SURVIVAL NEXT GEN PATHWAY

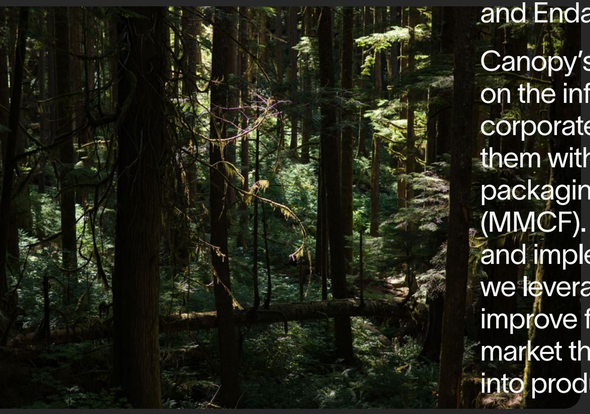
A Plan for Saving Forests and Climate. A Pulp Thriller.

2020

canopy

ABOUT CANOPY

Canopy is a not-for-profit environmental organization dedicated to protecting forests, species, and climate.



Canopy has collaborated with more than 750 companies to develop innovative solutions and make their supply chains more sustainable to help protect our world's remaining Ancient and Endangered Forests.

Canopy's forest conservation work focuses on the influential relationship between large corporate purchasers and the mills that supply them with pulp, print grade paper, paper packaging, and Man Made Cellulosic Fibres (MMCF). In helping major purchasers develop and implement forest conservation policies, we leverage forest protection in key regions, improve forestry practices, and develop the market that draws Next Generation alternatives into production.

Canopy is funded by philanthropic foundations and individual donors who share our passion for the planet.

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THE NUMBER OF CANOPY'S COLLABORATORS TO DATE

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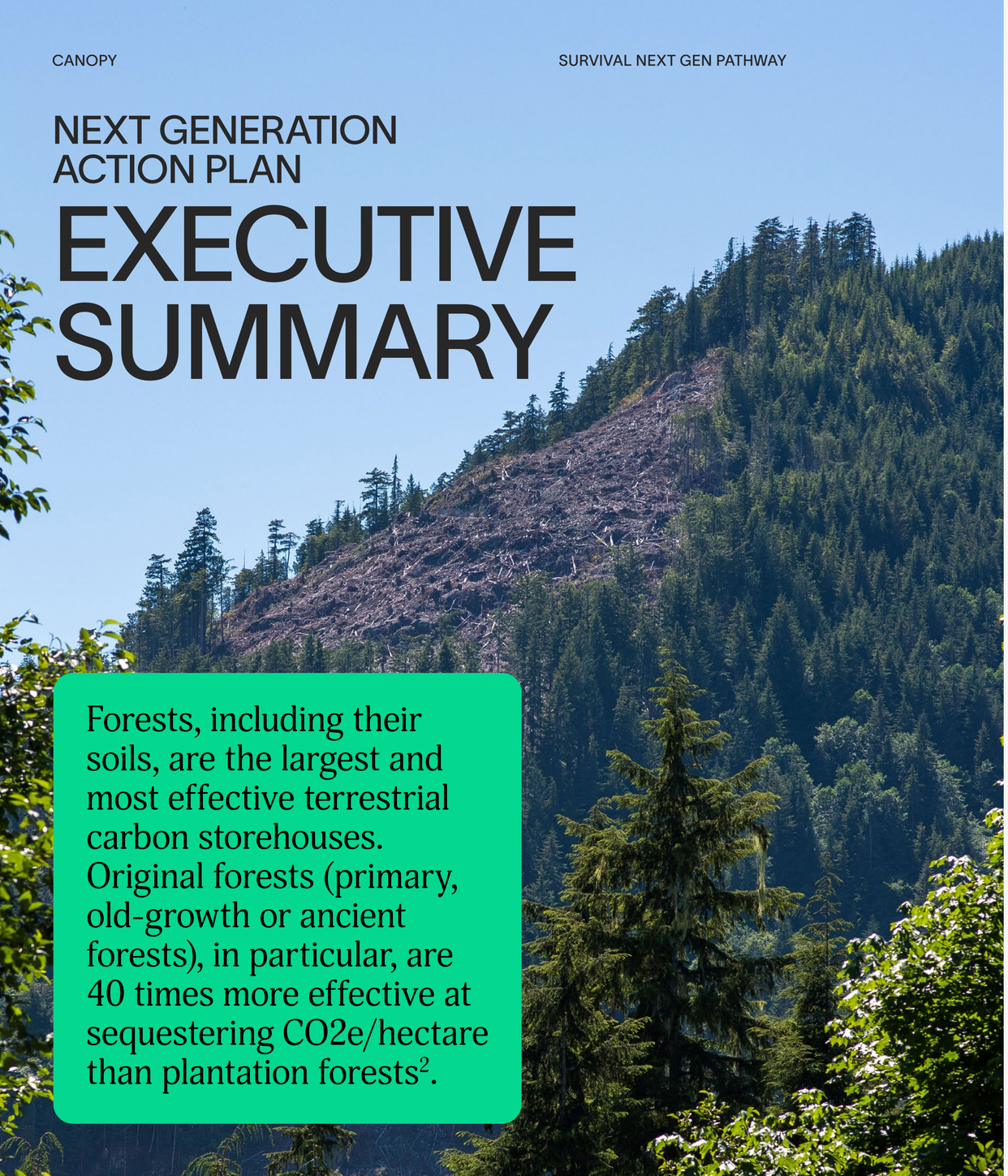
“The health of ecosystems on which we and all other species depend is deteriorating more rapidly than ever. We are eroding the very foundations of our economies, livelihoods, food security, health, and quality of life worldwide.

Through ‘transformative change,’ nature can still be conserved, restored, and used sustainably – this is also key to meeting most other global goals. By transformative change, we mean a fundamental, system-wide reorganization across technological, economic, and social factors, including paradigms, goals, and values.”

– SIR ROBERT WATSON Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services

NEXT GENERATION ACTION PLAN

EXECUTIVE SUMMARY



Forests, including their soils, are the largest and most effective terrestrial carbon storehouses. Original forests (primary, old-growth or ancient forests), in particular, are 40 times more effective at sequestering CO2e/hectare than plantation forests[2].

The world's scientists have delivered a sobering challenge to humanity. If we are to prevent runaway climate change, we have only 10 years left to transform our methods of production and the way we consume resources in order to keep global temperatures below an increase of 1.5°C.

A large part of the solution is to move more rapidly away from our reliance on fossil fuels. However, according to a landmark United Nations report released in May 2019, in order to support a reduction in greenhouse gas emissions, it is equally important to maintain and restore the world's forests. Healthy forests are projected to be one-third of the solution to the emerging climate and biodiversity crisis, and yet today forests continue to be cleared at a rate that far exceeds their ability to regenerate and maintain their life-support functions.

In 2018, Canopy mapped a large subset of the world's forests, referred to as Ancient and Endangered Forests[1], that are priorities for conservation because of their high carbon values and value for species habitat. Some of these forests are original (i.e., Ancient), that have never been industrially logged. Others are forests that have been logged and replanted for industrial fibre in areas with high carbon soils and/or in endangered species habitat. Recognizing their critical importance for climate stability and biodiversity, and our focus for over twenty years, has been to maintain the ecological integrity of Ancient forests and restore priority areas of Endangered forests that have been degraded.

During the course of researching this report, we have concluded that shifts toward circular economy production are not only absolutely necessary, but also achievable.

Supply-side shifts to the responsible production of pulp will require the utilization of existing agricultural and textile waste streams as the raw resource inputs – and the growing of new forests for wood on truly sustainable sites (i.e., not on high-carbon peat soils or in prime species habitat). Clean technology to utilize these materials is already starting to emerge into the market via alternative fibre pulp mills that use far less water, chemicals, and energy than conventional wood pulp production. Given the uncertainty about future wood supply, diversifying the fibre basket for pulp is a salient business proposition as well as an environmental strategy.

Making changes to the consumption patterns on the demand side of the supply chain is equally achievable. Measures to reduce the use of primary raw materials have high-quality ecological outcomes. Brands and retailers have the capability to influence and choose the materials that go into their goods. They also have the ability to innovate systems to reuse, reduce use, and extend the lifespan of materials and products they use and sell. These purchasing and design decisions are critical to taking pressure off forests. Cost savings also flow from reduction initiatives. Reusing shipping boxes, shipping lighter-weight packaging, and capturing an additional round of value from second-hand or rental clothing are choices that are gaining traction as business decisions that also serve environmental objectives.

Canopy is dedicated to finding solutions at the scale at which the problems occur and in the timeframe that the best available science directs us to act. Our Next Generation Action Plan outlines a combination of common-sense approaches, groundbreaking endeavours, and technological innovation. We recognize that a sector-wide transformation to responsible production is a climate and biodiversity imperative that both sides of the supply chain must embrace, and Canopy is eager to catalyze support for this shift.

By working together strategically, investors, innovative technology ventures, pulp producers, paper/packaging/viscose manufacturers, governments, and corporate buyers of wood pulp-derived products can make this vision a reality by 2030. Policies and investments that drive this forward are consequential to both a stable planet and a stable economy.

NEXT GENERATION ACTION PLAN

Contributes to achieving the goal of preserving nature at the scale needed to support life on earth. It presents an ambitious but achievable scenario to reduce, by 50%, the amount of forest fibre going into the manufacturing of pulp for paper and packaging and to produce viscose fabrics, such as rayon, for clothing.

It proposes to transform the global wood pulp commodity sector and its supply chain at precisely the scope and scale of its current impact on forests. The gravity of the challenges we face today warrant nothing less than bold ambition; there is no point in embarking on cosmetic changes at this time in history. It will require ingenuity, determination, and goodwill – and new infrastructure and investment. The investment needed is not inconsiderable, but it pales in comparison to the cost of inaction.

The conclusions in this report are based on research evaluating the proportion of pulp that is currently made from wood from high conservation and high carbon value forests and then establishing:

- The number of tonnes of forest fibre that can be reduced by replacing wood fibre with alternative fibres and recycled fibres.
- The number of tonnes of forest fibre that can be reduced by simply extending a forest product's lifespan.
- The number of tonnes of forest fibre that can be reduced through better design and logistics systems that reduce the use of wood-based products overall.
- The number of tonnes of new, sustainably planted forest pulp that need to replace pulp that currently comes from plantations established in prime species habitat and/or critically important carbon-rich soils.
- The investment required, globally, to build new mills and/or retrofit existing mills to utilize alternative fibres.

413M

TONNES OF PULP FOR PAPER PRODUCED GLOBALLY.

6.5M

TONNES OF VISCOSE PULP PRODUCED GLOBALLY.

184M

OF THOSE TONNES (NEARLY HALF) COME FROM VIRGIN WOOD FIBRE.

92M

OF THAT (NEARLY HALF) COMES FROM ANCIENT & ENDANGERED FORESTS.

3.3M

COMES FROM ANCIENT AND ENDANGERED FORESTS, SUCH AS THE CARBON-RICH PEATLANDS OF INDONESIA AND OLD-GROWTH BOREAL FORESTS OF CANADA.

A forest is much more than the sum of its trees. Forests, including the soils they create and are anchored in, are massive carbon sinks. They provide homes to thousands of species, regulate the climate, and act as rainfall generators, to name just a few ecological benefits of forests. Less than 20% of the world's original forests remain in tracts large enough to sustain their full range of ecosystem services[3].

NEXT GENERATION ACTION PLAN

Scenario proposes to eliminate 70% of the pulp fibres coming from original forests (i.e., never-before loggzed) and 30% of the pulp fibres from plantations that endanger rich carbon stores and prime habitat.

To do so will require

16.65M TONNES OF CONSUMPTION REDUCTION THROUGH REUSE & MATERIAL-EFFICIENT DESIGN

7.5M HECTARES[6] OF NEW FORESTS PLANTED ON LANDS NOT PRIORITIZED FOR FOOD PRODUCTION, HABITAT MAINTENANCE & RESTORATION OR CARBON STORAGE[7]

200 AGRICULTURAL FIBRE PULP MILLS[4]

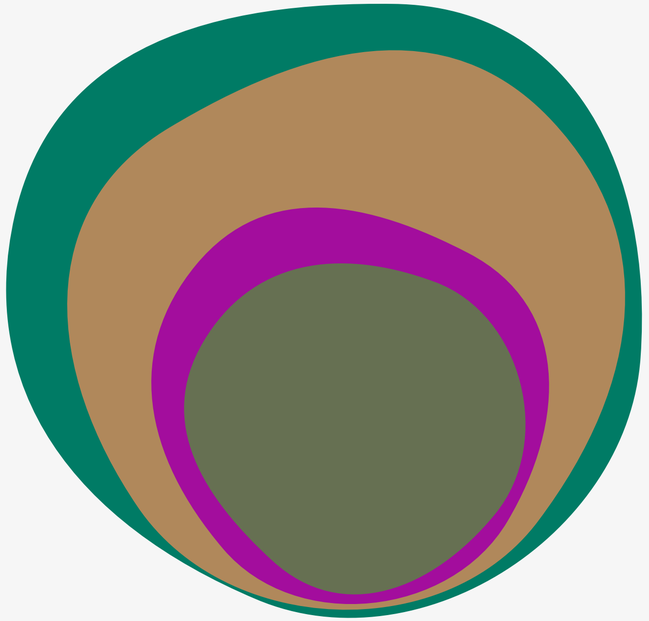
17 RECYCLED COTTON GARMENT AND/OR MICROBIAL-CELLULOSE DISSOLVING PULP MILLS

107 RECYCLED PAPER PULP[5] MILLS

2030 Target Investment $69B

The investment required over a 10-year period will be $64.8 Billion[8] to build the mills and approximately $4.2 Billion[9] to plant new plantations, for a total of $69 billion.

