbon dioxide from these mills¹⁹. A recent report by the International Confederation of Forest and Paper Associations (ICFPA) stated that the bioenergy portion of the fuel mix for the industry had increased from 53% in 2004–2005 to 61% in 2013–2014²⁰. This displacement of some fossil fuel use with a fuel that can have its emissions written off as “neutral” leads to reporting of reduced greenhouse gas emissions by companies and industry associations. However, these trend lines do not capture the industry’s true impact on the climate.

Wood and bioenergy is, in general, a poor energy source. A recent Chatham House report on bioenergy and climate²¹ stated: “Overall, while some instances of biomass energy use may result in lower life-cycle emissions than fossil fuels, in most circumstances, comparing technologies of similar ages, the use of woody biomass for energy will release higher levels of emissions

per unit of energy than coal and considerably higher levels than gas.” This is due to the low heating value (the inherent energy in a fuel) and higher moisture content of wood compared to other fuels²².

The EIA does expect the share of the U.S. pulp and paper sector’s purchased energy to decrease, largely due to the moves toward using less paper for many end-uses and relying more on digital information storage instead over the coming years. At the same time, there is a hopeful, if small (5%), increase in energy efficiency (the amount of energy consumed per unit of production) in pulp and paper mills worldwide, according to self-reported company data compiled by the ICFPA²³.

RAW MATERIALS: ALTERNATIVE FIBRES

Alternative fibres such as agricultural residues could replace much of the wood that we currently use in paper making, leading to greater industry efficiency and lower climate impacts. As Figures 6 and 7 show, from a Life-Cycle Assessment undertaken for tissue manufacturing company Kimberly Clark by the Georgia Institute of Technology²⁴, softwood-based pulps require the greatest use of fossil fuels for production and have the highest greenhouse gas emissions. Note that this does not include the vast amounts of bioenergy also consumed by virgin wood pulp, which would represent an even larger climate impact when accounted for accurately. Additionally, it does not include the additional climate benefits captured by using an agricultural “waste” such as wheat straw residue, that is otherwise burned in many regions to clear it from the fields²⁵.

Figure 6: Total fossil energy use for production of one ton of pulp with the baseline allocations for kenaf and wheat straw (kg oil equivalent per ton pulp)

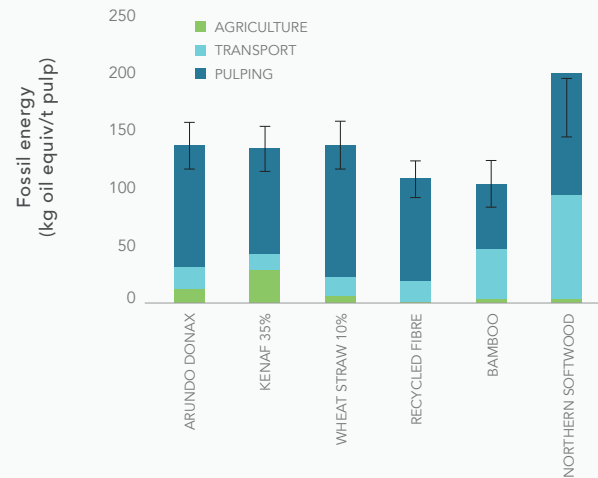
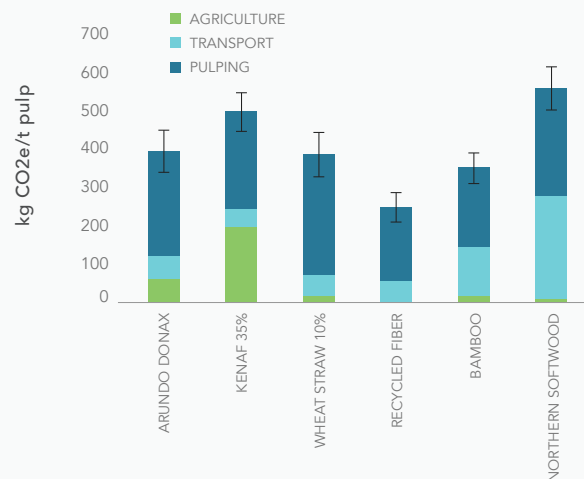


Figure 7: Greenhouse gas emissions from fossil fuel and chemical inputs in the production of pulp



METHANE: LANDFILLS, FOSSIL FUELS, BIOENERGY

Methane is a very powerful, but short-lived, greenhouse gas, with 86 times the global warming potential of CO₂ over a twenty-year timeframe. Methane is produced and released during a number of paper life-cycle steps (i.e. when fuels are burned and when paper decomposes in landfills). In addition, forest harvest in areas with significant peatlands often leads to major releases of stored methane as those peatlands dry up following harvest.

Because it is such a potent greenhouse gas, methane emissions are one of the top sources of paper's climate impacts, and reducing these emissions is critical to global climate change solutions. Utilising more recycled paper products not only reduces the impact by lowering energy needs for manufacturing, it also means keeping waste paper out of landfills where methane is created.

KEY ISSUES AND OPPORTUNITIES FOR THE FUTURE

To reduce the climate change impacts of pulp and paper production, the EPN recommends the following priorities:

- better forest management, including landscape level conservation planning to identify forests to be reserved from industrial logging; longer forest rotations (i.e., the length of times between harvest in a given stand); increasing canopy retention and buffer zones in areas at high risk of flooding or of high biodiversity value. Maintaining High Carbon Stock Forests²⁷ and reserving them from industrial logging would be one of the most effective short-term actions for forestry.

- ensure mill-level and forest-level accounting of carbon and other emissions that are transparent, accurate and complete. This will help to more efficiently identify low-emissions sources of pulp and paper.
- continued innovation in reducing the total energy intensity per unit of product. Employment of existing technologies such as closed loop, totally chlorine free bleaching can also be more widely adopted and have multi-fold benefits.
- greater use of agricultural waste, and other low-impact fibres, as a fibre source. Agricultural fibres can have lower life-cycle emissions. And their increased use in papermaking would also mean more options for keeping carbon on the landscape in the form of healthy forests.
- employ true renewables, such as wind and solar energy, instead of burning forests for energy. Biofuels increase emissions while reducing carbon storage on the landscape.
- end peatlands conversion and reverse conversion damages. As discussed in the Sidebar of this chapter, peat lands conversion, in particular in Indonesia, is a major driving force of climate change globally, not just locally. No peatlands should be converted or destroyed in any place on Earth and no High Carbon Stock Forests, by extension, should be so disturbed.
- reduce methane emissions from landfills. Achieving this requires capturing past landfilling of paper through capping and capturing methane escapes and using that fuel source to produce energy in place of fossil energy sources.
- increase the use of recycled content in paper and maximise the number of lives of recovered fibres through better sorting and avoiding rapid downcycling or disposable uses of the fibres. As the EIA Energy Outlook report stated, “[a]s is the case in other industries, recycling significantly reduces the energy intensity of production in the paper industry²⁸.” Studies show the potential to double the amount of paper currently recovered for manufacturing into new products .

6

CLEANER PRODUCTION

Lead Author: Rune Leithe, Ecology & Pioneering

INTRODUCTION

The pulp and paper manufacturing industry is one of the world's biggest polluters and must evolve to employ best available technologies and new innovations to clean up its act. The sector is not only the fifth largest consumer of energy, accounting for 4% of all the world's energy use, but the process of paper uses more water to produce one ton of product than perhaps any other industry¹. On average 10 litres of water are required to make one A4 sheet of paper – in some cases, it's as high as 20 litres².

The chemically intensive nature of the paper pulping and bleaching process is far from clean. The toxic chemicals used often end up being discharged as effluent into waterways where they pollute rivers, harm eco-systems, bio-accumulate and eventually enter the food chain. Besides carbon emissions, pulp and paper mills also release air pollutants in the form of fine particulate matter (PM2.5), nitrogen and sulphur oxides which can also affect public health.

While the industry has made some progress in recent years to operate more sustainably, it has been slow to adopt advances in technology that can deliver higher energy savings and water reductions whilst promoting less toxic production methods³. Urgent investment is required if pulp and paper mills are to play their part in the *Global Paper Vision*. The industry must not only embrace cleantech solutions, but lead by example and innovate. Breakthrough technologies are emerging that can help mills decarbonise and detox their operations whilst creating added value along the entire pulp and paper supply chain.

The *Global Paper Vision* recommends industry, consumers, retailers, governments, investors and non-governmental organisations (NGOs) commit to actions encompassing the following priorities:

- use best possible technology to minimise the use of water, energy, chemicals and other raw materials.
- use best possible technology to minimise solid waste, thermal pollution and emissions to air and water.
- eliminate toxic mill discharges and waste.
- eliminate the use of chlorine and chlorine compounds for bleaching.
- ensure production systems do not hinder equitable use of water, the quality of water or local food production. Nor should such systems jeopardise environmental services or ecosystem assets.

PULP PRODUCTION – THE KEY ISSUES

Bleached Kraft is the world's most common pulping process and accounts for more than 50% of global pulp production⁴. However much of it is still reliant on older technology, employing processes that are not very energy or water efficient. In addition, the vast majority of mills use a pulp bleaching process which poses significant risks in terms of toxicity and environmental pollution.

The quality of technology employed is often reflected in a mill's energy use and discharge rates – wastewater effluent flow, adsorbable organic halide (AOX) loads, and chemical oxygen demand (COD) loads are all good indicators of this. AOX measures the amount of chlorine-based substances used in the bleaching process and can help determine how toxic the effluent

is. COD quantifies the amount of oxygen required for total oxidation of the organic compounds found in wastewater, and is a useful metric for water quality.

Clear regional differences in environmental performance can be seen across the world. North American mills generally lag behind those in Europe, and also in South America where newer mills exist. Data examination indicates that wastewater effluent flows are significantly lower in the Nordic and South American countries. In Asia, there is little data available from mills to make comparisons with other regions of the world.

Figures 1 and 2 show the maximum and minimum levels for two of the most important effluent discharge components and its changes between 2006 and 2013. The level at 50% of the region's production is also marked as well as BAT (Best Available Technique) permitted levels in European Union as of 2015. This BAT level is also used in Asia and South America as well as other regions. Often best performance is much lower than BAT. Note that only newer modern mills are reported, and that the units of Kg/ADt represents kg/ton of produced Air Dried pulp.

Figure 1: Aox maximum, minimum and average performance of pulp mills, by region, with comparison to European Union best available technology, 2013

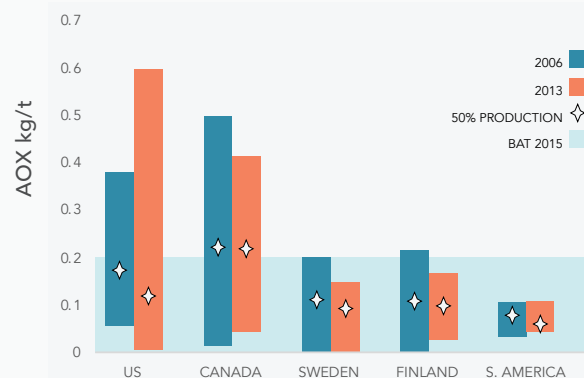
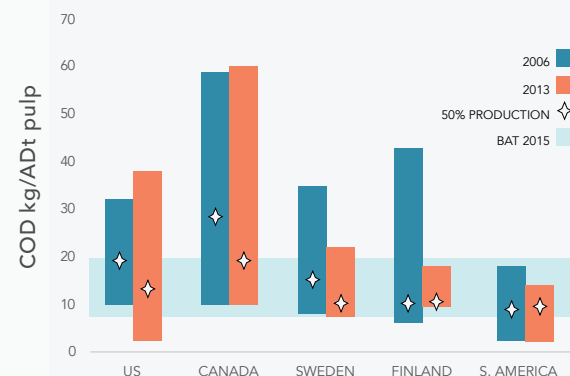


Figure 2: Cod maximum, minimum and average performance of pulp mills, by region, with comparison to European union best available technology, 2013



COD discharge rates also vary considerably according to region. The lowest COD discharge rates can be seen in South American and European mills, whilst Canadian mills have the highest. The lowest, most strictly regulated COD discharge rate known is 2.5 kg/ADt from a new eucalyptus Kraft bleach pulp mill in China⁵; it is not allowed to go above this rate in order to operate. AOX discharge rates show a similar trend. Since 2006, mills in the USA and Canada have reduced AOX discharge rates on average, while the "worst 50%" of the mills remain unchanged – although in general, the opposite can be seen in Europe.

Figure 3 shows that only a few best performing mills have discharge rates less than 20m³/tonne of effluent produced. The lowest values recorded are in the region of 10m³/tonne whilst the highest exceed 180m³/tonne. Clean cooling waters don't count as process water and so are not included in these figures. In all, Figures 1–3 show that the potential for improvement is

enormous. Even in Nordic countries and South America, only around 5% of the world's bleached pulp production meets industry best practice in terms of environmental performance^{6,7}.

Figure 3: Changes of volume discharged process water between 2006 and 2013 in five regions of the world.

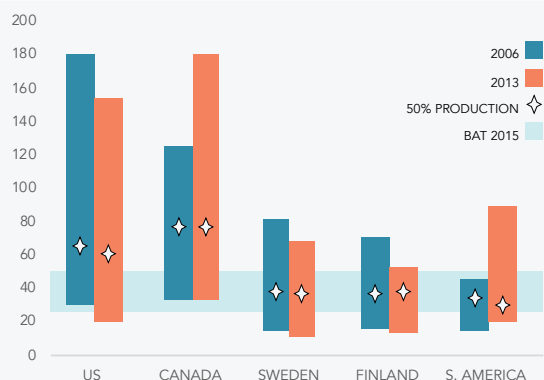
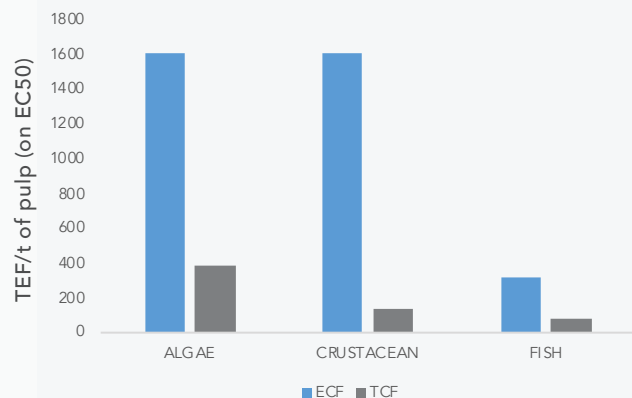


Figure 4: Comparison of the measured toxic effects from ECF and TCF production, expressed as TEF (Toxicity Emission Factors), for the three organism groups commonly used in the characterisation of forest industry wastewater in the laboratory.



Up to 85% of the total effluent volume discharged from a pulp mill is generated during bleaching – because of this, the bleaching stage represents the most toxic part of the pulp production process⁸. The use of elemental chlorine as a bleaching agent has been largely phased out due to concerns over the dioxin by-products released, but its use still persists in some mills.

The main type of bleaching method now used is Elemental Chlorine Free (ECF)⁹. However, ECF uses chlorine dioxide, which still contains residues of highly toxic chlorine compounds like dioxin^{10,11}. These can escape into waterways when discharged as AOX emissions¹². The pulp and paper industry claims that ECF bleaching is environmentally friendly, but two independent laboratory tests contradict this^{13,14}.

Figure 4 shows that from one of these independent laboratory tests, the effects of ECF bleaching exhibited greater toxicity than TCF on different water living species. The tests were based on mills with an AOX level of 0.20 kg/ADt compared to an EU average of 0.15 kg/ADt. Research suggests that only the most modern ECF mills using best available technology can keep AOX emission levels to a minimum¹⁵. For example, the Rosenthal pulp mill in Blankenstein, Germany achieves an AOX level of 0.04 kg/ADt¹⁶. The long-term effects of ECF effluents remain unknown, but chlorinated compounds like dioxins have been linked to cancer and reproductive organ failure in humans¹⁷.

Overall pollution levels are rising within the industry as virtually all new pulp production relies on chlorine-based bleaching. Most modern pulp mills have more than doubled in size over the past two decades – so while the pollution level per ton of pulp produced may have decreased during this time, increases

in capacity means that total pollution levels from individual mills might have risen, or largely remained the same¹⁸.

Detoxing pulp production means switching to a cleaner, safer bleaching technology – Totally Chlorine Free (TCF). TCF is 100% chlorine free and is the least harmful pulp bleaching process available. However very few mills use TCF and uptake of the technology has declined over the past decade. However new research shows an increasing interest for TCF¹⁹ due to more advanced ozone bleaching techniques that are not only offer a higher quality product, but are cost effective²⁰. TCF technology also offers good potential for lowering water usage – by a factor of 2 compared to ECF. One TCF mill operator in Sweden has reported that its total wastewater effluent volumes are half that of modern ECF discharges²¹.

The industry suffers from poor water recycling rates and while the more progressive pulp mills are looking to boost water efficiency, it is challenging for ECF mills to create closed loop systems that recycle wastewater from the bleaching process due to the accumulation of chlorine compounds in their filter systems²². Reducing fresh water use at mills results in many operational benefits including reduced effluent discharge, reduced water treatment costs, less chemical and energy use and lower fuel costs.

Mills largely remain reluctant to take on costs when it comes to improving their environmental performance, and in the absence of regulatory pressure, many have yet to invest in modern technology. This is the biggest production line problem facing the pulp industry. It is not enough for pulp mills to take a piecemeal approach to cleantech solutions – they must look to upgrade their entire operations; from the cooking process to the bleaching process. Improving upstream production practices will result in cleaner, downstream flows that are easier to manage.

Figures 1, 2 and 3 show that discharge levels of the three most important pulp production parameters – effluent flow, AOX and COD load rates – have significant potential to improve, even despite the level of progress made from 2006 to 2013. While there are a few exceptions, the bulk of production remains way below best performance.

Lastly, pulp mill emissions – in the form of carbon or air pollutants – are directly linked to energy consumption and the type of pulping technology used. Data from over 430 pulp and paper mills in Europe, South and North America shows that CO₂ emissions from USA industry are much higher, indicating a higher use of fossil fuels than the other regions²³. Mills that use less or no fossil fuels often will have invested in energy efficient processes – for example, installing recovery boilers to reclaim energy from the waste by-products of production, such as black liquor.

PAPER PRODUCTION – THE KEY ISSUES

Papermaking is very energy and water intensive due to the number of pulp soaking and drying processes involved. Paper drying accounts for up to 70% of fossil fuel energy consumption in the pulp and paper sector alone, and represents one of the largest sources of non-biological CO₂ emissions²⁴ in the broader forest fibre industry. This heavy use of energy makes it the third highest cost in the papermaking process, accounting for approximately 8% of turnover²⁵.

There are emerging technologies that are focused on improving heat efficiencies, such as reducing heat demand in paper production machines, but generally there has been slow progress by paper mills to drive large-scale energy savings. Most energy

saving opportunities for papermaking involve improving the efficiency of the drying process and recovering its waste heat for beneficial use²⁶.

A high reliance on fresh water also makes paper mills vulnerable to water risks, particularly if they are sited in water-stressed regions. One study suggests these water stresses may increase the cost of water for mills and result in supply limitations²⁷. Only a low number of mills have installed on-site water recycling systems and the lack of integrated pulp-paper mill facilities means there is little opportunity to achieve reductions in water use through consolidating production processes.

While paper mills are not as polluting as pulp mills, they still use a wide range of chemical additives and coatings to enhance the performance and quality of the final paper product. These additives account for around 3% of total raw material consumption in the European paper industry alone; globally over 8 million tonnes of chemical additives are used for paper production²⁸.

There is a need to improve the quality of environmental data on these chemical additives to better understand any hazardous effects they might have during paper production and when discharged into wastewater and sludge. If these substances cannot be eliminated by on-site wastewater treatment plants, they may have potentially harmful environmental consequences when released as mill effluent. Any chemical additives that remain in a mill's water circulation system can also hamper water recycling efforts²⁹.

Zero impact pulp and paper production – how do we get there? The pulp and paper industry is in urgent need of a detox and 100% chlorine-free production using TCF bleaching technology represents one of the best and easiest ways to achieve this. For

mills with strict environmental targets, TCF represents a clear opportunity to reduce mill effluent loads to zero discharge – a goal previously thought impossible. What's more the technology is available now, enabling existing mill operators to make the switch, albeit with some capital investment. New mills meanwhile can specify TCF technology from the outset.

TCF also delivers wider ecological and social benefits as it eliminates the risk of toxic chlorinated compounds escaping into waterways, helping to safeguard eco-systems and local communities. There are legacy issues too – ECF-bleached paper contains toxic residues in the form of an embedded chlorine 'footprint' that will withstand multiple lifecycles, if recycled. There are no such dangers with TCF.