- **NEW PLANTED $4.2B**
  to plant 7.5 million hectares of trees for forestry purposes
- **NEXT GEN PAPER FIBRE $40B**
  for agricultural fibre pulp for paper mills (including paper packaging)
- **NEXT GEN TEXTILE FIBRE $3.4B**
  for recycled cotton and microbial-cellulose dissolving pulp mills for production of viscose/MMCF fabrics
- **RECYCLED PAPER CONTENT $21.4B**
  for recycled pulp and paper mills



TO PUT THIS 10-YEAR, $69 BILLION PRICE TAG INTO PERSPECTIVE...

the maker of Botox sold for $63 billion in 2018. More pertinently, in 2018, $140 billion in investment from private, public and development finance institution (DFI) sources was committed to infrastructure development in 41 low- and middle-income countries[10].

FOUNDATIONAL UNDERSTANDINGS FOR THIS REPORT

WHAT ARE NEXT GENERATION SOLUTIONS?

Canopy defines Next Generation (Next-Gen) Solutions as the designs, systems, and technologies that enable us to achieve protection, including restoration, of 30% of the world's forests by 2030 and 50% of the world's forests by 2050. These solutions enable a radical reduction in the use of raw resources, optimize the efficient use of materials, lead to better product reuse, and shift the use of conventional high-impact fibre sources to alternative, less damaging fibre sources or regenerative feedstocks for manufacturing pulp for paper and viscose fabric goods.

Key to Next Generation Solutions is not just their ingenuity but the capability of scaling them to solve the problems we face at the scale at which the problems occur. That is when they truly become solutions.

50%

NATURE NEEDS HALF[11]

There are functionality thresholds that nature needs to be above to maintain the essential services that make the world, literally, livable. Natural ecosystems provide climate stability, oxygen production, fresh water, habitat for species and soil nutrients for seeds, breathable air, just enough rain for farming and myriad other functions that have taken 4.5 billion years to evolve.

33%

ONE-THIRD OF THE CLIMATE SOLUTION IS FORESTS

One-third of our climate destabilization crisis will be resolved by protecting existing forests[12], restoring degraded forests in priority landscapes, planting new forests, and practicing good forest management where logging is ecologically defensible. When forests are protected, so too are the species (including humans) that depend on them.

CONTEXT FOR THIS ACTION PLAN

There is overwhelming scientific consensus that we have fewer than 10 years to reduce the world's carbon emissions to stabilize our climate at a 1.5°C increase.[13]

Protecting forests has been identified as the most economical and fastest way to reduce emissions and to continue sequestering carbon. Planting new forests has been identified as critical to absorbing the over-burden of carbon currently in the atmosphere[14]. Original forests (primary, old-growth, or ancient forests), in particular, are documented to be 40 times more effective at sequestering CO2e/hectare than plantation forests[15].

Canopy has identified and mapped a large subset of the world's forests, referred to as Ancient and Endangered Forests, that are priorities for conservation because of their carbon values and values for species habitat. For 20 years, we have worked with many hundreds of businesses that use pulp and paper and viscose forest products to help them eliminate Ancient and Endangered Forests from their supply chain. We have witnessed how focused market demand from major corporate customers can leverage mills to produce environmentally preferable paper and viscose products. We have also seen the bottleneck that occurs when demand for better products meets the barrier of a conventional production mindset that assumes that commodity pulp must be wood product.

To systematically address the stress on high- carbon and biodiverse forests, we began searching for leading Next Generation Solutions ventures. Disruptive technologies that turn alternatives to wood fibres into commercial-grade pulp need to be leveraged into the market. Corporate customers are ready to use environmentally preferable pulp products for paper and viscose. The technologies to make pulp from fibre alternatives emerging into commercial-scale production. Citizens around the world are concurrently demanding that the linear approach – from resource extraction through the marketplace and onward to the landfill – has to change. A convergence point has arrived.

Three billion trees go into making packaging every year.[16] It can be daunting to consider instigating such a huge shift. The pathway we have laid out in these pages tackles the problem from its two (linear) ends: how to marshal investment to unlock the funds needed for construction of the alternative fibre mills and how to reduce demand so that the amount of alternatives needed is achievable.

These chapters do not present an inflexible plan. They provide an illustration of how the scope and scale of transition can be achieved – with infrastructure built in multiple countries and utilizing a variety of technologies, feedstocks and strategies – between 2020 and 2030.

150M
TREES → VISCOSE

3B
TREES → PACKAGING

PAPER FACTS

413M

TONNES OF PAPER PRODUCED EACH YEAR

↓

432M

TONNES OF PULP IS REQUIRED TO MAKE THAT MUCH PAPER

235M – 54.4%

TONNES[17] IS RECYCLED PAPER PULP

184M – 42.6%

TONNES[18] IS WOOD PULP

12.9M – 3%

TONNES[19] MADE WITH AGRICULTURAL FIBRES SUCH AS WHEAT STRAW, BAGASSE AND BAMBOO

CELLULOSIC (VISCOSE) TEXTILE FACTS

6.5M

TONNES[20] OF VISCOSE TEXTILES, MADE FROM TREES WERE PRODUCED IN 2019

150M

TREES ARE CUT EACH YEAR TO FEED THE WORLD'S VISCOSE PRODUCT MILLS[21]

2.5–3T

TREES MAKE 1T OF RAYON

PART 1 →
WHAT NEEDS TO BE DONE

CHAPTER 1

THE PATHWAY OUTLINED

We have a problem. What are we going to do about it?

In this report, we outline how retooling the industrial systems for pulp and paper production can contribute significantly to protecting 50% of the world's forests to advance global climate and biodiversity targets. We posit – in pragmatic terms – a pathway for mills that produce pulp for paper, packaging, and viscose fabrics to stop using Ancient and Endangered Forest[22] fibre. These are the forests that are critical to stabilizing the climate and safeguarding biodiversity.

We have identified concurrent actions that corporate customers can take to reduce their overall use of forest fibre and give preference to sustainable alternatives. The Next Generation Action Plan demonstrates how to scale up the production of alternative fibre pulp and to institute systems for paper and viscose reduction by 2030.

Some components of this approach are obvious and well understood: plant more trees for new fibre supply, reduce consumption, and recycle. Other components are new or emerging Next Generation Solutions. These include the introduction of alternative fibres instead of wood for pulp production at economies of scale, as well as new clean technologies to turn these fibres into pulp for paper, packaging, and viscose products.

Addressing scope 1, 2, and 3 emissions (those a company makes directly and those resulting from having goods manufactured elsewhere on a company's behalf) and their biodiversity impacts motivates businesses to reduce their consumption of big-ticket items like virgin-paper content in shipping boxes and to favour products from manufacturing processes with a lower footprint. Because this trend is accelerating, pulp mills that continue to use wood fibre from high carbon, high biodiversity forests risk having stranded assets.

WHEN IMPLEMENTED, THE SUPPLY CHAIN WILL SEE A REDUCTION OF THE FOLLOWING

70% OF ALL PULP DERIVED FROM ORIGINAL FORESTS (ANCIENT FORESTS)[23]

30% OF THE PULP DERIVED FROM TODAY'S PLANTATIONS AND PLANTED FORESTS –

to allow priority sites (endangered forests developed on high carbon stock forest soils, or on endangered species forest habitat) to be restored to natural forest for habitat and carbon storage.

OBJECTIVE
DISPLACE ANCIENT AND ENDANGERED FOREST PULP FROM SUPPLY CHAIN

PAPER TARGETS — 92M TONNES

RECYCLE
16M TONNES
of wood pulp with recycled (especially Post Consumer Recycled) fibre.

REDUCE/REUSE
16M TONNES
less wood based paper and viscose products.

REGENERATE
30M TONNES
of wood pulp with virgin wood from new well-managed plantations/ forests.

REPLACE
30M TONNES
of wood pulp with agricultural fibre pulp alternative.

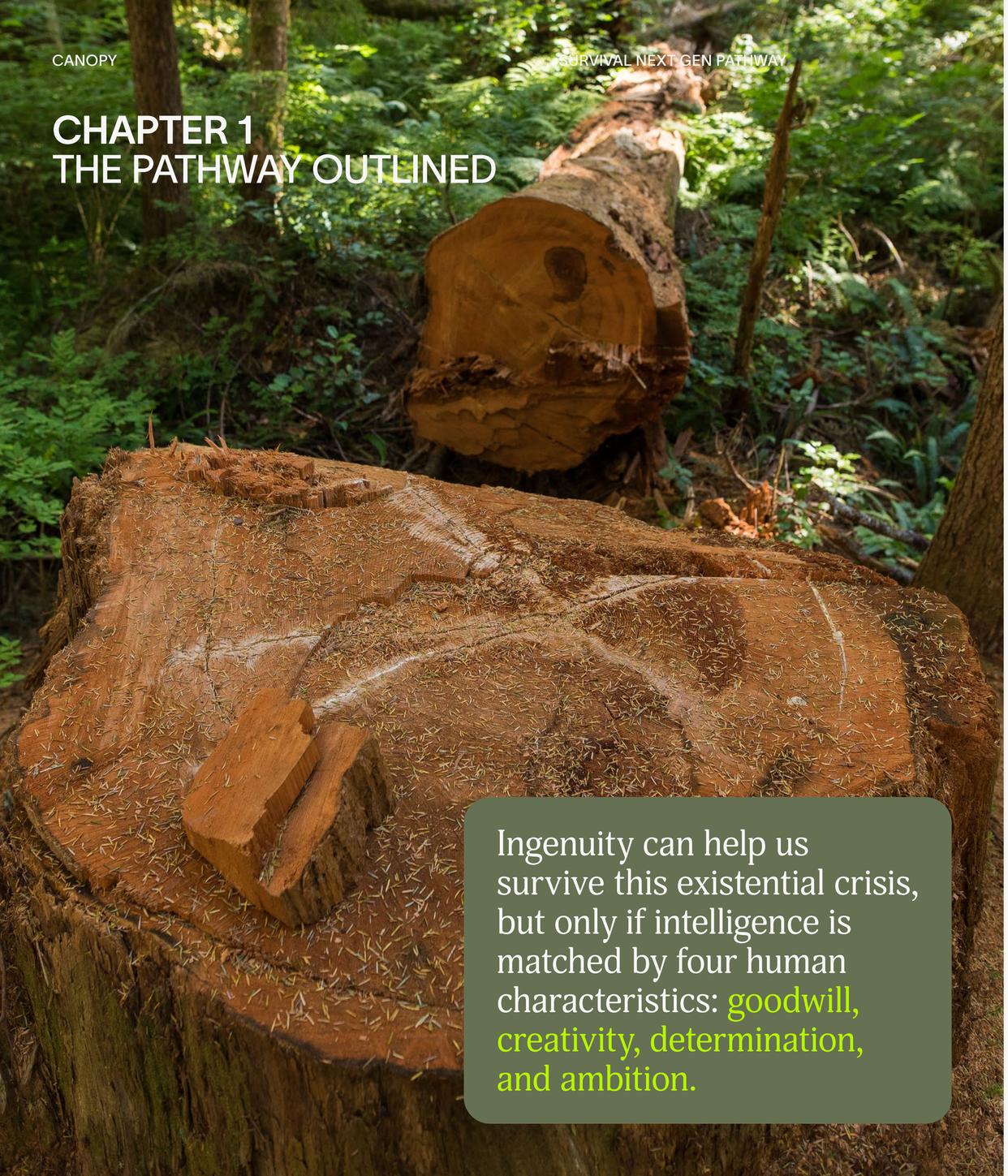
VISCOSE TARGETS — 3.3M TONNES

REPLACE
2.6M TONNES
of wood pulp with pulp derived from alternative fibres.

REDUCE/REUSE
650,000+ TONNES
Extend the life of at minimum 10%+ (650,000+ tonnes) of clothing containing viscose.

REGENERATE
50,000 TONNES
of wood pulp with virgin wood from new well-managed plantations/ forests.

CHAPTER 1
THE PATHWAY OUTLINED



Ingenuity can help us survive this existential crisis, but only if intelligence is matched by four human characteristics: goodwill, creativity, determination, and ambition.

In this action plan, we assessed the number of tonnes of pulp for paper (including paper-based packaging and for viscose textiles) that are currently produced globally from forest fibre. We then calculated how many million tonnes each of the component approaches needs to contribute toward the conservation goal through the following methods:

REDUCE AND REUSE

Reduce consumption on the demand side of the supply chain through creative design and delivery systems and extend the lifespan of products such as shipping boxes and T-shirts.

RECYCLE

Increase the amount of recycled paper fibre in products.

REPLACE

Replace a significant amount of wood pulp with alternative fibre sources such as:

Agricultural residues and fibre crops for paper[24].

Waste cotton and rayon scraps and used garments for recycling into new viscose.

Microbial cellulose fibre for viscose grown from food waste.

REGENERATE

Plant new trees for wood pulp to fill the supply gap resulting from the restoration of priority forests that have been degraded.

This approach requires the building and retrofitting of mills to process Next Generation alternative fibres and recovered paper. The cost for the new mills is not inconsiderable: this assessment estimates a price tag of $64.8 billion[25] to be spent on mill infrastructure between now and 2030, and an additional $4.2 billion to plant new trees for fibre production.

However, these mills can be located in more than 20 countries around the globe. Seventy percent of those mills could likely be built in India, China, United States, Brazil, Canada, Ukraine, and Indonesia, where fibrous agricultural residues are plentiful and tens of millions of tonnes of it are being burned or dumped. These new mills would provide additional benefits, such as economic development in rural regions and in underemployed urban areas.