The detox agenda is especially relevant given the shift towards resource efficiency and zero waste. Production methods that use less chemicals, water and energy may one day become necessary, meaning that the industry must develop and adopt breakthrough technologies³⁰. These include trialing new methods such as near waterless production or utilising plant-based deep eutectic solvents to reduce energy and chemical residue. These aims are already achievable, to some extent, with existing TCF technology³¹. Eliminating chlorine compounds in the pulp bleaching process and adopting best available technologies will benefit both society and the environment.

New technologies like flash condensing steam and DryPulp for cureformed paper offer potential for near waterless, or waterless, production. The former uses steam vapour to form paper and board, and is most suited for chemically pulped virgin pulp fibre production. Steam forming could enable significant water savings – up to one-thousandth the volume of water used today³². The volume of fresh water required would also be reduced.

The concept of DryPulp technology goes one step further, being completely waterless, and would represent a new production process for papermaking. Being able to make paper without water would offer mill operators the flexibility to make new products at lower cost. Both technologies are still at the research and development stage however, and will require considerable investment to commercialise.

Pulp and paper mills can also work towards zero emissions by switching to 100% electricity from truly renewable and low carbon emission sources³³. High efficiency drying processes can help with this – these are yet to be widely implemented, but include ultrasonic drying, microwave drying and infrared drying²⁴. In pulp production, there is also potential to reduce electricity use through new technologies focused on improving efficiencies in the refining and grinding processes, and in the pre-treatment of wood chips.

On a wider level, mill operators should look to set ambitious carbon reduction goals, for example by committing to science-based targets which are aligned to climate science and the stated aims of the Paris Climate Agreement. This will ensure that any decarbonisation efforts are meaningful. Mills should also look to work more closely with the entire forest and fibre supply chain to optimise the use of raw materials and renewable energy where possible.

Pulp and paper mills may also benefit from greater collaboration with other industries. Here, mills could utilise the waste heat and steam from adjacent factories located nearby, instead of releasing it into the air or waterways. There are several examples of pulp mills that supply, or plan to supply, energy to both industry and municipalities – these include Södra in Sweden³⁴ and Finnulp in Finland³⁵.

KEY ISSUES AND OPPORTUNITIES FOR THE FUTURE

If the pulp and paper industry is to aspire to a *Global Paper Vision*, to grow and prosper in a low carbon way, it must get to grips with cleaner production. Non-TCF mills should be encouraged to commit to 'zero discharge' policies by adopting clear deadlines for the elimination of chlorine and chlorine derivatives from their production processes. This could encompass a stepped approach to phase-out.

Increasing water scarcity will make many mills vulnerable to fresh water supply risks in the future. The adoption of TCF will help drive immediate water efficiencies for pulp mills, but long-term, the industry needs to adopt closed loop water recycling systems where possible, and invest in technological innovation to help make the transition towards waterless production.

Divesting in fossil fuels and making the shift towards renewable energy will help mitigate the industry's heavy energy use. The utilisation of combined heat and power (CHP) should already be a key part of a mill's energy strategy for on-site electricity generation, but zero emission pulp and paper production should be the final goal. New, emerging technologies may help here and the industry needs to be proactive in exploring these.

Ultimately, the industry needs to find smarter ways to detox and decarbonise whilst creating value. Investing in cleaner, more advanced technologies is a necessary transitional step in working towards this, and tougher environmental regulation would help drive this forward. Pulp and paper mills are possible sites for energy production, and there is ample opportunity to create new high value commodities from the by-products of

paper manufacture, which otherwise would be flushed away as pollutants into waterways or stored at hazardous dumpsites. Wood-based polymers, chemicals and fuels could potentially be produced on a large scale in parallel with pulp production, generating additional revenue streams for the industry.

IMMEDIATE ACTIONS TO TAKE

- Address information gaps in some regions of the world and international standards for reporting.
- Focus on new investments and improving lagging performance in
- Advocate for toxic free, water-efficient paper production and promote TCF as the pulp bleaching technology of choice.
- Invest in breakthrough technologies to drive innovations such as waterless production.
- Work towards off-grid, zero emissions with greater uptake of truly renewable and low carbon energy.
- Explore opportunities around closed loop production through supply chain collaboration.
- Call for stricter regulation and enforcement by authorities.

7

TRANSPARENCY AND INTEGRITY

Lead Author: Emmanuelle Neyroumande, formerly of WWF-International

IS A NEW ERA OF TRANSPARENCY ON THE WAY?

Information sharing has never been so fast nor so inexpensive as it is today, thanks to the development of mobile communication and the internet. In the past, companies could act one way in a given place then turn around to promise to their customers and investors that they are in fact acting differently. Today, it has become far more difficult to hide facts and as a result, transparency has soared. In the last three years, governments, civil society and companies themselves have started several initiatives aimed at transparency. In particular, the number of pulp and paper manufacturers and retailers announcing commitments to tracking and disclosing deforestation impacts has increased sharply. Yet disclosure of action plans and progress is lagging, and too many companies rely solely on sustainable certification schemes to demonstrate commitment to their transparency goals or policies. More problematic still is the lack of participation by companies upstream in the supply chain, especially those located in Africa, Latin America and Asia. Better adoption and practice of transparency, both in quality and quantity, is critical to moving toward the *Global Paper Vision*.

Transparency and integrity is a key pillar of the *Global Paper Vision*, which allows society to evaluate the level of commitment and to track progress toward meeting the pillar's goals. It calls on industry, consumers, retailers, governments, investors and non-governmental organisations (NGOs) to commit to actions encompassing the following priorities:

- develop binding policies and targets and commit to a time-bound process for achieving them.
- demonstrate and report on chains of custody for all paper and paper products and ensure all buyers have easy access

to reliable information on fibre content, sustainability and production methods.

- eliminate greenwashing, or the practice of misleading consumers with false environmental claims.
- ensure fair systems of economic rewards and liabilities that help reduce the impacts of pulp and paper production and use.
- refuse investment and participation in business transactions (e.g. financing and trading) that are not fully consistent with this Vision.
- commit to transparent, regular, publicly available, and comprehensive reporting on progress.

THE INCREASING IMPORTANCE OF TRANSPARENCY AND ACCOUNTABILITY

Transparency and accountability work together. The more a company feels it is accountable to external stakeholders, the better its transparency will be. This is driven by the growing accountability asked by governments, customers and society at large about corporate environmental and social impacts. Change in transparency patterns is therefore an indicator of a shift in environmental awareness and the advantages of transparency vary depending on the stakeholders.

For companies, being transparent was for a long time only a means to ensure accountability to shareholders regarding

financial commitments, performance and progress. As the scope of accountability expands from shareholders to society at large, it is increasingly including non-financial elements. For example, the European Union has passed a Directive on disclosure of non-financial information. Under Directive 2014/95/EU, large companies must publish reports on the policies they implement in relation to environmental protection, social responsibility and treatment of employees, respect for human rights, anti-corruption and bribery, and diversity. From 2018 onward, the 6,000 large companies listed on EU markets, or operating in the banking and insurance sectors, must disclose this information in their management report¹.

For civil society organisations, asking for transparency is a means for evaluating the environmental impact of a company and verifying alignment between promises and actions. For consumers, transparent information as to the meaning of environmental guarantees made on products empowers them with the ability to make informed decisions about how best to spend their money. For governments, transparency is often requested as a way to ensure compliance with regulations and declarations.

A key benefit of transparency is the possibility for comparison. Companies can compare their performance on any number of metrics to that of competitors and adjust their own policies and practices to better align in ways deemed desirable. Civil society organisations can increase peer pressure by exposing best and inferior performers. Consumers can adjust their spending habits to give preference to products displaying verifiable environmental guarantees. Governments can use transparency to decide to increase or decrease regulation based on the sector’s environmental and social performance.

There are benefits to transparency, as trust can only be built with stakeholders and customers if there is sincere acknowledgement of hurdles and shortcomings and a faith and reliability in claims of success. But there is naturally also a resistance to transparency and there are pragmatic concerns to manage. Some companies see risks in disclosing their environmental policies and performance. Their image could be damaged by past mistakes or slow performance revealed by their honesty, leading to potential financial losses.

Figure 1: Trends in sustainability reporting instruments, 2017²

		2006		2010		2013		2016	
REPORTING INSTRUMENTS	Mandatory	35	58%	94	62%	130	72%	248	65%
	Voluntary	25	42%	57	38%	50	28%	135	35%
	Total	60		151		180		383	
COUNTRIES & REGIONS		19		32		44		71 (64 with instruments)	

A SURGE IN SUSTAINABILITY REPORTING INSTRUMENTS AND MONITORING PLATFORMS

Carrots and Sticks is a periodic report by KPMG International, the Global Reporting Initiative, United Nations Environment Programme and the Centre for Corporate Governance in Africa, that assesses developments in sustainability reporting regulation and policy across 71 countries and in virtually every sector of economic activity. The 2016 edition identified a worldwide surge in the number of reporting instruments as shown in Figure 1. With the number of reporting instruments more than doubling in the past three years, increased implementation of these instruments is particularly strong in Europe, Asia Pacific and Latin America.

Government regulation accounts for the largest proportion of sustainability reporting instruments worldwide, with two-thirds of the instruments being mandatory and the remainder voluntary.

NEW TOOLS FOR ASSESSMENT

In the forest sector, transparency instruments have historically been deployed via voluntary questionnaires sent directly to companies. Examples of these instruments include the Carbon Disclosure Programme (CDP) on forests, water and carbon, or World Wildlife Fund's (WWF) Environmental Paper Company Index (EPCI). However, the increase in company disclosure has led to a new type of tool in the last few years which can analyse and compare public reporting that is now more readily available online. This has made corporate progress reporting the cornerstone of transparency and meta-analysis of progress towards the collective goals of stakeholders. The deployment of this new type of comparative tool allows interested parties to assess pulp and paper producers and users, primarily for their exposure to practices leading to deforestation. Utilising

this approach, two initiatives known as Forest 500 and Supply Change have led civil society's analysis of company pledges on implementing responsible supply chains for agricultural commodities, including timber and pulp. As a result, a number of compelling details are emerging about the social and environmental impacts of this sector, which are explored briefly below.

The Forest 500 identifies and ranks the most influential companies, financial institutions, and governments potentially exposed to commodities whose production is causing deforestation. The ranking is based on data collected from publicly available policies. The 500 tracked companies and investors have shown a surge in social and environmental commitments in recent years. Since 2014, pledges increased from 14% to 40% in 2016.³

However, the report finds that ranked companies represent too small a percentage of the global marketplace to be on track for ambitious timelines to eliminate deforestation in these supply chains globally. Indeed, of the 162 companies related to pulp and paper assessed, more than half of the assessed companies have no time-bound actionable plans as of 2016. In its look at financial institutions, the Forest 500 report shows only one-third of 150 assessed financial institutions have deforestation-related commitments in place. Of these, only four investors and lenders (3%) have policies committing to ensure avoidance of links to deforestation when investing in companies in all four of the commodity supply chains evaluated: palm oil, beef and leather, soy, and timber and paper.

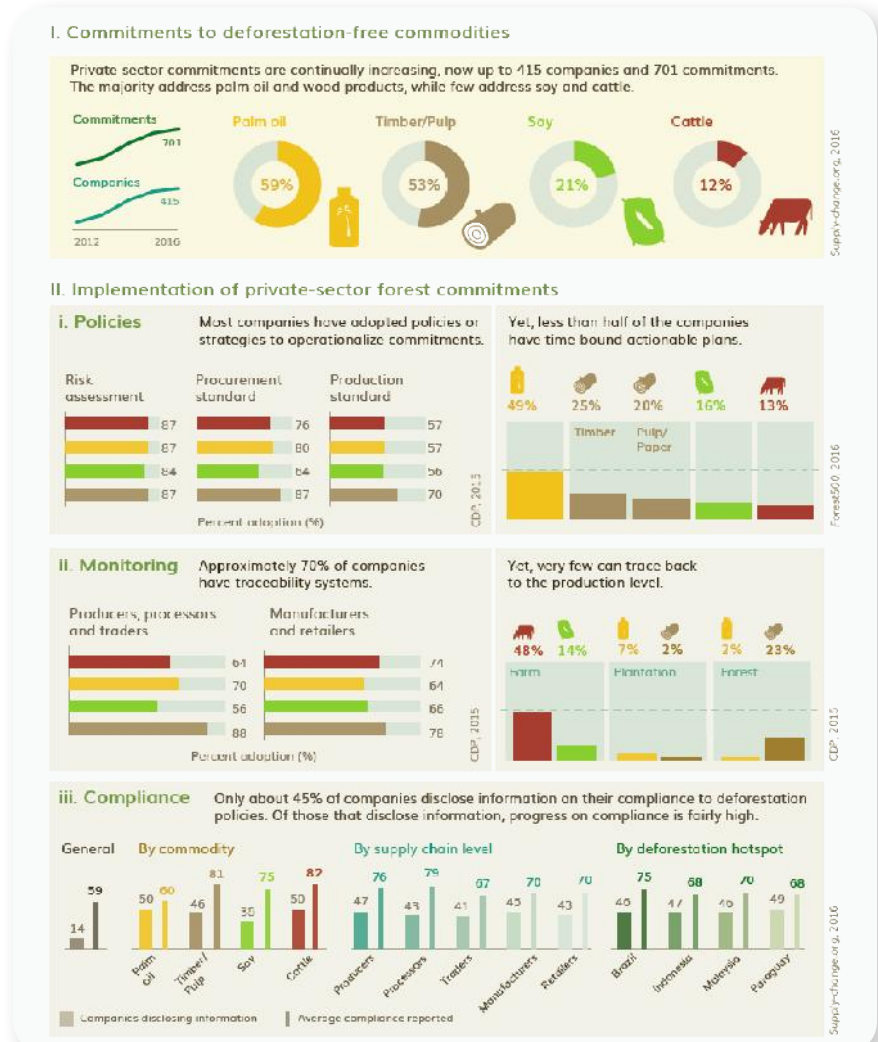
Similarly, Supply Change is a project hosted by the NGO Forest Trends, which tracks and analyses the goals, progress and specific attributes of corporate commitments related to commodity-driven deforestation. For example, information tracked at the website <http://supply-change.org> includes details of whether the policy includes various key elements for leadership, such as protection of High Conservation Value Forests, climate goals, protection of human rights, water conservation, peatland protection, and more. It tracks companies, their commitments, corresponding implementation policies and their progress towards their commitments over time.

The Supply-Change.org 2017 progress report reveals that more than 447 companies have made 760 pledges to reduce their impacts on forests and the rights of forest communities for all deforestation-linked commodities⁴.

A third tool for measuring implementation of voluntary corporate commitments is the progress reporting on the New York Declaration on Forests, which commits signatories to eliminate their role in deforestation by 2020. A global overview is conducted yearly on the pledges, and in the 2016 progress report, 108 companies announced 212 new commitments tied to deforestation-related commodities, an increase of 43% over the previous year⁵. But the report also finds insufficient progress reporting and action on the pledges.

Figure 2 presents compiled information from several transparency instruments to give a comprehensive overview from commitment to compliance. We can see from this table that for timber/pulp and paper, commitments, policies and traceability transparency are quickly progressing, while time-bound action plans, traceability to the production level, and compliance transparency are lagging behind.

Figure 2: Supply Change tracking of commitments, implementation, monitoring and compliance to deforestation-free commodities sourcing (2017)



TRANSPARENCY INSTRUMENTS SPECIFIC TO THE PULP AND PAPER SECTOR

1. For financiers

While several voluntary initiatives related to environmental screening of projects exist, like the Equator Principles, the financial sector has at large not been reporting on the subject (cf. Forest 500 results above). The Environmental Paper Network's 2017 report, *In the Red*, assessed 42 private banks and found that none of them thoroughly protect themselves from clients breaching essential social and environmental safeguards⁶. Several hurdles are mentioned, including: risk of displacing clients, less demanding financiers, or the confidentiality of deals. Rainforest Action Network (RAN), in partnership with Tuk Indonesia and Profundo, and Banktrack, in partnership with the Environmental Paper Network (EPN), have launched transparency tools to assess commitments and investments in the pulp and paper sector. Those tools enable comparison of policies and exposure of financiers towards environmental and social risk linked to the sector, and demonstrate the significant gaps in ambition that must be filled.

2. For the manufacturing industry

Transparency regarding wood sourcing and air and water pollution is usually prompted via questionnaires or direct discussions with manufacturing companies driven by civil society organisations. This information is compiled and shared with tools such as the WWF's Environmental Paper Company Index (EPCI), WWF's Check Your Paper tool, and the Ecopaper Database maintained by Canopy and EPN. In particular, voluntary participation in the EPCI, which covers the whole footprint from sourcing to manufacturing and transparency, increases regularly, with 15% of the world's

paper and board production reported on. The performance of companies who participate also increases, with more than 90% of product categories reported since 2013 showing improvement. The area in most need for improvement is the category "pulp" which tends to show lower overall environmental performance scores than the other product categories. Companies in Asia and in the packaging industry are those with the lowest rates of participation.

3. For the forest industry

Potential deforestation is tracked in near real time via satellite imagery by Global Forest Watch (GFW), a project of World Resources Institute, where alerts and links to companies can be made. This initiative allows governments, civil society and companies to assess deforestation trends globally and to be alerted to new forest clearing in their personalised regions or landscapes of interest.

4. For retailers

Retailers communicate their policies and progress via reporting mechanisms, including Annual Reports or Corporate Social Responsibility reports, and often publicly promote their environmental leadership actions. These are monitored by investors and NGOs, and compiled and analysed for meta-data by Forest 500 or Supply Change as mentioned above. Another new initiative has been launched by the Stockholm Environment Institute, known as

TRASE, to increase supply chain transparency for retailers. The initiative is initially for food products, but will soon be extended to pulp and paper products.

5. For consumers

Though motivated consumers can research their preferred brands and their manufacturers, for most consumers, readily available information linked to transparency comes in the form of labelling. The labelling can notify consumers of third-party forestry certification, supply chain traceability, and other issues such as recyclability or the inclusion of recycled content. Ecolabels covering fibre sourcing and clean production exist mainly in Europe, with, for example, the EU Ecolabel and the Blue Angel label. In North America, there is GreenSeal and EcoLogo. Unless the product is using recycled material, these logos do not replace the need for credible third-party forestry certification and labelling for the fibre in products. Lastly, the EPN offers a free online tool for the public called the Paper Calculator, which can easily help compare the environmental resource impacts of choosing paper with virgin vs. recycled fibre content.

CHALLENGES

1. Commitment versus progress

There are a growing number of transparency instruments available today. And a growing number of paper producers and corporate buyers publishing responsible supply chain commitments. Yet communication on progress, and actual progress, towards implementation is lagging. According to Supply Change, for all companies monitored, one in five commitments has become dormant while nearly one in three companies has at least one dormant commitment. Robust monitoring systems are still rare, and only 45% of companies are reporting on compliance with deforestation policies.

2. The role of certification

A cornerstone of transparency to the consumer is third-party sustainable forestry certification. It is also an easier – and more recognised – option for sustainability sourcing for companies and financiers than setting up internal or company-derived sustainability criteria. According to Supply Change, the majority of companies opt to limit procurement to certified products rather than defining company product standards. This seems to drive commitments, as efforts are generally more advanced in commodities with widely recognised certification standards and integrated supply chains, according to Supply Change. Its data also shows that certification-based commitments are more likely to have information available for reporting on progress.

This suggests a wide range of advantages to using certification as an element of transparency. Yet not all certification systems have the level of quality that would be expected, and there are many other environmental and social aspects that need to be part of a disclosure mechanism. See Chapter 4 on responsible fibre sourcing for data on third-party certification's impact in the marketplace.

3. Expanding transparency

According to the *Carrots and Sticks* report, almost one third of reporting instruments apply exclusively to large companies listed on stock exchanges. Supply Change also noted that companies with commitments on deforestation are twice as large as companies without commitments. Indeed, most compulsory reporting applies only to large companies, as reporting was initially required for informing shareholders and investors of the company's performance. In this context, it is clear that innovative ideas are needed to

reach more small and medium enterprises (SMEs) and family owned businesses.

Another hurdle is that, according to the NY Declaration on Forests Progress Report, most of the companies that have announced commitments are manufacturers and retailers - nearly 90% of which are headquartered in Europe, North America or Australia. Companies operating upstream in the supply chain (producers, processors, and traders) and those headquartered in Asia, Africa and Latin America are slower to act. More specifically for the pulp and paper sector, participation in WWF's EPCI highlights a lack of engagement from companies in Asia and from the packaging industry. We have also seen above that very few financial institutions disclose their policies and even less their implementation.

RECOMMENDATIONS

- Progress reporting should have a consistent, comparable, and timely public release of data, covering the different pillars of the EPN *Global Paper Vision*, and be third-party audited. Progress reporting is an important metric to gauge the seriousness of the commitments, and companies are encouraged to communicate at any stage – achievement, interim milestones, and even when goals are missed and/or re-established.
- Source any virgin wood fibre for paper from forest managers that have credible, independent, third-party certification for employing the most environmentally and socially responsible forest management and restoration practices. Forest Stewardship Council (FSC) is currently the only international certification programme that comes close to meeting this goal. FSC certification needs to be

part of the transparency instruments used by financiers and companies, but it can't be the sole aspect of commitment and transparency. All pillars of the EPN *Global Paper Vision* should be part of commitments, action plans and progress reports disclosed.