If this investment is concentrated into 5 years, to allow for planning and construction by 2030, the average yearly infrastructure investment globally will be approximately $13 billion. An additional $420 million per year will need to be mobilized to plant new forests to replace the wood supply removed from areas that need to be restored to natural forests.

CHAPTER 1
THE PATHWAY OUTLINED

TRANSFORMING THE SUPPLY CHAIN

PRACTICAL TARGETS

In the following two sections we specify how many tonnes of original forest pulp can be eliminated from the paper and viscose supply chain to contribute to conserving or recuperating half of the representative forest ecosystems of the world.

We have put forward detailed targets for the number of tonnes of each alternative that will replace the pulp from Ancient and Endangered (original) forest and investment targets to achieve each.

MAKING IT TO PAPER NIRVANA – THE PAPER TRAIL

2017 Global & Paper-Based Packaging Production — 413M TONNES

235M TONNES — Recycled Paper Pulp

184M TONNES — Wood Pulp
50%[27] Original Forests
50%[28] Planted Forests

12.9M TONNES — Alternative Fibres (e.g., agricultural residues, bamboo)

2017 Global & Paper-Based Packaging Production — 413M TONNES

70% → 64.4M TONNES* OF ORIGINAL FOREST PAPER PULP REMOVED

30% → 27.6M TONNES* OF CURRENT PLANTED FOREST PULP REMOVED

92M TONNES* OF TOTAL PAPER PULP TO BE REPLACED WITH BETTER OPTIONS

*NUMBERS HAVE BEEN ROUNDED

CHAPTER 1
THE PATHWAY OUTLINED

REMOVING 50% OF WOOD FROM PAPER
The Alternative for 92 million tonnes

REPLACE 16%
Of Forest Pulp

WITH →

30M TONNES
Of agricultural fibre pulp alternative.

REGENERATE 16%
Of Forest Pulp

WITH →

30M TONNES
Of virgin wood from new well-managed and well-sited plantations/forests.

RECYCLE 9%
Of Forest Pulp

WITH →

16M TONNES
Recycled (especially Post Consumer Recycled) fibre.

CONSUME 9% LESS

16M TONNES
Wood-based paper and viscose products.

PAPER & PACKAGING
Infrastructure Needed and Cost

AGRICULTURAL FIBRE PULP MILLS* **200 → $40B**

RECYCLED PAPER PULP MILLS* **107 → $21.4B**

TREE PLANTATIONS **7.5M HA → $4.1B**

*150,000 TONNES/YEAR CAPACITY[26]

REQUIREMENTS

REPLACE

Identify 60 million tonnes of agricultural residue and/or sustainable fi bre crops globally.[29]

REGENERATE

Plant on degraded agricultural land and areas not prioritized for forest restoration.[30]

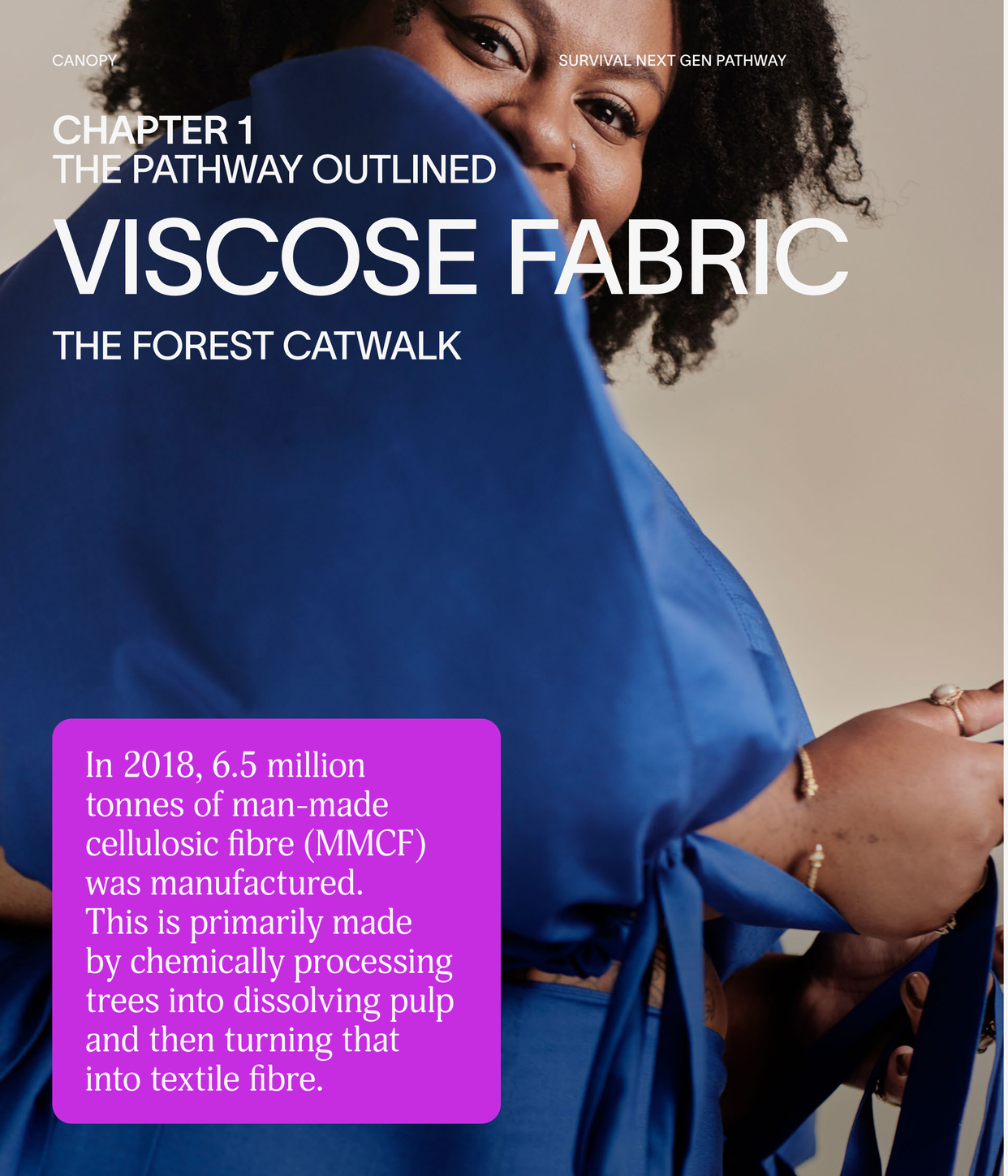
Use a mix of intensive plantation and agro-forestry.

RECYCLE

Improve municipal recycling collection for better quality feedstock. Create incentives for recycled content. Institute recycled content minimums.

REDUCE AND REUSE

DEMAND SIDE: Design products and business systems to be optimally material-efficient and design for reuse.



CHAPTER 1
THE PATHWAY OUTLINED

VISCOSE FABRIC

THE FOREST CATWALK

In 2018, 6.5 million tonnes of man-made cellulosic fibre (MMCF) was manufactured. This is primarily made by chemically processing trees into dissolving pulp and then turning that into textile fibre.

In this report, we refer to dissolving pulp and the variety of textiles it is used for – such as rayon, lyocell, and trademark names Tencel, Modal, and Liva – as viscose.

The process of making dissolving pulp requires the chemical extraction of the cellulose component of the tree. However, cotton textiles and viscose textiles are also cellulosic fibres. Recent technology innovations now make it possible to convert waste cellulosic fabrics into viscose – that is, dissolving pulp. This creates an opportunity to recycle a fraction of the 20 million tonnes of cotton fabric waste and the 6 million tonnes of viscose fabric waste that is generated every year back into viscose pulp. Whereas on average, it takes 2.5 - 3 tonnes of trees to create 1 tonne of viscose pulp[31], it takes only about 1 tonne of recycled cotton or rayon to make 1 tonne of viscose pulp.

More than 83.5 million tonnes of textile waste are generated globally every year[32]. Approximately 24% (20 million tonnes)[33] of that is pre-consumer and post-consumer cotton waste. Recycling just 25% (5 million tonnes) of global pre-consumer and post-consumer cotton textile waste, plus 25% (1.6 million tonnes) of rayon textile waste, could replace all wood fibre currently used to manufacture dissolving pulp.

We have posited a much more conservative trajectory to manufacture only forty percent of current viscose from recycled textiles, microbial cellulose, and agricultural residue cellulose. This would require recycling just over 10% of cotton textile waste. There is no need to build any additional dissolving pulp capacity using wood as a fibre source. There is ample cellulosic textile in the waste stream to feed new mills. The compelling suite of environmental benefits associated with these alternative fibres warrants a retooling of a significant percentage of existing mills.

25%+25%

COTTON TEXTILE WASTE

RAYON TEXTILE WASTE

COULD REPLACE ALL WOOD FIBRE CURRENTLY USED TO MANUFACTURE DISSOLVING PULP

CHAPTER 1
THE PATHWAY OUTLINED

REMOVING 50% OF WOOD FROM PAPER
The Alternative for 3.3 million tonnes

REPLACE **40%** OF WOOD PULP WITH PULP DERIVED FROM ALTERNATIVE FIBRES

REDUCE/ REUSE **10%** OF CLOTHING CONTAINING VISCOSE TO EXTEND THE LIFE OF THESE GARMENTS.

REGENERATE **1.5%** OF WOOD PULP WITH VIRGIN WOOD FROM NEW WELL-MANAGED AND WELL-SITED PLANTATIONS/FORESTS.

REQUIREMENTS

Identify approximately 2.6 million tonnes of waste cotton and viscose textiles for feedstock.

Collect and sell second-hand clothing; sell up-cycled clothing; provide in-store repair services.

Plant on degraded agricultural land and areas not prioritized for forest restoration[35]. Use a mix of intensive plantation and agro-forestry.

INFRASTRUCTURE NEEDED AND COST

RECYCLED TEXTILE & FOOD WASTE CELLULOSE
Dissolving pulp mills (viscose)

16 → $3.4B

TREE PLANTATIONS

20,000HA → $11M

CHAPTER 1
THE PATHWAY OUTLINED

PULP FOR VISCOSE TEXTILES

Global viscose production was 6.5 million tonnes in 2018, primarily made from wood fibre.

REMOVING 50% OF THE ANCIENT AND ENDANGERED FOREST FIBRE FOR VISCOSE FROM THE SUPPLY CHAIN COULD BE ACHIEVED BY REMOVING:

70% → 2.3MT 34
OF ORIGINAL FOREST VISCOSE PULP

30% → 1MT
OF RESTORATION AREA VISCOSE PULP

3.3MT
TOTAL PULP FOR VISCOSE TO REPLACE WITH BETTER OPTIONS

CHAPTER 1
THE PATHWAY OUTLINED

Future Dissolving Pulp Development

No new dissolving pulp production should be built near forests or rely on wood fibre as its feed source. It should be built closer to urban centres where landfilled clothing is an environmental problem and a burden on municipal coffers. New mills should be built near garment-sewing facilities where offcut cotton and viscose fabric waste can be easily sorted and collected. This potential fibre supply is currently being buriedin landfills. Some mills can be located near or adjacent to food-processing facilities to grow microbial cellulose on industrial food waste, or they can be near agricultural lands where cellulosic fibre can be obtained after food grain is harvested, without damaging soil quality.

The investment for future production is not captured in this action plan.

ACTION REQUIRED

Ensure that future dissolving pulp capacity projected to come on line by 2030 is built to process recycled cotton and cellulosic fabrics, agricultural fibres and/or microbial cellulose.

PART 1
SUMMARY

What Needs to be Done for Paper, Packaging and Viscose

Eliminating Ancient and Endangered Forests from the pulp supply chain requires 324 alternative fibre and recycled paper mills to be built (or retrofitted) globally and 7.52 million hectares of new planted forest for fibre. Nearly 17 million tonnes of Ancient and Endangered Forests will need to be removed from the supply chain through reuse, efficiency and reduction initiatives by major purchasers of forest products (demand-side management). Siting of mills and of planted forests must include an assessment to ensure a supply of sustainable fibre. Areas prioritized for forest protection or restoration are not to be utilized for fibre farms.

ACTION REQUIRED

Identify 50 million to 60 million tonnes of agricultural fibre feedstock[36] per year that is logistically available while ensuring that soil carbon is not compromised (see Chapter 3 for more information).

Develop systems to aggregate the 2.6 million tonnes of waste textiles for the supply chain and apply technologies to effectively separate blended fibres.

Identify appropriate sites for planting trees for fibre.

Improve recyclable paper collection in many jurisdictions to capture used paper before landfill and to capture recovered paper quality for recycling.

PART 2 →
HOW TO IMPLEMENT

CHAPTER 2

INVESTMENT PATHWAY

> “We estimate that investor appetite for impact investing is as high as $26 trillion – $21 trillion in publicly traded stocks and bonds, and $5 trillion in private markets involving private equity, non-sovereign private debt, and venture capital.”
>
> – **PHILIPPE LE HOUÉROU,** CEO, INTERNATIONAL FINANCE CORPORATION[37]

In this chapter, we identify how the investment for the scale-up of more sustainable, regenerative, and circular alternatives to can be mobilized.

In the Investment-by-Region charts, we have posited which countries could receive the mills, based on access to agricultural fibres and waste textiles.