- Mandatory reporting from governments should be expanded to medium-sized enterprises, financial institutions and non-listed companies in countries where such tools already exist. In countries where reporting is poor, governments should put in place such requirements. Voluntary tools should adapt their requirements to SMEs and set up strategies to reach them. More companies in Asia and from the packaging industry should disclose their environmental performance, and respond to voluntary initiatives like CDP or WWF's EPCI. Finally, specific tools to monitor implementation of commitments by financial institutions should be put in place, as has been done by the NY Declaration on Forests initiative. Signing a commitment like the Equator Principles is insufficient without additional active and transparent strategies.

KEY ISSUES AND OPPORTUNITIES FOR THE FUTURE

The surge in transparency tools, binding and non-binding, and the increased level of disclosure of environmental and social impacts by pulp and paper manufacturers and retailers is welcome. Currently, most tools used by industry focus on deforestation and use sustainable forestry certification as a proxy for more detailed performance metrics. While this is an important aspect, the environmental and social impact of the sector is wider, and efforts of transparency and accountability should

cover all pillars of the *Global Paper Vision*. In addition, there is little disclosure on compliance and progress from companies who have made important social and environmental commitments; or if it exists, too often it lacks credibility and independent verification. In lieu of company-level disclosures, it is best to disclose progress with third-party auditing as much as possible. Finally, small and medium enterprises, financiers in general, pulp and paper companies in Asia, and more generally companies in Latin America and Africa, have not yet taken transparency to heart. Mandatory and voluntary instruments should engage those as much as possible in the future.

- 1 - FAO Yearbook of Forest Products 2010-2014, p 186, <http://www.fao.org/3/a-i5542m.pdf> from which all the per capita consumption figures are also taken. Published, 2016.
- 2 - FAO, *ibid.*
- 3 - *ibid.*
- 4 - *ibid.*
- 5 - From <http://www.paperonweb.com/World.htm>
- 6 - Pöyry Management Consulting, World Fibre Outlook 2030: Global consumption of papermaking fibre and specialty pulps has grown by 125% since 1980, 2 February 2016
- 7 - Van Weijk, Stijn, Julia A. Stegemann, and Paul Ekins, Global Life Cycle Paper Flows, Recycling Metrics, and Material Efficiency, *Journal of Industrial Ecology*, 6 June 2017.
- 8 - *ibid.*
- 9 - *ibid.*
- 10 - See the UN Declaration of the Rights of Indigenous Peoples, the 'Ruggie Report' to the UN on Business and Human Rights, FAO's Voluntary Guidelines on the Responsible Governance of Tenure of Land, Fisheries and Forests in the Context of National Food Security and Forest Peoples Programme Guiding Principles <http://www.forestpeoples.org/guiding-principles/free-prior-and-informed-consent-fpic>
- 11 - FAO, *op. cit.*
- 12 - Environmental Paper Network, Mapping Pulp Mill Expansion - Risks and Recommendations, September 2015, <http://www.environmentalpaper.eu/wp-content/uploads/2015/09/Pulp-Report-final1.pdf>
- 13 - FAO, *op. cit.*
- 14 - Oliver Lansdell, The displacement of China's non-wood pulp capacity, March 2016, see: <http://www.hawkinswright.com/news-and-events/blog/post/hawkins-wright-blog/2016/03/23/the-displacement-of-china>
- 15 - FAO, Forest Resources Assessment 2015 How are the world's forests changing?, Rome, 2016, <http://www.fao.org/3/a-i4793e.pdf>
- 16 - Potapov, Peter et al, The last frontiers of wilderness: Tracking loss of intact forest landscapes from 2000 to 2013, *Science Advances* 13 Jan 2017: Vol. 3, no. 1, e1600821 DOI: 10.1126/sciadv.1600821, <http://advances.sciencemag.org/content/3/1/e1600821.full>
- 17 - FSC, Facts & Figures, <https://ic.fsc.org/en/facts-and-figures>
- 18 - FAO, Global Forest Resources Assessment 2015, <http://www.fao.org/3/a-i4793e.pdf>
- 19 - European Environmental Paper Network. Paper Vapour. 2013
- 20 - <http://highcarbonstock.org/the-high-carbon-stock-approach/>
- 21 - EKONO, Inc. Environmental Performance, Regulations and Technologies in the Pulp and Paper Industry. 2015.
- 22 - EKONO, Inc. Environmental Performance, Regulations and Technologies in the Pulp and Paper Industry. 2015.
- 23 - Environmental Paper Network North America. Paper Calculator. <http://www.papercalculator.org>
- 24 - Environmental Paper Network. In the Red. July 2017. <http://environmentalpaper.org/wp-content/uploads/2017/08/In-the-Red.pdf>

- 1 - FAO Yearbook of Forest Products 1967, p35 <http://www.fao.org/3/a-am464t.pdf>
- 2 - FAO Yearbook of Forest Products 2010-2014, p 186, <http://www.fao.org/3/a-i5542m.pdf> from which all the per capita consumption figures are also taken. Published, 2016.
- 3 - ibid.
- 4 - ibid.
- 5 - ibid.
- 6 - ibid.
- 7 - ibid.
- 8 - From <http://www.paperonweb.com/World.htm>
- 9 - From <http://www.mckinsey.com/industries/paper-and-forest-products/our-insights/pulp-paper-and-packaging-in-the-next-decade-transformational-change?cid=other-eml-alt-mip-mck-oth-1706&hlkid=10b14d7f7fcd4a91b235c37be3630f06&hctky=1630833&hdpid=d3359c71-be5f-4386-ae88-fb95d49375c4>
- 10 - <http://www.theguardian.com/environment/2012/apr/20/sainsburys-toilet-roll-carbon-emissions>
- 11 - Mandy Haggith, Paper Trails: from Trees to Trash, the True Cost of Paper, Virgin Books/Random House, 2008.
- 12 - <http://www.environmentalpaper.org/epne-case-studies>
- 13 - Refiller. Lifecycle Assessment: reusable mugs vs. disposable cups. April 2013. http://www.tcd.ie/GreenPages/documents/refiller_cup_comparison.pdf

- 1 - Yearbook of Forest Products, 1969-1980, Food and Agriculture Organization of the United Nations, 1980; See Table 1 (Japan produced 12,973,000 metric tonnes)
- 2 - PulpandPaper-Technology, at <http://www.pulpandpaper-technology.com/articles/top-largest-paper-producing-companies-in-the-world>
- 3 - FAO Yearbook Statistics: Forest Products 2015, Food and Agriculture Organization of the United Nations
- 4 - Schmid, John, China becoming mighty oak of world's paper industry, Milwaukee Journal Sentinel, December 28, 2012, archived at the Los Angeles Times, <http://articles.latimes.com/2012/dec/28/business/la-fi-china-paper-industry-20121228>
- 5 - FAO Yearbook Statistics: Forest Products, Food and Agriculture Organization of the United Nations, 1980, 1990, 2000, 2010, 2015
- 6 - WBCSD Forest Solutions, Facts & Trends: Fresh & Recycled Fibre Complementarity, April 2015
- 7 - FAO Yearbook Statistics: Forest Products 1990, op. cit.
- 8 - Pöyry Management Consulting, Paper and paperboard market: Demand is forecast to grow by nearly a fifth by 2030, 13 March 2015
- 9 - Pöyry Management Consulting, World Fibre Outlook 2030: Global consumption of papermaking fibre and specialty pulps has grown by 125% since 1980, 2 February 2016
- 10 - Environmental Paper Network North America Paper Calculator Version 4.0. <http://www.papercalculator.org> (While the Paper Calculator was developed to represent impacts in the North American setting, its results are likely to be relatively proportional globally for the majority of mills that operate similarly.) New and renovated recycling mills are likely to produce even greater savings and reductions.
- 11 - Environmental Paper Network, The State of the Paper Industry: Monitoring the Indicators of Environmental Performance, 2007
- 12 - Pulp mills use dried wood, which has half the weight of fresh trees. But trees' high water content requires that twice as much must be cut to get the appropriate amount of pulp mill inputs.
- 13 - RISI, World pulp and recovered paper 15-year forecast, Volume 13, Number 3, August, 2013, cited in World Business Council for Sustainable Development, Facts & Trends: Fresh and Recycled Fibre Complementarity, April 2015
- 14 - WBCSD Forest Solutions, op. cit.
- 15 - Resource Recycling, "China's Sword Effort Continues to Rattle Market," April 4, 2017
- 16 - Resource Recycling, "Where Exports Displaced from China are finding a Home, January 16, 2018
- 17 - International Council of Forest & Paper Associations, 2015 ICFPA Sustainability Progress Report
- 18 - RISI, Annual Review of Global Pulp and Paper Statistics, cited in the International Council of Forest & Paper Associations, 2015 ICFPA Sustainability Progress Report
- 19 - Paper Recycles, Statistics 2016, <http://www.paperrecycles.org/statistics/paper-paperboard-recovery>
- 20 - See the presentation for Blue Heron Paper Company (now closed) at <http://www.conservatree.org/learn/SolidWaste/Roundtable/mfrs.shtml#lesjoel> and the Norpac/Weyerhaeuser presentation at <http://www.conservatree.org/learn/SolidWaste/Roundtable/challenges.shtml>
- 21 - Pöyry 2015, op. cit.
- 22 - WBCSD Forest Solutions, op. cit.
- 23 - Van Weijk, Stijn, Julia A. Stegemann, and Paul Ekins, Global Life Cycle Paper Flows, Recycling Metrics, and Material Efficiency, Journal of Industrial Ecology, 6 June 2017.

24 - Van Weijk, op. cit.

25 - FAO Statistics: Forest Products, Food and Agriculture Organization of the United Nations, 2015 Yearbook

26 - FAO 2015 Yearbook, op. cit.

27 - Van Ewijk, op. cit., based on FAO (Food and Agriculture Organization of the United Nations), FAO Stat – Forestry production and trade, 2016

28 - Environmental Paper Network, The State of the Paper Industry: Monitoring the Indicators of Environmental Performance, 2007, based on data from RISI, Global Pulp & Paper Fact & Price Book, 2006 and American Forest & Paper Association (AF&PA), Recovered Paper Annual Statistics, 2005.

29 - FAO Yearbook Statistics: Forest Products 2015, op.cit. See p. 180 for World Recovered Paper Production statistics for 2015, and p. 186 for World Paper and Paperboard Production, 2015.

30 - Van Weijk, op. cit.

31 - Van Weijk, ibid.

- 1 - ILO Fundamental Work Rights: freedom of association, the right to organise and to collective bargaining; the abolition of forced labour, the elimination of child labour; and the prohibition of discrimination in employment and occupation (equality of opportunity and treatment).
- 2 - ILO Convention 169 for the Protection of the Rights of Indigenous Peoples, General Declaration of Human Rights (1948), UN Convention for the Elimination of all Forms of Racial Discrimination (1966), International Agreement on Economics, Social and Cultural Rights (1966), International Agreement on Civil and Political Rights (1966), UN Declaration of the Rights of Indigenous Peoples.
- 3 - See the UN Declaration of the Rights of Indigenous Peoples, the 'Ruggie Report' to the UN on Business and Human Rights, FAO's Voluntary Guidelines on the Responsible Governance of Tenure of Land, Fisheries and Forests in the Context of National Food Security and Forest Peoples Programme Guiding Principles <http://www.forestpeoples.org/guiding-principles/free-prior-and-informed-consent-fpic>
- 4 - Barry, J. and Kalman, J. Our Land Our Life. Taiga Rescue Network 2005.
- 5 - https://ww2.ibge.gov.br/home/estatistica/economia/pevs/2016/default_xls.shtm
- 6 - See <http://www.braziljusticenet.org> for more about the Aracruz conflict
- 7 - More about APP and APRIL's impacts in Indonesia can be found on <http://www.eyesontheforest.or.id>
- 8 - Portucel: The Process of Access to Land and the Rights of Local Communities. Justiça Ambiental. http://wrm.org.uy/wp-content/uploads/2017/04/Portucel_The_process_of_access_to_Land_and_the_Rights_of_Local_Communities.pdf
- 9 - <http://www.wrm.org.uy> for links to campaigns globally against damaging fibre plantations.
- 10 - <http://www.waswanipi.com/en/>
- 11 - The Expanding Chinese Paper and Forest Products Industry, Don Roberts, CIBC World Markets. 2004.
- 12 - USDA Forest Service Southern Forest Resource Assessment 2001. Also John Bliss and Conner Bailey. 2005. Pulp, Paper, and Poverty: Forest-based Rural Development in Alabama, 1950-2000. Pp. 138-158 in, Robert Lee and Don Field (eds.), Communities and Forests: Where People Meet the Land. Corvallis: Oregon State University Press.
- 13 - Chris Lang, Yes to Life, No to Pulp Mills, Robin Wood Magazine, August 2006.
- 14 - <http://www.innu.ca/forest/sec1overview.htm>
- 15 - Christian Cossalter and Charlie Pye-Smith (2003) "Fast-Wood Forestry: Myths and Realities", CIFOR, Bogor.

- 1 - FAO, Yearbook 2015 Forest products, <http://www.fao.org/3/a-i5542m.pdf>
 - 2 - ibid.
 - 3 - ibid.
 - 4 - ibid.
 - 5 - Zhong Zhuang, Lan Ding Haizheng Li, China's Pulp and Paper Industry: A Review , School of Economics Georgia Institute of Technology, see: http://www.cpbis.gatech.edu/files/papers/CPBIS-FR-08-03%20Zhuang_Ding_Li%20FinalReport-China_Pulp_and_Paper_Industry.pdf
 - 6 - Oliver Lansdell, The displacement of China's non-wood pulp capacity, March 2016, see: <http://www.hawkinswright.com/news-and-events/blog/post/hawkins-wright-blog/2016/03/23/the-displacement-of-china>
 - 7 - Pöyry, Pulp market in transition, http://www.poyry.com/sites/default/files/media/related_material/0011_2013_v1_pulp_market_in_transition_final_small.pdf
 - 8 - RISI, The China Pulp Market: A Comprehensive Analysis and Outlook Special Market Analysis Study, 2012
 - 9 - FAO, Forest Resources Assessment 2015 How are the world's forests changing?, Rome, 2016, <http://www.fao.org/3/a-i4793e.pdf>
 - 10 - Butler, R.A. What's the current deforestation rate in the Amazon Rainforest? Mongabay, 2015. <http://news.mongabay.com/2015/05/whats-the-current-deforestation-rate-in-the-amazon-rainforest/>.
 - 11 - Potapov, Peter et al. The last frontiers of wilderness: Tracking loss of intact forest landscapes from 2000 to 2013, Science Advances 13 Jan 2017: Vol. 3, no. 1, e1600821 DOI: 10.1126/sciadv.1600821, <http://advances.sciencemag.org/content/3/1/e1600821.full>
 - 12 - EPN, Too Much Hot Air, The failure to change management practice on peatlands by the pulp and paper industry in Indonesia, May 2017, <http://www.environmentalpaper.eu/wp-content/uploads/2017/04/Too-much-hot-air-20170426.pdf>
 - 13 - http://ec.europa.eu/environment/forests/timber_regulation.htm
 - 14 - <http://www.fws.gov/international/laws-treaties-agreements/us-conservation-laws/lacey-act.html>
 - 15 - <http://www.legislation.gov.au/Details/C2012A00166>
 - 16 - The countries are: Brazil, Cameroon, the Democratic Republic of the Congo [DRC], Ghana, Indonesia, Laos, Malaysia, Papua New Guinea [PNG] and the Republic of the Congo. Hoare, A. Chatham House Report, Tackling Illegal Logging and the Related Trade - What Progress and Where Next?, July 2015, https://indicators.chathamhouse.org/sites/files/reports/Tackling%20Illegal%20Logging%20and%20Related%20Trade_0.pdf
 - 17 - Hoare, A. Chatham House, Research Paper Appendix, Methodology for Estimating Levels of Illegal Timber- and Paper-sector Imports, https://indicators.chathamhouse.org/sites/files/reports/Methodology_illegality_estimates_November2014%20update_1.pdf
 - 18 - Steinbrecher RA & Lorch A. 2008. "Genetically Engineered Trees & Risk Assessment: An overview of risk assessment and risk management issues." Federation of German Scientists. http://www.econexus.info/sites/econexus/files/GE-Tree_FGS_2008.pdf.
 - 19 - FAO, Forests and Genetically Modified Trees, 2010, <http://www.fao.org/docrep/013/i1699e/i1699e.pdf>
 - 20 - WRM, WRM information sheets on GE tree research, 2009, <http://wrn.org.uy/all-campaigns/wrm-information-sheets-on-ge-tree-research/>
 - 21 - Overbeek W. An overview of industrial tree plantation conflicts in the global South. Conflicts, trends, and resistance struggles, 2012, <http://www.ejolt.org/wordpress/wp-content/uploads/2012/06/EJOLT-Report-3-low1.pdf>
- Gerber, J.F. Conflicts over industrial tree plantations in the South: Who, how and why? Global Environmental Change. 2011, <http://www.sciencedirect.com/science/article/pii/S0959378010000804>

- 22 - WRM, GE Trees: Threatening North America's Native Forests, September 2014, <http://wrm.org.uy/articles-from-the-wrm-bulletin/section1/ge-trees-threatening-north-americas-native-forests/>
- 23 - WRM, Transgenic trees in Chile: Urgent need to modify DNA of policies, not plants, April 2015, <http://wrm.org.uy/articles-from-the-wrm-bulletin/section1/transgenic-trees-in-chile-urgent-need-to-modify-dna-of-policies-not-plants/>
- 24 - WRM, Belgium: Field Liberation Movement Takes Action Against GE Trees, February 2017, <http://wrm.org.uy/articles-from-the-wrm-bulletin/section2/belgium-field-liberation-movement-takes-action-against-ge-trees/>
- 25 - FuturaGen, FuturaGene Overview, <http://www.futuragene.com/en/overview.aspx>
- 26 - *ibid.*
- 27 - Open letter signed by 103 environmental and social organisations to the Brazilian National Technical Biosafety Commission (CTNBio), May 2014, <http://wrm.org.uy/all-campaigns/open-letter-to-be-sent-to-the-brazilian-national-technical-biosafety-commission-ctnbio/>
- 28 - Salva le Foreste, Brazilian peasants protest to stop transgenic trees, March 2015, <http://www.salvaleforeste.it/en/plantations/4005-brazilian-peasants-s-protos-stop-transgenic-trees.html>, O Globo, MST invade fábrica e destrói milhares de mudas geneticamente modificadas, March 2015, <http://g1.globo.com/sao-paulo/itapetininga-regiao/noticia/2015/03/mst-invade-fabrica-e-destrui-milhares-de-mudas-geneticamente-modificadas.html>
- 29 - WWF, Better production for a living planet, 2012, http://awsassets.panda.org/downloads/wwf___better_production_for_a_living_planet___2012_web.pdf
- 30 - Forest Trends, Supply Change: Tracking Corporate Commitments to Deforestation-Free Supply Chains, 2017, http://www.forest-trends.org/documents/files/doc_5521.pdf
- 31 - FERN, Company promises: How businesses are meeting commitments, March 2017, <http://www.fern.org/sites/fern.org/files/Company%20promises.pdf>
- 32 - RAN, Beyond Paper Promises, May 2017, http://www.ran.org/beyond_paper_promises
- 33 - Respectively, <https://www.asiapulppaper.com/sustainability/vision-2020/forest-conservation-policy> and <http://www.aprilasia.com/en/sustainability/sustainability-policy>
- 34 - FSC, Facts & Figures, <https://ic.fsc.org/en/facts-and-figures>
- 35 - The data is however older, related to 2010, the latest data set released by FAO in 2015, see: FAO, Global Forest Resources Assessment 2015, <http://www.fao.org/3/a-i4793e.pdf>
- 36 - FSC'S Market Share 2016, June 2017 <https://ic.fsc.org/en/news-updates/market-news/id/1884>
- 37 - FSC'S Market Share 2016, *ibid.* and FSC, The global volume and market share of FSC-certified timber, June 2015 <https://ic-es.fsc.org/preview.global-Fvolume-of-fsc-wood-produced-annually.a-4928.pdf>
- 38 - Land rental prices exclude tree plantations from good quality land, affecting their extension and their productivity. Consequently, pulpwood production is not sufficient to meet the demand, and the high price makes long distance transport economically unsustainable. RISI, 2012 The China Pulp Market: A Comprehensive Analysis and Outlook, 2012, see: <http://www.risiinfo.com/risi-store/do/product/detail/china-pulp-study.html?source=PA1209SF>
- 39 - EPN, Mapping Pulp Mill Expansion - Risks and Recommendations, September 2015, <http://www.environmentalpaper.eu/wp-content/uploads/2015/09/Pulp-Report-final1.pdf>
- 40 - EPN, Expansion of the Brazilian pulp industry - Impacts and risks, March 2017, <http://www.environmentalpaper.eu/wp-content/uploads/2017/03/170314-Pulp-Mill-Expansion-in-Brazil-discussion-document.pdf>
- 41 - http://www.imasul.ms.gov.br/index.php?templat=vis&site=155&id_comp=4054&id_reg=10622&voltar=lista&site_reg=155&id_comp_orig=4054