THERE ARE FIVE GOOD REASONS FOR MOBILIZING INVESTMENT TO BUILD MILLS THAT USE ALTERNATIVE FEEDSTOCKS TO WOOD

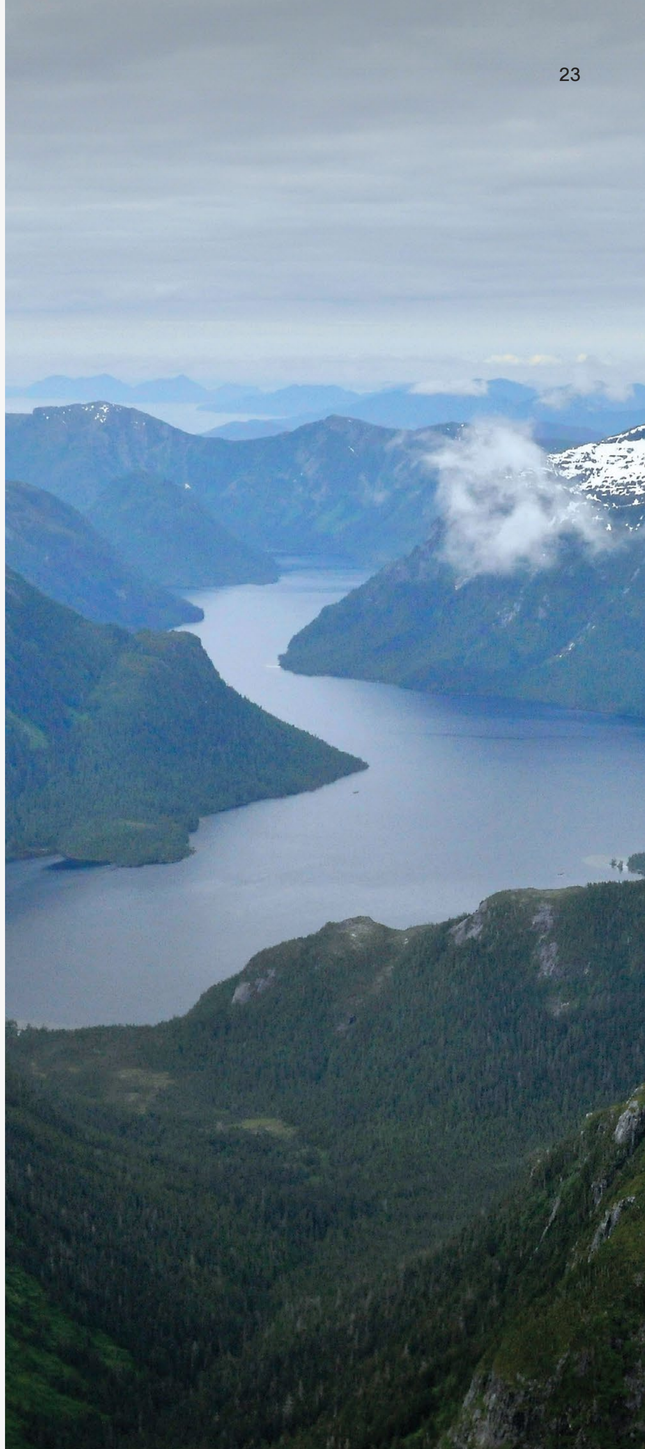
- Biodiversity protection
- Climate benefit of halving forest degradation, reducing burning of straw residues, and diverting textile waste from landfills
- Cleaner manufacturing compared to conventional wood pulp
- ROI potential because the market is ready for eco alternatives
- Opportunities that can meet Environmental, Social, and Governance (ESG) criteria and advance the United Nations Sustainable Development Goals (SDGs)

CHAPTER 2
INVESTMENT PATHWAY

The Price Tag for Retooling the Paper, Packaging & Viscose Supply Chains

Today's ecological realities require a quick scale-up of pulp production capacity for paper and viscose that doesn't use high-carbon and biodiverse forest fibre and that uses less energy and water than conventional wood-pulping infrastructure. Based on today's construction costs, this global scale-up of Next Generation Solutions pulp infrastructure will require $64.8 billion by 2030 and $4.2 billion for planting new tree fibre to displace Ancient and Endangered Forest fibre to feed conventional mills. Investments are expected to receive a market rate of return.

TARGET INVESTMENT BETWEEN 2020 AND 2030	$69B
AGRICULTURAL FIBRE PULP MILLS (paper/packaging)	200 → $40B → 30M
RECYCLED PAPER PULP MILLS[38] (paper/packaging)	107 → $21.4B → 16M
RECYCLED TEXTILE & FOOD WASTE CELLULOSE dissolving pulp mills (viscose)	16 → $3.4B → 2.6M
TREE PLANTING HECTARES (general pulp wood feedstock)	7.65M → $4.2B → 30.05M



CHAPTER 2
INVESTMENT PATHWAY

MOVING INFRASTRUCTURE FORWARD

INVESTMENT ACTION REQUIRED

AGRICULTURAL FIBRE PULP	$4B → $12B	Raised in equity (10%–30% of the whole) to anchor financing for mills. Debt financing will follow.
RECOVERED PAPER PULP	$2.1B → $6.4B	Raised (10%–30%) equity financing to help unlock debt financing for recycled pulp and paper mills.[39]
VISCOSE PULP	$340M → $1.02B	Raised (10%–30%) equity financing to help unlock debt financing to convert existing mills or build new Next Generation dissolving pulp mills.

CHAPTER 2
INVESTMENT PATHWAY

LEVERAGING INVESTMENT STRATEGIES

The business plans for alternative fibre pulp mills that Canopy has seen project good market-rate returns on investment. However, the investment approaches outlined in this section are strategies, not solicitations. Each individual venture must still =develop a viable business case, and investors must conduct normal due diligence.

We have focused the investment approach on raising the equity component since equity is harder to raise than debt financing and, depending on how the equity is structured, it can serve to attract investment.

Pooled Equity Funds Unlocking Debt

The equity required to unlock commercial-scale infrastructure for these new technologies will range between 10% and 30% of the capital expenditure, with the upper range likely reserved for the first facilities built using a range of emerging technologies.

SOLUTION APPROACH

Establish pooled equity funds of between $650 million and $20 billion globally (10% to 30% of capital expenditure) to leverage debt financing for ventures using alternative fibres and clean tech to manufacture Ancient and Endangered Forest–free pulp for paper, packaging, and textiles.

THESE VENTURES SHOULD BE SCREENED TO ENSURE

The amount of feedstock (e.g., agricultural residue) they require can be obtained without compromising soil carbon.

The pulp production process – be it agricultural residue or recycled textiles – is significantly less chemical-, energy-, and water-intensive than conventional wood pulping.

PATHWAY EXAMPLES

SEE GRAPHS 1, 2 AND 3 EXAMPLE INVESTMENT BY REGION (PG 30)

Establish $2.8 billion in pooled equity funds for India to leverage an additional $6.4 billion in debt finance. This $9.2 billion would produce 6.9 million tonnes of non-wood pulp for paper production.

Establish $200 million in pooled equity funds for Indonesia to leverage an additional $400 million in debt finance. This $600 million would produce 450,000 tonnes of non-wood pulp for paper production. Consider making concurrent protection of priority rainforest habitat and restoration of peatlands an investment criteria.

Direct $200 million in equity to secure $600 million investments for the production of more than 450,000 tonnes of recycled textile dissolving pulp for viscose mills in China.

Establish $1.2 billion pooled equity funds for the United States to leverage an additional $2.8 billion in debt finance for 3 million tonnes of non-wood pulp for paper production.

Invest in ventures that reduce pulp use (e.g., reusable box design, reusable box-sharing/ pooling ventures, and up-cycling and recycling ventures that can work at larger scales).

Advocate for municipal and commercial waste collection, which is crucial to a successful circular and/or regenerative economy. Investments need to power the supply chain, not just the new tech for processing recycled materials or growing microbial cellulose.

CHAPTER 2
INVESTMENT PATHWAY

Catalytic Capital – De-Risk Investment

According to the Council on Foundations, "Catalytic first-loss capital refers to socially- and environmentally-driven credit enhancement provided by an investor or grant-maker who agrees to bear first losses in an investment in order to catalyze the participation of co-investors that otherwise would not have entered the deal."[40]

Governments at all levels and mission-based/impact investors should strategically dedicate policies and investments to attract more conventional private investment in carbon-reducing, biodiversity-conserving, job-stimulating mill infrastructure. Contributing catalytic capital to accelerate the pace of infrastructure development can be considered strategic contributions from a variety of departments and programs to meet the SDGs, as well as national and regional mandates.

For example, building wheat straw pulp mills outside of Delhi or in rural United States areas contributes to rural economic development and addresses the significant respiratory health issues caused by burning straw residues. Recycled textile pulp mills can be strategically placed to provide jobs for underemployed urban populations and they divert expensive waste from municipal landfills.

Catalytic capital is a proactive investment strategy that enhances high-carbon emission-divestment programs being supported by many philanthropic entities.

SOLUTION APPROACH

Regional, national and, where appropriate, international government bodies contribute one-quarter of the pooled equity funds ($5 billion) and earmark all or a significant portion of this investment as catalytic first-risk investments. Additional capital will be attracted more quickly this way.

Development banks from major consuming countries, such as those in Europe and North America, designate a portion of their investment as de-risking capital for this type of infrastructure in the global south.

De-risking investment can be structured as collaborations between regional and federal governments. It should be accompanied by regulatory and policy-enabling conditions. For example, the United States has tax-free bonds that can be developed as investments for mill infrastructure development, concurrent with initiatives for rural employment (location) or sustainability.

Philanthropic, impact and mission-based investors can catalyze conventional investment through strategic allocations of catalytic capital (e.g., dedicated portions of foundation endowments). This can include initiating partnerships with governments to contribute first-loss capital to either pooled equity funds or to investments in specific mills or technologies and processes that enable the mills to be built.

Invest in ventures that reduce pulp use (e.g., reusable box design, reusable box-sharing/pooling ventures, and up-cycling and recycling ventures that can work at larger scales).

Advocate for municipal and commercial waste collection, which is crucial to a successful circular and/or regenerative economy. Investments need to power the supply chain, not just the new tech for processing recycled materials or growing microbial cellulose.

PATHWAY EXAMPLES

U.S. federal government could contribute $1.2 billion over 5 years to a pooled equity fund, $450 million of which would be de-risking investment.

Development finance institutions could contribute $1 billion into initiatives to collect agricultural residue fibre and divert used-cotton-garments from landfill and for growing microbial cellulosic to feed pulping capacity in the global south.

Major foundation funders in the forest conservation, climate mitigation and rural economic development space could form a working group to develop a catalytic capital (de-risking) strategy and action plan for a subset of their investment to leverage conventional investment in priority regions.

CHAPTER 2
INVESTMENT PATHWAY

Impact Investment Funds – Seeing the Forest for the Trees

Infrastructure shifts are critical to achieving a safe climate and biodiversity protection as well as myriad other SDGs. Enabling mill infrastructure that utilizes lower-carbon-impact feedstocks and processes removes the pressure to log natural forests. Impact investment funders need to be at the forefront of leveraging their funds for this kind, and scale, of systemic change.

SOLUTION APPROACH

Circular economy, rural economy, urban renewal, biodiversity and climate objectives can be met concurrently. Direct a substantial percentage of impact investment portfolios earmarked for climate mitigation, biodiversity, and community economic development toward mill infrastructure and supply-chain-enabling processes.

FOR EXAMPLE

Supply-side (infrastructure) ventures using alternative feedstocks

Demand-side management ventures working on design, logistics, and systems to reduce consumption

Collection of waste textiles and processes to separate blended fibres

Pre-Competitive Research and Development

The wood pulping industry has refined its manufacturing processes for more than a hundred years. Most paper, packaging, and viscose mills have machinery tuned to run wood pulp and are staffed with engineers who are trained in wood fibre chemistry and processing. Commercial products and trials have already shown that conventional viscose staple fibre, paper, and packaging mills can produce quality products using pulps made from agricultural residues and recycled textiles without any additional infrastructure. While the pulping process is different, the pulp can be used on conventional machinery for the next stage of production (e.g., agricultural pulp to conventional paper mill). The more that engineers work with pulp made from fibres other than trees, the faster they gain insights and expertise for using non-wood fibres in their processing facilities. This quickly improves the quality of the alternative fibre products that come to market.

SOLUTION APPROACH

Structure multiple funds and collaborations between governments, universities, paper- and textile-purchasing companies, and product manufacturers for intensive R&D to refine the emerging technologies and to integrate these new pulps into conventional end-product manufacturing facilities.

CHAPTER 2
INVESTMENT PATHWAY

Planting Forests for Species and Carbon and Trees for Pulp

We need more forests that are destined to grow old and perform ecosystem services critical to life on earth[41]. We also need trees to provide wood and pulp. In Chapter 1, we describe how many hectares of trees need to be planted specifically to provide pulp fibre, in tandem with consumption reduction and alternative pulp fibres development. These planted areas should be dedicated to supplanting current unsustainable wood fibre. Any future growth in wood pulp would require additional planted forest to what we propose here.

Yields of wood fibre vary in different hemispheres and under a variety of forest management systems. We estimate that the cost of planting trees for pulp production will be $4.2 billion. The faster that happens, the better. Since trees take time to grow, this investment should be front-ended into the strategy.

In this report, we focus on planting trees for pulp supply, which is a business investment. We strongly encourage additional investments in forest protection and forest restoration, which have social and environmental returns on investment and potential carbon-credit income; however, we have not included these in this report.

There are myriad tree-planting efforts underway. Some of these programs are aimed at generating trees that will go into commercial timber and pulp logging rotations (some of which could be managed to gain biomass and carbon over time). Others are aimed at regenerating deforested or degraded habitats and are intended to be restored to natural forests under protection. There are agro-forestry programs to stimulate small-holder farmers to plant a diversity of tree types interspersed with other crops, increasing carbon sequestration and improving farmer benefits.