- 1 - Food and Agriculture Organization of the United Nations (FAO). 1998a. Global Fibre Supply Study Forest Products Division Forestry Department, April (Draft). Rome: FAO: 46).
- 2 - FAO, Yearbook 2015 Forest products, <http://www.fao.org/3/a-i5542m.pdf>
- 3 - Kimberly-Clark Corporation. Press Release. April 28, 2015. <http://investor.kimberly-clark.com/releasedetail.cfm?ReleaseID=909120>
- 4 - Fibres included in papers in the EcoPaper database include: wheat straw, sugarcane bagasse, miscanthus, fallen palm leaves, elephant poo, seeds, mushrooms, flax, banana coffee and tobacco residues, sunflower stalk, recycled cotton textiles, hemp, and fruit fibre.
- 5 - Canopy. EcoPaper Database. <http://epd.canopyplanet.org/>

1 - Intergovernmental Panel on Climate Change, Climate Change 2014 Synthesis Report Summary for Policymakers Assessment Report 5. November 2014. http://www.ipcc.ch/pdf/assessment-report/ar5/syr/AR5_SYR_FINAL_SPM.pdf

2 - ibid.

3 - Moomaw and Smith. "The Great American Stand: US Forests and the Great Climate Emergency." Dogwood Alliance. 2017.

4 - EKONO, Inc. Environmental Performance, Regulations and Technologies in the Pulp and Paper Industry. 2015.

5 - Environmental Paper Network. Paper Calculator v4.0. 2018

6 - "Review of available literature on LCAs was completed for the European Environmental Paper Network in 2013 and continues to represent a reliable breakdown of the expected GHG emissions at each stage of paper's lifecycle from raw material harvest to disposal. See European Environmental Paper Network. Paper Vapour assessment, <http://environmentalpaper.org/wp-content/uploads/2017/08/paper-vapour-discussion-paper-c.pdf>, 2013. Using data from:

- Book Industry Study Group. (2008) 'Environmental Trends and Climate Impacts: Findings from the U.S. Book Industry.' (Data collected directly from industry participants and suppliers, with additional data the Paper Task Force.)
- Climate for Ideas. (2009.) 'Carbon Footprint of Recycled Paper Mills.' Unpublished. (Direct observations from five recycled tissue mills.)
- Climate for Ideas. (2008) '100% Recycled Papers made by Cascades: Greenhouse Gas Emissions Performance and Competing Products' August 2008.
- Discover Magazine (2008) 'How Big Is DISCOVER's Carbon Footprint?' 21 April 2008.
- Energetics Incorporated. (2005) 'Energy and Environmental Profile of the U.S. Pulp and Paper Industry' Columbia, Maryland. December 2005.
- Environ International Corporation (2012) 'Life-cycle Assessment of Deinked and Virgin Pulp', Denver, Co, November 2012. (Report for National Geographic.)
- Environmental Protection Agency (2013) 'Forest Carbon Storage in EPA's Waste Reduction Model.' Washington, D.C.
- Gough, Christopher M., et al. (2007) 'The legacy of harvest and fire on ecosystem carbon storage in a north temperate forest', Global Change Biology 13, 1935 – 1949.
- Gower ST, McKeon-Ruediger A, Reitter A, Bradley M, Refkin DJ, Tollefson T, et al. (2006) 'Following the Paper Trail: the Impact of Magazine and Dimensional Lumber Production on Greenhouse Gas Emissions', Washington, DC: The H John Heinz III Center for Science, Economics and the Environment. (Report commissioned by Time, Inc.)
- Harmony Environmental, LLC (2009) 'Life-cycle Carbon Footprint, National Geographic Magazine.' October1, 2009. (Report commissioned by National Geographic Society.)
- INFRAS. (1998) 'A Life-cycle Assessment of the production of a daily newspaper and a weekly magazine', Zurich. (Report commissioned by Axel Springer.)
- Integrated Pollution Prevention and Control (European Commission), (2001). 'Reference Document on Best Available Techniques in the Pulp and Paper Industry'. December 2001.
- Manomet Center for Conservation Sciences (2010) 'Biomass Sustainability and Carbon Policy Study.' Brunswick, Maine. June 2010.
- Moore, S., et al. (2013) 'Deep instability of deforested tropical peatlands revealed by fluvial organic carbon fluxes.' Nature 493, 660–663. 31 January 2013.

- Miner, R (2003). 'Characterising Carbon Sequestration in forest Products Along the Supply Chain'. NCASI. December 2003.
 - Miner, R. and Perez-Garcia, J. (2007) 'The Greenhouse Gas and Carbon Profile of the Global Forest Products Industry'. Special Report No. 07-02. NCASI. February 2007.
 - Newell, J. and Vos, R. (2012). 'Accounting for forest carbon pool dynamics in product carbon footprints: Challenges and opportunities.' Environmental Impact Assessment Review 37 (2012) 23 – 36.
 - Newell, Joshua P. and Vos, Robert O. (2011) 'Papering' Over Space and Place: Product Carbon Footprint Modeling in the Global Paper Industry'. Annals of the Association of American Geographers. 28 April 2011.
 - Paper Task Force / Paper Calculator. White Papers Nos. 3, 10A, 10B, 10C, 11 and updating information for the Paper Calculator. 1995 – 2011. (Data provided by industry sources and updated regularly.)
 - Thornley, J. H. M., and M. G. R. Cannell. (1999) 'Managing Forests for Wood Yield and Carbon Storage: A Theoretical Study', Tree Physiology 20, 477–484. 24 August 1999.
- 7 - Harris et al. Carbon Balance Manage (2016) 11:24. DOI 10.1186/s13021-016-0066-5
- 8 - Gough, Christopher M., et al. (2007) 'The legacy of harvest and fire on ecosystem carbon storage
- 9 - Smith, James, et al. "Methods for Calculating Forest Ecosystem and Harvested Carbon with Standard Estimates for Forest Types of the United States." US Forest Service. General Technical Report NE-343. 2007.
- 10 - Harris et al., op. cit.
- 11 - NRDC. Pandora's Box: Clearcutting in the Canadian boreal unleashes millions of tons of previously uncounted carbon dioxide emissions. November 2017. <https://www.nrdc.org/sites/default/files/pandoras-box-clearcutting-boreal-carbon-dioxide-emissions-ip.pdf>
- 12 - Environmental Paper Network, et al. Too Much Hot Air: The failure of the Indonesian pulp and paper industry to reform its management of peatlands. 2017. <http://www.environmentalpaper.eu/wp-content/uploads/2017/04/Too-much-hot-air-20170426.pdf>
- 13 - Gough, Christopher M., et al., op. cit. in a north temperate forest', Global Change Biology 13, 1935 – 1949.
- 14 - Thornley, J. H. M., and M. G. R. Cannell. (1999) "Managing Forests for Wood Yield and Carbon Storage: A Theoretical Study", Tree Physiology 20, 477–484. August 24.
- 15 - Calfapeitra, C. et al. "Carbon mitigation potential of different forest ecosystems under climate change and various managements in Italy." Ecosystem Health and Sustainability. Vol. 1, Issue 8. 27 October 2018.
- 16 - Wei, X. and Blanco, J. "Significant Increase in Ecosystem C Can Be Achieved with Sustainable Forest Management in Subtropical Plantation Forests." PLOS One. 24 February 2014.
- 17 - Schulze, et al. 'Large-scale bioenergy from additional harvest of forest biomass is neither sustainable nor greenhouse gas neutral,' Global Change Biology, 2012.
- 18 - U.S. Energy Information Agency. *International Energy Outlook 2016*, Chapter 7: Industrial sector energy consumption. - In regions where paper consumption is lower, this figure would be lower to as an overall measure, although it would change little on a per-unit basis.
- 19 - Brack, Duncan. 'The Impacts of the Demand for Woody Biomass for Power and Heat on Climate and Forests.' Chatham House. 23 February 2017.
- 20 - International Confederation of Forest and Paper Associations. 2015 Sustainability Progress Report. <http://www.icfpa.org/uploads/Modules/Publications/2015-icfpa-sustainability-progress-report.pdf>

21 - Brack, Duncan, op. cit.

22 - John D Sterman et al 2018 Environ. Res. Lett. 13 015007 <http://iopscience.iop.org/article/10.1088/1748-9326/aaa512/pdf>

23 - ICFPA, op. cit.

24 - Thomas, Valerie M., and Wenman Liu. 'Assessment of Alternative Fibers for Production.' School of Industrial and Systems Engineering, and School of Public Policy, Georgia Institute of Technology. February 11, 2013.

25 - New York Times, Farmers Unchecked Crop Burning Fuels India's Air Pollution. November 3, 2017. <https://www.nytimes.com/2016/11/03/world/asia/farmers-unchecked-crop-burning-fuels-indias-air-pollution.html>

26 - IPCC, op. cit.

27 - <http://highcarbonstock.org/the-high-carbon-stock-approach/>

28 - US Energy Information Agency, op. cit.

29 - Van Weijk, Stijn, Julia A. Stegemann, and Paul Ekins, Global Life Cycle Paper Flows, Recycling Metrics, and Material Efficiency, Journal of Industrial Ecology, 6 June 2017.