Programs that have a carbon-credit investment associated with them and some types of agro-forestry have a crop profit-sharing structure. This is an area of investment opportunity that requires good research to ascertain the credibility of programs in achieving the environmental and social goals stated as well as an ROI. In particular, pulp plantation forests need to be Forest Stewardship Council (FSC)[42]–certified at minimum, and preferably part of a regional landscape-level plan that has forest conservation and restoration legislated and implemented. Commercial forestry is sustainable only when enough forest in the region also exists for habitat, rainfall production, water management, and other ecosystem functions.

SOLUTION APPROACH

Invest in credible tree/forest regeneration efforts.

Invest in agro-forestry projects that benefit small-holder farmers.

Invest in planting forest to supply individual companies' current wood/paper/cellulosic textile needs and to regenerate the amount of forest lost to supply their historic purchases.

$4.2B

THE ESTIMATED COST OF PLANTING TREES FOR PULP PRODUCTION.

CHAPTER 2
INVESTMENT PATHWAY

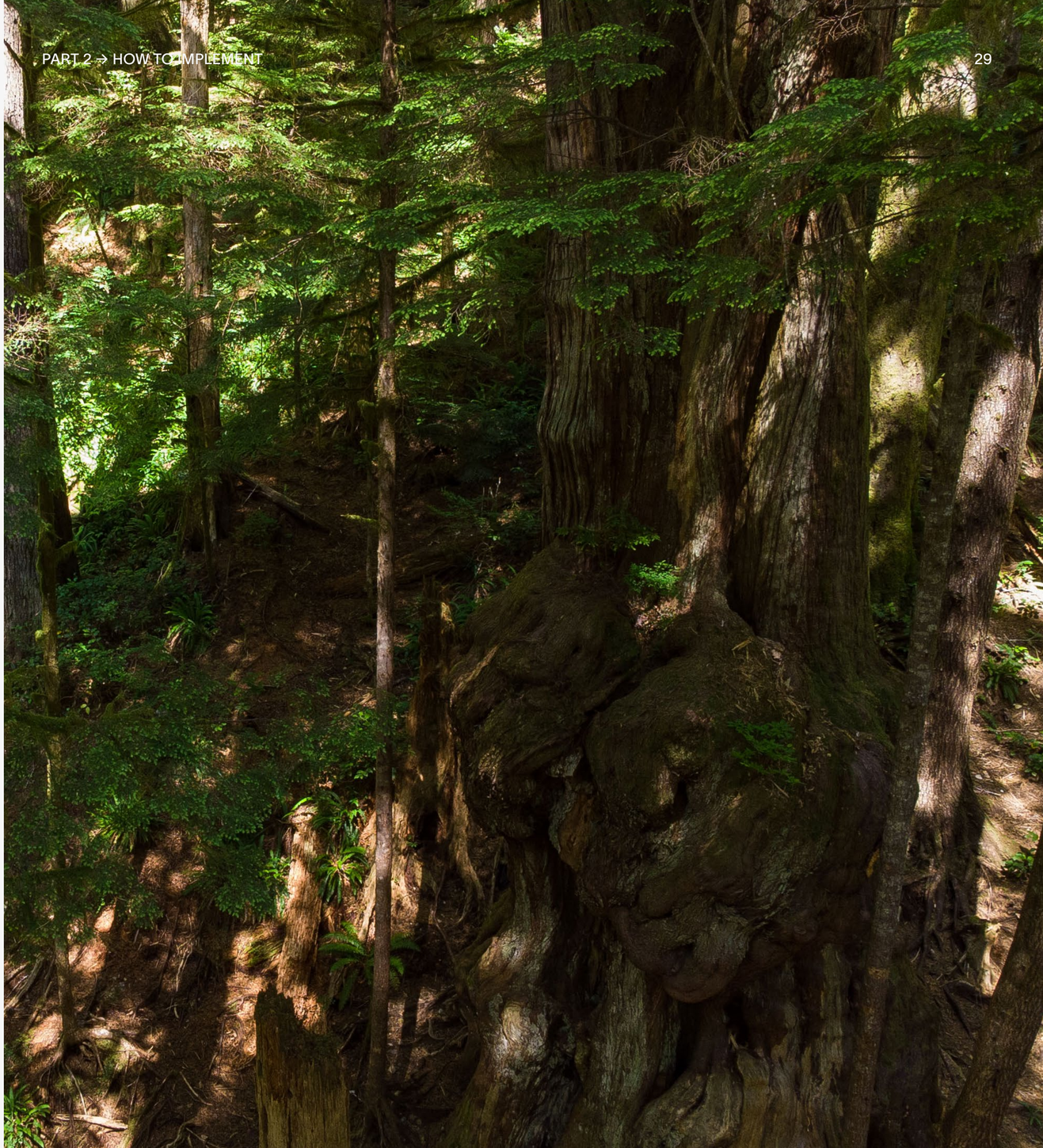
Conservation Financing

Forests have evolved to function at large landscape scales. Small and fragmented patches don't sustain habitat and the range of life-supporting functions that larger forests provide. Finding ways to maintain landscape-level forest structure is critical to both conserving biodiversity and preventing or mitigating the impacts of climate change and extreme weather.

Conservation financing is a means to encourage and support land-use decision-makers and stakeholders – such as governments, Indigenous and traditional communities, and loggers – to transition their economies to enable large-scale forest conservation and improve forest management. The Great Bear Rainforest Ecosystem-Based Management Framework[43] and associated Coast Funds[44] is one of the most comprehensive examples at present. This approach is now being adapted and explored in other locations, such as the Leuser Ecosystem in Indonesia and Sacred Headwaters of the Amazon.

SOLUTION APPROACH

Allocate investments for conservation financing initiatives alongside philanthropic investments to support landscape-level conservation plans and conservation economies in priority forest ecosystems around the world.



INVESTMENT IN NON-WOOD MILLS BY REGION
2020–2030 Potential

WORLD TOTAL INVESTMENT NEEDED

AGRICULTURAL FIBRE PULP MILLS

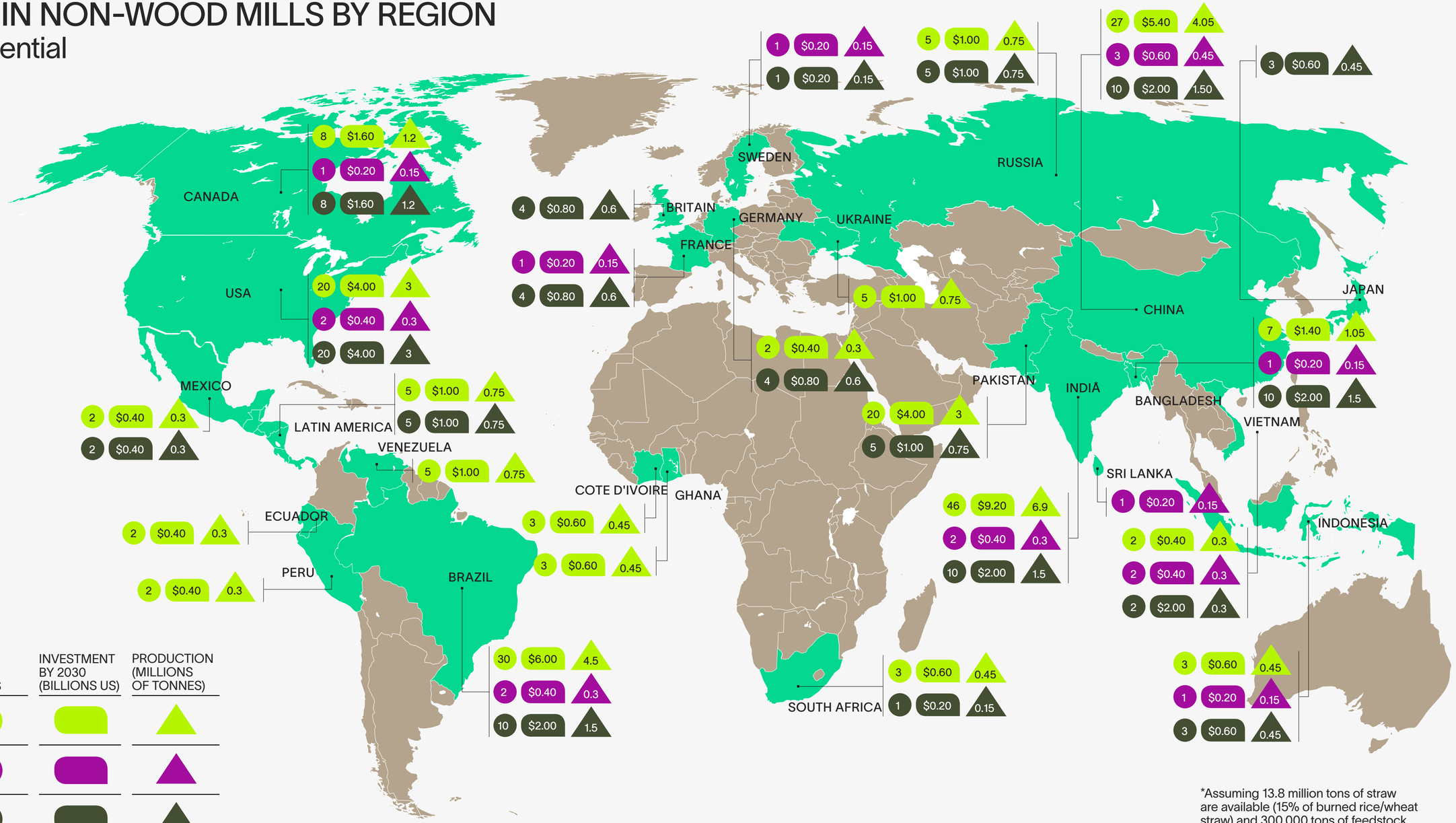
200 | $40 | 30

NON-WOOD DISSOLVING PULP MILLS FOR TEXTILES

17 | $3.4 | 2.55

RECYCLED PULP FOR PAPER MILLS

107 | $21.4 | 16.05



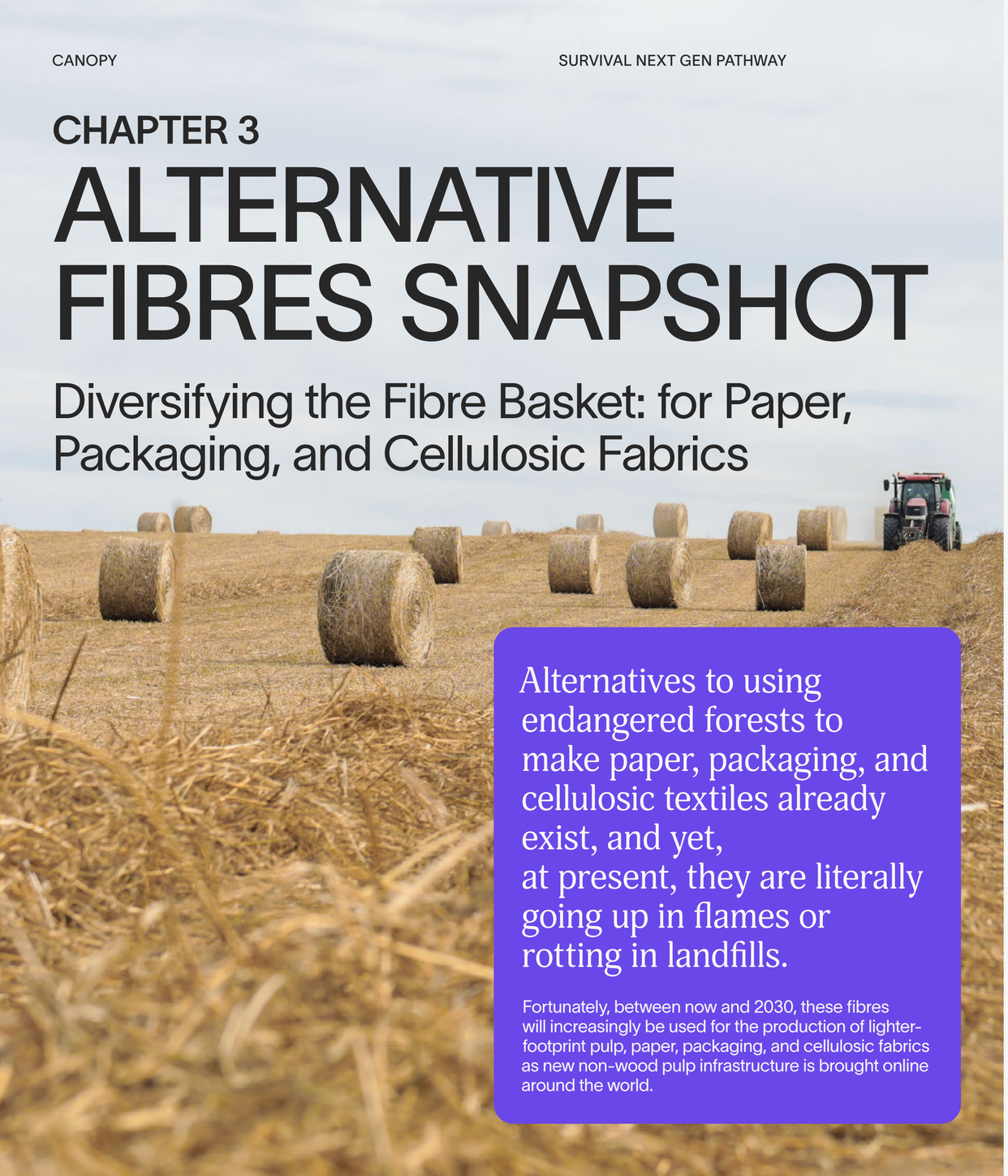
	NUMBER OF MILLS	INVESTMENT BY 2030 (BILLIONS US)	PRODUCTION (MILLIONS OF TONNES)
AGRICULTURAL FIBRE PULP MILLS	●	▬	▲
NON-WOOD DISSOLVING PULP MILLS FOR TEXTILES	●	▬	▲
RECYCLED PULP FOR PAPER MILLS	●	▬	▲

*Assuming 13.8 million tons of straw are available (15% of burned rice/wheat straw) and 300,000 tons of feedstock per 150,000 ton/yr pulp mill

CHAPTER 3

ALTERNATIVE FIBRES SNAPSHOT

Diversifying the Fibre Basket: for Paper, Packaging, and Cellulosic Fabrics



Alternatives to using endangered forests to make paper, packaging, and cellulosic textiles already exist, and yet, at present, they are literally going up in flames or rotting in landfills.