- 1 – Wetlands International, et al. Fact book for UNFCCC policies on peat carbon emissions. 2009 <https://www.wetlands.org/publications/fact-book-for-unfccc-policies-on-peat-carbon-emissions/>
- 2 – Wetlands International. Briefing Paper: Accelerating action to save peat for less heat. 2015 <https://www.wetlands.org/publications/briefing-paper-accelerating-action-to-save-peat-for-less-heat/>
- 3 – Environmental Paper Network, et al. Too Much Hot Air: The failure of the Indonesian pulp and paper industry to reform its management of peatlands. 2017. <http://www.environmentalpaper.eu/wp-content/uploads/2017/04/Too-much-hot-air-20170426.pdf>
- 4 – Wetlands International. Peatland Brief: An assessment of the “eko-hidro” water management approach. 2016. <https://www.wetlands.org/publications/peatland-brief-an-assessment-of-the-eko-hidro-water-management-approach/>
- 5 – Hooijer, A., Page, S., Jauhiainen, J., Lee, W. A., Lu, X. X., Idris, A., and Anshari, G.: Subsidence and carbon loss in drained tropical peatlands. *Biogeosciences*, 9, 1053-1071, <https://doi.org/10.5194/bg-9-1053-2012>. 2012.
- 6 - van der Werf, G. Global Fire Emissions Database. 2017. http://www.globalfiredata.org/updates.html#2015_indonesia
- 7 - Shannon N Koplitz, Loretta J Mickley, Miriam E Marlier, Jonathan J Buonocore, Patrick S Kim, Tianjia Liu, Melissa P Sulprizio, Ruth S DeFries, Daniel J Jacob, Joel Schwartz, Montira Pongsiri and Samuel S Myers. “Public health impacts of the severe haze in Equatorial Asia in September–October 2015: demonstration of a new framework for informing fire management strategies to reduce downwind smoke exposure.” *Environmental Research Letters*. Volume 11, Number 9. 19 September 2016. <http://iopscience.iop.org/article/10.1088/1748-9326/11/9/094023>
- 8 - World Bank. The cost of fire: an economic analysis of Indonesia’s 2015 fire crisis (English). Indonesia sustainable landscapes knowledge; note no. 1. Washington, D.C. : World Bank Group. 2016. <http://documents.worldbank.org/curated/en/776101467990969768/The-cost-of-fire-an-economic-analysis-of-Indonesia-s-2015-fire-crisis>
- 9 – Deltares. Assessment of impacts of plantation drainage on the Kampar Peninsula peatland, Riau. November 2015. <http://www.deltares.nl/app/uploads/2015/12/Plantation-Impacts-Kampar-Peatland-DELTARES-2015.pdf>
- 10 - <https://www.moorwissen.de/en/paludikultur/paludikultur.php>
- 11 – Asia Pulp and Paper. Forest Conservation Policy. February 1, 2013. <http://www.asiapulppaper.com/sustainability/vision-2020/forest-conservation-policy>
- 12 – APRIL. APRIL Group’s Sustainable Forest Management Policy 2.0, June 3, 2015. <http://www.aprilasia.com/en/sustainability/sustainability-policy>
- 13 – Wetlands International, et al. Will Asia Pulp and Paper Default on its Zero Deforestation Commitment?. April 2016. <http://www.wetlands.org/publications/will-asia-pulp-paper-default-on-its-zero-deforestation-commitment/>
- 14 – Asia Pulp and Paper. Press Release. August 13, 2015. <http://www.asiapulppaper.com/news-media/press-releases/asia-pulp-paper-commits-first-ever-retirement-commercial-plantations-tropical-peatland-cut-carbon-emissions>
- 15 - APRIL Independent Peat Expert Working Group (IPEWG). Meeting 5, Summary Report. March 2017. <http://www.aprildialog.com/wp-content/uploads/2017/04/IPEWG-Mtg-5-Summary-Report-FINAL.pdf>

- 1 - UNESCO. Water in the productive Processes. http://www.unesco.org/fileadmin/MULTIMEDIA/FIELD/Venice/pdf/special_events/bozza_scheda_DOW_9_1.2.pdf.
- 2 - Hoekstra, Arjen Y. The Water Footprint of Modern Consumer Society, 2013
- 3 - American Forest & Paper Association. Better Practices, Better Planet, 2020 Sustainability Goals. 2016
- 4 - FAO. Yearbook of forest products 2015. <http://www.fao.org/forestry/statistics/80570/en/>
- 5 - EKONO Inc. Strategy study. Environmental performance regulations and technologies in the pulp and paper industry, 2015, August 2016
- 6 - Ibid
- 7 - European Union. Best Available Techniques (BAT), Reference Document for the Production of Pulp, Paper and Board. Industrial Emissions Directive 2010/75/EU Integrated Pollution Prevention and control. 23015. http://eippcb.jrc.ec.europa.eu/reference/BREF/PP_revised_BREF_2015.pdf
- 8 - Cabrera, Maria Noel, et al. Pulp Mill Wastewater: Characteristics and Treatment. Chapter 7, Biological Wastewater Treatment and Resource Recovery, Robina Farooq and Zaki Ahmad. 2017. INTECH platform
- 9 - Alliance for Environmental Technology. Trends in world bleached chemical pulp production 1990-2012. AET Reports, 2013
- 10 - European Union. op. cit.
- 11 - SCA. Publication Papers Technical Support. <http://www.sca.com/globalassets/papper/media/brochyre/papermaking-eng>.
- 12 - U.S. Patent Office. Process for the production of Chlorine dioxide, 2013. <http://www.google.ch/patents/US8431104>
- 13 - Tarpea, Maria with Britta Eklund, Margareta Linde and Bengt -Erik Bengtsson. 1999. Toxicity of Conventional, Elemental Chlorine-Free, and Totally Chlorine-Free Kraft Pulp Bleaching Effluents Assessed by Short-term Lethal and Sublethal Bioassays. Institute of Applied Environmental Research, Stockholm University, S-106 91, Stockholm, Sweden. <http://onlinelibrary.wiley.com/doi/10.1002/etc.5620181115/full>
- 14 - Sandström, Olof with Olle Grahn, Åke Larsson, Mikael Malmaeus, Tomas Viktor & Magnus Karlsson. Dec 2016. Återhämtning och kvarvarande miljöeffekter i skogsindustrins recipienter. IVL, Swedish Environmental Institute.
- 15 - <http://www.ivl.se/download/18.6a63a18158efefeeb91c7/1481879056752/B2272.pdf>
- 16 - EKONO. Benchmarking of the Environmental Performance of the Gunns Limited Mill in Northern Tasmania, EKONO Report No 74150-1, 2007
- 17 - AOX requirements for Eco-labelled paper products – EEB and BEUC comments, 2010. <http://www.beuc.eu/publications/2010-00435-01-e.pdf>
- 18 - WHO fact sheet. Dioxins and their effects on humans, October 2016. <http://www.who.int/mediacentre/factsheets/fs225/en/>
- 19 - European Union, op. cit.
- 20 - Tissue World Magazine. July/August 2016. https://issuu.com/tissueworldmagazine/docs/tw-ja16_web/39
- 21 - Wennerström, Maria with Mårten Dahl, Solveig, Nordén, Ann-Sofi Näsholm. THE SECOND GENERATION TCF BLEACHING WITH HC OZONE. Metso Paper 2015. <http://www.eucalyptus.com.br/icep03/220Wennerstrom.text.pdf>
- 22 - Ibid
- 23 - Frost & Sullivan. Pulp and Paper Industry: Water Use and Wastewater Treatment Trends, 2002 EKONO, Inc, op. cit
- 24 - Confederation of European Paper Industry. Unfold the Future. The Forest Fibre Industry, 2050 Roadmap to a low-carbon bio-economy. 2011.
- 25 - European Commission. Integrated Pollution Prevention and Control (IPPC), Reference Document on Best Available Techniques in the Pulp and Paper Industry, 2001. 2001.

- 26 - Kramer, K.J., Masanet, E., Xu, T., Worrell, E., 2009. Energy Efficiency Improvement and Cost Saving Opportunities for the Pulp and Paper Industry. An ENERGY STAR Guide for Energy and Plant Managers. Lawrence Berkely National Laboratory, Berkely, CA, LBNL-2268E.
- 27 - <http://news.thomasnet.com/imt/2013/07/29/pulp-and-paper-industry-strives-to-reduce-its-water-impact>
- 28 - European Commission, op, cit.
- 29 - European Commission, op, cit.
- 30 - Unfold the Future. The Forest Fibre Industry, 2050 Roadmap to a low-carbon bio-economy. CEPI report, 2011.
- 31 - Unfold the Future. The Two Team Project. CEPI, 2013
- 32 - Ibid
- 33 - <http://reneweconomy.com.au/act-solar-auction-grid-paper-mill-win-top-awards-17248/>
- 34 - <http://www.sodra.com/en/pulp/pulp-sustainability/process/>
- 35 - <http://www.finnpulp.fi/finnpulp-mill.html>

- 1 – European Union Parliament and Council. Directive 2014/95/EU. <http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A32014L0095>
- 2 – KPMG, et al. Carrots Sticks Global trends in sustainability reporting regulation and policy. 2016. <http://www.sseinitiative.org/wp-content/uploads/2016/05/Carrots-Sticks-2016.pdf>
- 3 – Forest 500. Sleeping giants of deforestation: the companies, countries and financial institutions with the power to save forests – The 2016 Forest 500 results and analysis. <http://forest500.org/analysis/insights/sleeping-giants-deforestation-2016-forest-500-results-and-analysis>
- 4 - Supply Change. Supply change: Tracking Corporate Commitments to Deforestation-Free Supply Chains. March, 2017. http://www.forest-trends.org/documents/files/doc_5521.pdf#
- 5 – Climate Focus, et al. Progress on the New York Declaration on Forests – Eliminating Deforestation from the Production of Agricultural Commodities. Goal 2 Assessment Report. 2016, <http://forestdeclaration.org/wp-content/uploads/2015/11/2016-Goal-2-Assessment-Report.pdf>
- 6 - Environmental Paper Network. In the Red. July 2017. <http://environmentalpaper.org/wp-content/uploads/2017/08/In-the-Red.pdf>

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Susan Kinsella was director of communications and research for Conservatree Paper Company when it jumpstarted the markets for recycled paper in North America. When the company closed after 20 years, she founded the nonprofit Conservatree in order to continue its advocacy, education and technical assistance for all types of environmental papers. In 2002, she initiated the founding of the Environmental Paper Network.

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Rune Leithe is based in Gothenburg, Sweden. Between 1988 and 1995 he worked for Greenpeace on numerous toxic and forest related issues. Since 1995 he has led Ecology and Pioneering as a consultant working with various international NGOs. Rune is a forester and spends most of his leisure time with his family in their own forest in southern Sweden.

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Emmanuelle Neyroumande is a Director at Deloitte Sustainability services, based in Deloitte's French office. She has more than two decades of experience in sustainable natural resources management and responsible supply chains. She supports companies from multiple sectors on sustainability initiatives in various areas: deforestation-free supply chains, product environmental footprinting, circular economy, forestry and agro-ecology, certification, responsible consumption, biodiversity conservation. She coordinated WWF's efforts to reduce the footprint of forest products, in particular pulp and paper, and assisted companies in their life cycle analysis and responsible sourcing. Prior to WWF, she spent three years at the Representation of the European Commission in Indonesia in charge of Forestry projects.