Fortunately, between now and 2030, these fibres will increasingly be used for the production of lighter-footprint pulp, paper, packaging, and cellulosic fabrics as new non-wood pulp infrastructure is brought online around the world.

PAPER AND PACKAGING

Paper was not made from forest fibre until the 1800s. Prior to that, it was made from annual plant fibres, cotton rags, and flax/linen. In many parts of the world, paper production shifted to using trees, but several countries – including India and China – never stopped producing paper from agricultural fibres.

Today, what's old is new again. Cleaner and more efficient technologies have been developed for pulping agricultural fibres in the last decade. These can now convert fibres, such as the following, into pulp for high-quality paper and packaging at scale:

- Wheat straw residues (i.e., the stalk left after the harvest of the grain/seed)
- Sorghum straw residue
- Flax and hemp straw residues
- Sugar cane bagasse residue[45]
- Pineapple leaves
- Bamboo[46]
- Fibre-specific crops, such as miscanthus and switchgrass

Every year, millions upon millions of tonnes of agricultural residue are burned or dumped around the world, while high conservation value forests are logged to make disposable paper products. India alone burns 92 million tonnes of wheat and rice straw residue annually[47]. China shuttered 7.5 million tonnes of agricultural pulp production over the last decade to deal with outdated polluting pulp mills[48]. Cleaner tech mills have not yet been built to capture that fibre supply and recuperate that lost production. But the opportunity awaits.

Fortunately, agricultural fibre pulp mills are beginning to be built all over the world, most using new technologies that use less water, chemicals, and energy than conventional wood kraft pulp mills. Columbia Pulp, the first commercial-scale wheat straw pulp mill in North America since the last one closed in the 1960s, has just been built in Washington State, USA. Chinese industry giant YFYJupiter opened a clean-tech wheat straw mill in 2013 that produces 1,000 tonnes of straw paper a day. Trident, one of India's diversified corporate players, has recently upgraded its biggest wheat straw pulp and paper mill. European tissue giant Essity is retrofitting a mill to produce agricultural fibre pulp for paper packaging in Germany.

Canopy is tracking more than a dozen other ventures that use a variety of new technologies and that are ready to build the mills that will scale up the commercial production of commodity agricultural fibre pulp for paper and packaging. A comprehensive Life Cycle Analysis by Kimberly-Clark illustrated that wheat straw pulp has a dramatically smaller ecological footprint compared to northern softwood pulp[49].

As companies mobilize to develop and implement ambitious sustainability targets, hundreds of corporate paper consumers have stated they will give preference to agricultural fibre paper over paper made with Ancient and Endangered Forests[50]. The stage is set for this new supply chain to pick up a significant share of the market.

Canopy advocates that agricultural fibre products be certified by Roundtable for Sustainable Biomaterials[51] to ensure sustainable removals, the maintenance of soil carbon and other social and environmental factors for sustainable agriculture are met. Practices that regenerate soil carbon or avoid carbon emissions, for example diverting crop residue from traditional burning or the planting of fibre-specific crops that fix carbon on degraded soils, can be certified through to the end product.

92M

TONNES OF WHEAT AND RICE STRAW RESIDUE BURNT ANNUALLY IN INDIA

CHAPTER 3
ALTERNATIVE FIBERS SNAPSHOT

TEXTILES

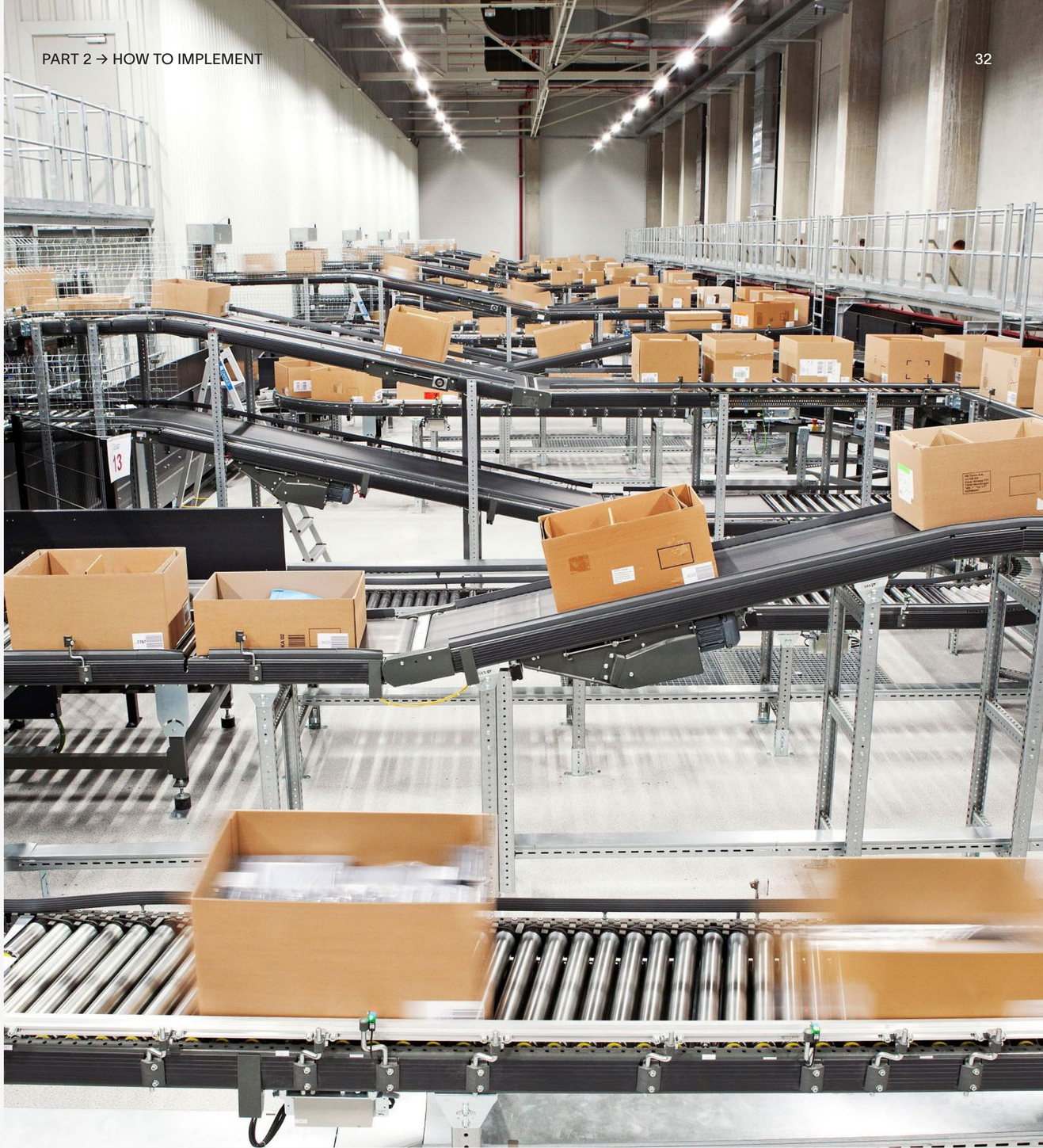
Dissolving pulp is conventionally made by chemically extracting the cellulose from wood. The average yield is poor, with 3 tonnes of tree fibre for every 1 tonne of dissolving pulp for viscose produced (depending on the production facility). This cellulose is the base of man-made cellulosic fibre (MMCF), which can be turned into acetate, viscose, rayon, lyocell, and trademark brands such as Tencel, Modal, and Liva. Approximately 150 million trees are logged each year to produce these fabrics[52]. Production continues to grow, with over 9 million tonnes of capacity now built[53] (and 6.5 million tonnes of production in 2019).

The fashion industry is grappling with its role in the dramatic increase in textile waste and the impact of viscose on forests. It is increasingly looking for circular-economy solutions. Several ventures have responded to the opportunity by developing technologies that take used cotton and rayon garments/fabric and turn them into new dissolving pulp. Others have developed methods to grow cellulose from food waste (i.e., microbial cellulose) and to convert agricultural fibres, such as wheat straw, into cellulose. The conversion ratio of old cotton fabric into new dissolving pulp is about 1:1 compared to the average 3:1 tree fibre to dissolving pulp. All of the new technologies reviewed by Canopy use significantly less water and chemicals per tonne of dissolving pulp produced. As this report is being published, four of the largest viscose producers have begun lines of production using 20% or more recycled cotton fabric. Canopy lists Next Generation technology ventures on our website. Producers who are utilizing Next Gen feedstocks are isted in the Hot Button Report.

As we state in Chapter 1, an estimated 83.5 million tonnes of textile waste is created annually from the global fashion industry and it is projected to increase to 135 million tonnes by 2030[54]. Approximately 24% of this waste is cotton and 6% is viscose textiles. New York State alone sends 700,000 short tons of textiles into landfills annually[55]. China produces more than 26 million short tonnes of textile waste per year (nearly 70,000 short tonnes/day)[56].

Landfilling used clothes is a big expense for municipalities and creates myriad environmental problems. The average consumer bought 60 percent more clothes in 2014 than in 2000[57]. Instituting corporate and municipal textile-collection systems to recycle 25% of the cotton and 25% of the viscose fabric waste into new dissolving pulp manufacturing facilities could eliminate the need to have any wood forest fibre inputs to make viscose-based textiles. Similarly, microbial cellulose production will contribute to the solution by diverting food waste into the textile feedstock supply chain with a much lighter carbon and biodiversity footprint.

60% THE INCREASE IN CLOTHES PURCHASED BY THE AVERAGE CONSUMER BETWEEN 2000 AND 2014



CHAPTER 4

THE ROLE OF THE CORPORATE BUYER

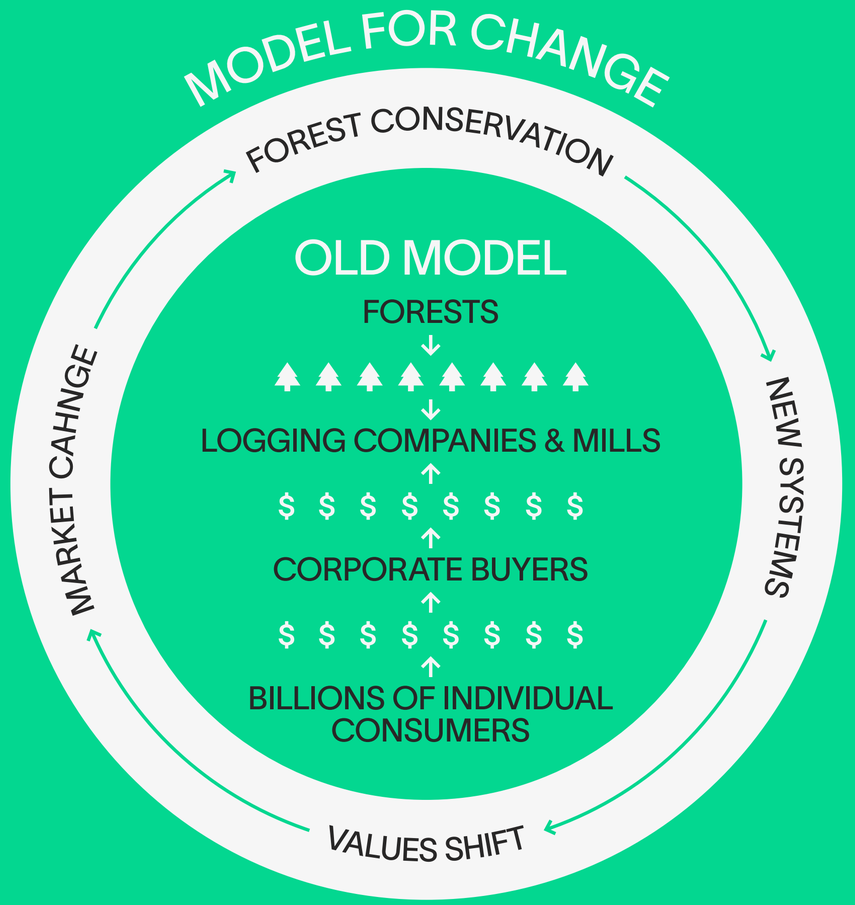
In the past 10 years, corporate social responsibility has moved from the margins of the economy to become a foundational business strategy.

Today, thousands of major corporations have environmental purchasing and sustainability policies that prioritize forest and species conservation and climate stabilization. **If your business doesn't have one already, you're behind the times – and likely behind your peers and competitors**[58]. In a demand-and-supply economy, corporate consumers hold tremendous power.

Corporate customers play a critical role in incentivizing conventional producers to change their fibre sourcing and in drawing the supply of innovative alternatives into the market. As the most influential players on the demand side of the supply chain, corporate purchasers are the key to building investor confidence in the viability of Next Generation Solutions technologies.

> "Historically, we've focused on efficiency, such as material light-weighting. This is still good – any company will want to reduce the volume of materials it is consuming – but we're transitioning to a phase of really honing in on the design and asking how we can better design for recyclability, degradability or reusability."
>
> – **DANIEL LOCKE,** PACKAGING SUSTAINABILITY LEAD, KIMBERLY-CLARK[62]

CANOPY MODEL OF CHANGE



CHAPTER 4
THE ROLE OF THE CORPORATE BUYER

The following are five action categories for corporate purchasers to turn environmental paper, packaging, and viscose textiles preferences into business realities:

1. MATERIAL EFFICIENCY

Less is more. Strategies for reducing the total amount of wood product a company buys include design innovation and logistics innovation such as:

- Designing boxes to be reusable and shared across businesses (modelled on pallet-sharing systems already in place)
- Improving logistics for recycling paper/packaging and textiles[59]
- Capturing the value of products more than once:
  - Incorporate second-hand sales and/or up-cycling
  - Clothing rental business model

2. MAXIMIZED RECYCLED CONTENT

Numerous life cycle analyses consistently show recycled fibre delivers the best environmental performance[60]. Communicate preferences to suppliers, including specific and ambitious targets for recycled content so that Ancient and Endangered forest fibre can be avoided:

- Designing boxes to be reusable and shared across Specify higher than 50% recycled. Choose 100% recycled if it's available and give highest preference to post-consumer recycled (PCR) content.
- Send a purchasing preference letter to suppliers specifying the recycled content preference.
- If it's not possible to make the product with 100% recycled content, specify the acceptable alternatives in order of preference (e.g., for paper: (1) recycled, (2) agricultural residue content, and (3) FSC-certified wood from regions outside Ancient and Endangered Forests).
- Use Canopy's EcoPaper Database as a good resource for finding environmentally preferable papers.

NEXT GEN KICK-START EXAMPLE

OFF-TAKE TONNAGES TO SECURE
REQUIRED INVESTMENT AND PRODUCTION

PAPER

300
CORPORATE PARTICIPANTS

↓

5000
TONNES EACH

↓

1.5M
TONNES

VISCOSE

100
CORPORATE PARTICIPANTS

↓

2500
TONNES EACH

↓

250K
TONNES

CHAPTER 4
THE ROLE OF THE CORPORATE BUYER

3.
DRAW INNOVATIVE FIBRE PRODUCTS INTO THE MARKET

Innovation requires champions on both ends of the supply chain. Performance refinements happen through experience and experiment, particularly at larger scales.

For pilots and early-stage trials, collaborate with innovators, other brands, and producers to pilot and trial new technologies and products.

Set ambitious, time-bound targets for the percentage of Next Generation fibre your company plans to integrate into your packaging, paper, and textile products.

Send a letter to suppliers stating a purchasing preference for products containing a high content of Next Gen fibres.

Incorporate first-to-market alternative fabrics, papers, and packaging into your products and business operations.

4.
INVESTMENTS[61]

When buyers invest in innovation, it draws other investors and accelerates the shift from lab-scale to commercial-scale production.

Contribute to R&D, trials, and commercialization of paper/packaging and textile fibre innovation.

Look into strategies to pool equity investment or to provide dedicated investments for specific innovator ventures.

5.
OFF-TAKE AGREEMENTS

An off-take agreement is an arrangement between a purchaser and a supplier to purchase or sell a portion of the upcoming goods. Having only one or two niche suppliers does not serve the scale of transformation needed. Off-take agreements help new tech ventures to secure investment. It is especially important for initial first-to-market producers of environmentally preferable products as they break into established commodity supply chains.

- Make commitments to purchase a specific amount for 2 to 3 years to draw Next Generation pulps through the supply chain to market (e.g., a reasonable first step would be a commitment to purchase the equivalent of 5% of total current forest fibre product content a company purchases).
- Consider allowances for a modest price premium for the first 3 years (if necessary) to draw the Next Generation pulp sector into economy-of-scale production.

"Historically, we've focused on efficiency, such as material light-weighting. This is still good – any company will want to reduce the volume of materials it is consuming – but we're transitioning to a phase of really honing in on the design and asking how we can better design for recyclability, degradability or reusability."

– DANIEL LOCKE, Packaging Sustainability Lead, Kimberly-Clark[62]

CHAPTER 5

REDUCTION: LESS IS MORE

Use Less – It Really Isn't Rocket Science.

In Chapter 1, we put forward the goal of a 9% reduction in the consumption of paper, paper-based packaging, and 10% of viscose products made of wood pulp.

This is likely not an ambitious enough target and could be set higher, given that there are companies that have reduced their warehouse-to-retail cardboard boxes and their retail packaging by more than 50%. Because paper packaging use is currently on the rise, a reduction represents a trajectory shift. For this reason, we have chosen a modest goal for reduction. If that target is surpassed, the world will be better for it.

Paper (Yes, That Includes Packaging)

The Internet is full of how-tos for using less paper in your office and business; these date back to the 1990s and are still relevant. Newsprint excluded, the printing and writing paper grades – like catalogues, copy paper, novels, and promotional flyers – comprise 25%[63] of the world's paper consumption. Almost all printing-and writing-grade papers are in decline, but at 100 million tonnes[64] of product per year, it's impossible to discount the significant benefit that reducing consumption even further will have on protecting forest species and preventing climate-damaging carbon emissions.

Recent discussions about reduction have been focused on packaging, primarily the elimination of single-use plastics. The market response to the important plastics issue is unfortunately resulting in a shift from plastics to paper packaging products, resulting in greater impacts on forests. Since solutions need to be holistic, not knee-jerk, Canopy is focused on supplementing plastic packaging reduction efforts with reduction solutions for paper-based packaging and moulded paper fibre, both of which are on growth trajectories. Fifty-seven percent of all the paper made in the world goes into packaging[65].

Many companies use more paper packaging than the actual product they sell. The rise of e-commerce with the myriad products manufactured elsewhere and then shipped globally, along with the proliferation of packaged consumer goods in the food and beverage industry (for fast food and electronics), has contributed to a 2.5% annual increase[66] in paper packaging. Three billion trees go into making packaging every year[67].

How To Achieve Reductions

THE PALLET MODEL

One option with significant potential for impact is to establish a forum between shippers and corporate customers to create standardized sizes for reusable (e.g., recycled plastic) boxes to make box-sharing more functional.

HERE ARE TWO SYSTEM OPTIONS:

— Extended-use buy/sell programs: A reusable box is sold to a manufacturer, and box-management companies in cities then purchase the boxes from retailers, repair them when needed, and sell them back into the system. This forms an "open pool" of continuous retrieval and selling back for reuse. It is very successful in the pallet market.

— Leasing or rental systems: Reusable boxes are brought to centralized storage depots so that users can rent or lease them. This functions as a "pool" as well, but a more closed one.

PRODUCT DESIGN TO ENABLE REUSE

Designing cardboard boxes for reuse can result in dramatic reductions in paper use and significant cost savings to companies that establish this system for their warehouse-to-retail transport and manufacturer-to-customer warehouse shipping boxes.

The basics: Design cardboard boxes that are more stackable (crush less) and are easily unfolded to flat and then folded back to box form. Develop systems to either return unsold goods from retail stores to the warehouse in the boxes that delivered goods to stores, or unfold boxes for return to the warehouse in the trucks that deliver new goods to the stores. Back at the warehouse, the boxes can be re-folded and refilled with goods. A well-designed box can be reused about six times, which can result in six times fewer shipping boxes.

100M

TONNES OF PRINTING AND WRITING GRADE PAPERS ARE STILL PRODUCED EACH YEAR.

CHAPTER 5
REDUCTION: LESS IS MORE

BASIS WEIGHTS – LIGHTEN THE LOAD

Over 20 years ago, Bank of America offered 10% of the cost savings to the employee who developed the best cost-saving idea. The winning idea reduced the basis weight of ATM receipts and this eventually led to ATMs offering customers the option to receive a receipt at all. This reduction saved the company $500,000 the first year. Reducing paper basis weights not only saves paper and costs, it's lighter to ship, saving on fuel and associated emissions.[68]

Assess: Are your goods being shipped in boxes that are overbuilt for the job? Could they be lighter? Are your goods being wrapped/displayed in paper packaging that could be a lighter-weight paper or even...

NAKED

Thirty-five of body care corporation Lush's products now have no packaging at all. It's an ethical philosophy of the personal-care-product company, translated into a marketing approach that encompasses product design and promotion.

Eliminate paperboard display boxing around your products that are already in containers, such as shampoo bottles and creams. Eliminate packaging around items that hold their integrity without a container. For example, prAna now rolls clothing and ties it with raffia rather than putting it in boxes.

If writing about the product is necessary, consider attaching a tag rather than putting the product in a six-sided box. Excessive packaging bothers people – and orangutans and woodland caribou and songbirds.

Tissue and Towel – No Choice but the Better One

PERSONAL TISSUE TOWEL

Tissue is a very personal single-use item, and some types are more necessary than others. One type that has been developed as a convenience is the pervasive "wipes." A wipe is a non-woven cellulosic product that has taken the place of a damp cloth or sponge. This single-use item clogs city sewer systems and landfills – and it originates from forest ecosystems. These products should be eliminated except for special situations and replaced by reusable alternatives. Buying tissue that has high recycled or agricultural content or where the wood fibre is certified by the Forest Stewardship Council is a major contribution to forest protection[69].

COMMERCIAL TISSUE TOWEL

A lot of tissue is used in commercial settings, like airports, corporate and hospital bathrooms, and restaurants, where people use whatever is made available to them. Here the institution and the producer have means to modify the public's use of tissue by:

- Installing dispensers that mete out amounts in smaller allotments to discourage excessive use (e.g., sheets rather than rolls, and dispensers that provide a quantity with a break, requiring users to wait for a second quantity)
- Using 100% post-consumer recycled (PCR) or high-percentage PCR and pre-consumer recycled paper to reduce the use of wood fibre in flushables and single-use tissue/towel and napkins
- Requiring agricultural fibre content to replace 15% or more of wood fibre for tissue content that is not recycled fibre

$500,000

THE AMOUNT SAVED THE YEAR BANK OF AMERICA STARTED ASKING CUSTOMERS IF THEY WANTED A RECEIPT.

CHAPTER 5
REDUCTION: LESS IS MORE

Virgin Viscose Fabrics

TRIPLE V
VOLUNTARY VISCOSE REDUCTION STRATEGIES

Brands and manufacturers can institute voluntary measures to divert garments they sell from going to landfill. Some companies are already doing so.

IN-STORE COLLECTION

A discount coupon can incentivize customers to bring used clothing back to stores. Brands, in turn, can establish closed-loop agreements with producers to ensure a supply of high-quality recycled material for the manufacture of additional products. H&M, Patagonia, Inditex, C&A, Uniqlo, and EILEEN FISHER are among the brands that have initiated this type of program.

CAPTURE VALUE TWICE AND THRICE

— Retailers can offer discount coupons to customers who bring in used clothing that is in good condition (of the brand) and resell the items in second-hand sections of their retail outlets.

— Up-cycle and mend[70]. Establish repair and up-cycle sewing services in-store for customers who bring in their worn and torn clothing to have stylish mending and alterations done. Use boro and sashiko stitching to make damaged clothing as fashionable as its first iteration.

DESIGNING A LONGER LIFE

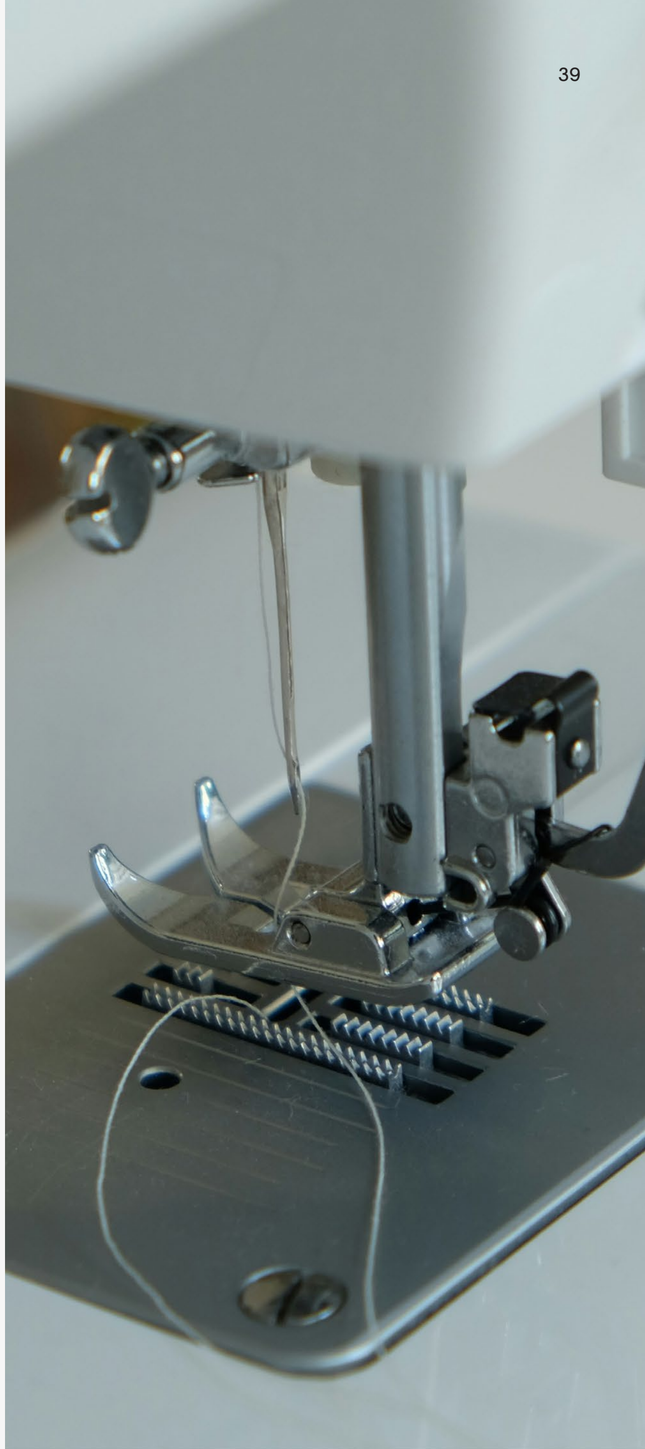
Increasing the number of items designed to last 50% longer would dramatically decrease the amount of raw material needed to produce viscose[71]. Designing clothing for a longer life includes making the garment more easily recyclable, using less blended fibres, and incorporating easier-to-remove buttons and zippers. Brands can also engage their online communities and in-store clients to “buy for a lifetime” and support them with the caring of their garments to extend their lifespan.

Across the Board

EXTENDED PRODUCER RESPONSIBILITY (EPR)

EPR is an approach in which businesses are responsible for a product through its lifetime, starting with how it’s created all the way through to the end of the product’s life cycle. EPR has been implemented in numerous countries and jurisdictions, from France to Chile to India, for products such as electronics and beverage bottles. Well-designed government legislation that requires businesses to adopt and internalize the cost of EPR has the best record of stimulating the better design of products to reduce waste and increase recyclability. It encourages cross-business coordination to pay for and manage this recycling (e.g., greater efficiency in recycling of similar materials).

EPR requires the company that profited from the sale of the product to help cover the costs of its disposal, rather than forcing the municipality to pay to landfill or recycle it on their behalf. EPR legislation is a motivator for companies to reduce the amount of waste their customers produce after consuming their products. Its logic and the crises we face make it a credible tool for reducing waste.



CONCLUSION

This is the turnaround decade. The scope of the challenges facing us are at scales much larger than any corporation could manage individually. Strategies that cross competitive and pre-competitive spheres are paramount, given the urgency of the climate and biodiversity crisis. A nascent circular economy is emerging as many companies take steps to reduce their impact on the planet.

To meet these market expectations, technological innovations are rapidly developing that could revolutionize the production of commodities like pulp for paper and viscose. In concert with initiatives to use materials much more efficiently, we could see a halving of the pulp sector's impact on global forests by the end of the decade.

The approach Canopy has outlined is a tangible plan for shifting the pulp sector away from its heavy reliance on forest fibre. With concrete targets to work toward, this transformation can be driven by the industries' corporate customers along with private, public, and philanthropic investors.

There is no one silver bullet for protecting forests. But there are discrete complementary actions to enable us to reduce the impact of viscose, paper, and packaging on forests by 50%. Putting a price tag to each of the components illustrates how achievable this transformation is: $68.8 billion between 2020 and 2030 for consumption reduction, for building mills to pulp alternative fibres, for increasing recycling capacity, and for planting new trees in the right places to supplant wood for pulp from Ancient and Endangered Forests.

The research and projections from the Next Generation Solution Action Plan lays out a set of target-driven actions that will contribute significantly to stabilizing the climate and protecting species. We see a way forward from a conventional focus on wood pulp to a diversified cellulose fibre products sector by 2030. Leveraging this shift into forest protection and a stabilized climate will be one of the greatest accomplishments of the millennium. One might call the imperative to meet this objective a "pulp thriller."

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6. The number of hectares is not exact because yields will be different depending on northern or southern hemispheres and whether areas are intensively managed plantations or agro-forestry management systems.
7. Recycled paper is not a Next Generation technology, but increasing the capture of recyclable paper and increasing recycled content in paper products are obvious parts of any strategy to reduce impacts on forests; therefore, we have included the amount of production and cost to build new milling capacity.
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23. These numbers are extrapolated from FAO data that uses the term “original forests.” The world’s primary (original) remaining forests contain the qualities of Ancient and Endangered Forests, as shown in ForestMapper canopyplanet.org/tools/forestmapper/
24. Agricultural residues include wheat straw, flax and hemp straw, and pineapple leaves. Fibre crops include miscanthus, switchgrass and other fibrous plants.
25. All price figures throughout the report are listed in U.S. dollars.
26. Assuming 150,000 tonnes/year. The size and output of the mills will vary depending on availability of feedstock within a 100-kilometre radius and other factors. More mills of a smaller size may be preferable in some regions or for some technologies.
27. Rounded from 50.35% in assumptions table in Methodology appendix.
28. Rounded from 49.65% in assumptions table in Methodology appendix.
29. Assuming 50% to 60% pulp yields, each mill would require 250,000 to 300,000 tonnes of fibre feedstock.
30. Assuming an average of 4 tonnes of kraft pulp from 1 hectare of forest/year. The yields per hectare vary widely depending on hemisphere, type of forest management and type of tree(s) planted. For example, intensive eucalyptus plantations can produce 10 to 15 tonnes/hectare/year. eucalyptus.com.br/eucaliptos/ENG14.pdf Agro-forestry farms and northern/temperate planted forests produce smaller volumes/hectare.
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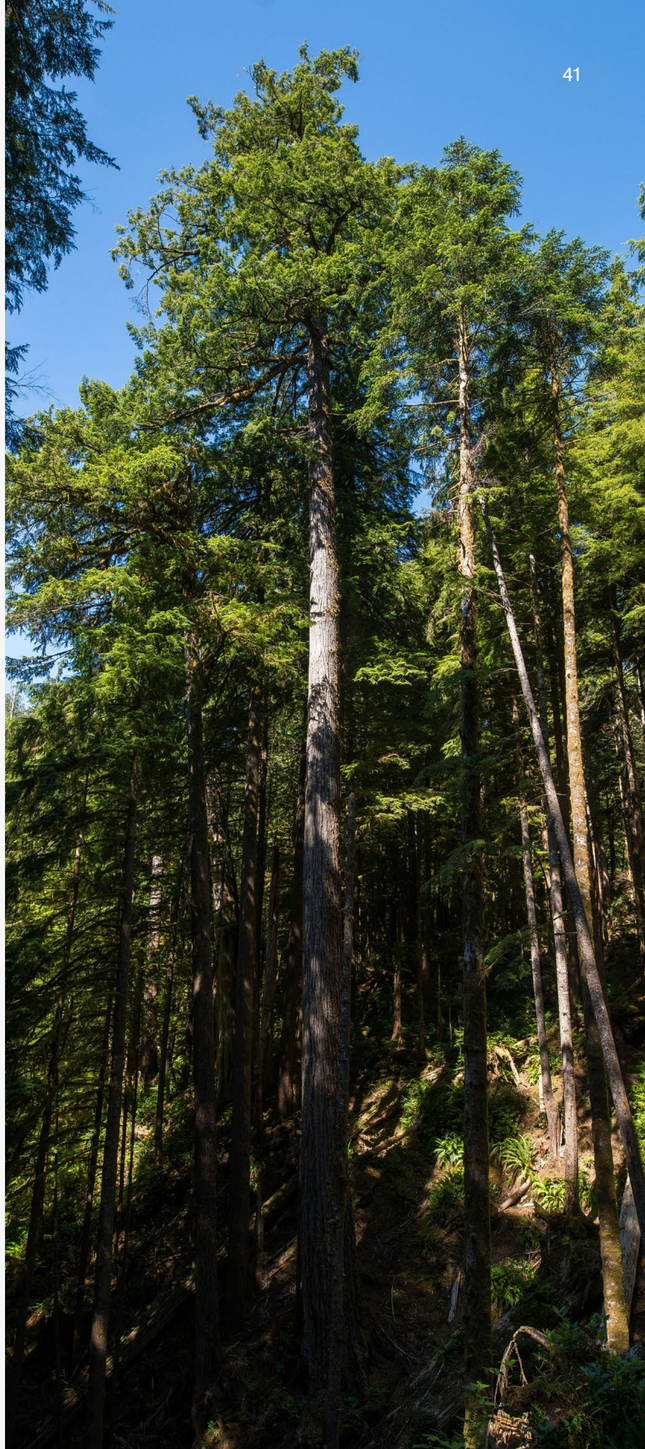

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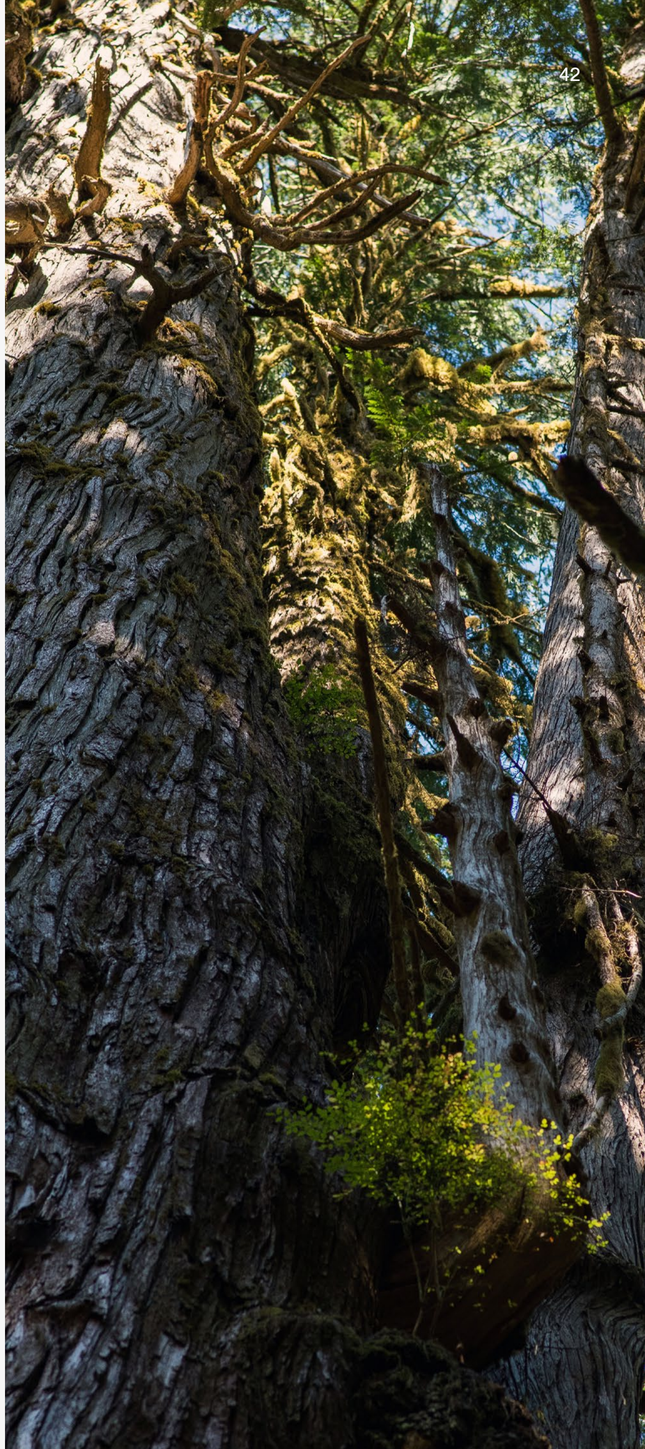


APPENDIX 1
METHODOLOGY

UNDERSTANDING THE ORIGINAL AND PLANTED FOREST NUMBERS

The tonnes of pulp derived from original and from planted forests globally was extrapolated from a number of sources. We sought to use information that would be consistent across data (e.g., definition of original forests, definitions of products).

BASIS FOR TOTAL WOOD PULP FOR PAPER AND PACKAGING

Source: http://www.fao.org/forestry/statistics/80938/en/

FAO 2017 reports global production of wood pulp at 184 million tonnes for 431 million tonnes of paper and paperboard.

EXTRAPOLATION OF WOOD PULP FROM ORIGINAL FOREST (AKA PRIMARY, AKA ANCIENT FOREST) AND FROM PLANTED FORESTS

SOURCE fao.org/3/i4895e/i4895e06.pdf

FAO 2015. Changes in planted forests and future global implications cites: “Globally in 2012, 46.3% of industrial roundwood comes from planted forests. One interesting result was that in the tropics and subtropics, 65% of production is from planted forest, but this reduces to 45% for temperate and only 14% for the boreal zone.”

SOURCE fao.org/forestry/statistics/80938@180723/en/

FAO 2017 data on Major producers of forest products

SOURCE worldwildlife.org/industries/pulp-and-paper

WWF cites global paper production uses 40% of all industrial wood traded globally.

SOURCE globalforestatlas.yale.edu/ecoregions

Yale School of Forestry and Environmental Studies, and The Nature Conservancy (Global Forest Atlas Map)

This map was used to determine which countries’ forests should be classified as temperate, tropical, and subtropical.

ASSUMPTION METHODOLOGY

To extrapolate the percent of global wood-based pulp that is from original forests and from planted forests, we assigned the percentages of planted forest pulp production from the FAO 2015 source to the percent of global pulp production of each country (FAO Major producers of forest products 2017), calculated as a percent of the 184 million tonnes of wood pulp (FAO global production data), following guidance from the Global Forest Atlas as to which forest zone type applies to each country.

The FAO data only quantified the percent of global pulp production to the top 11 pulp-producing countries. We assumed that the unaccounted-for 14% of global production would be from tropical forest regions and applied planted and original forest of origin fibre percentages accordingly.

The outcome, as seen in the table below, was very evenly split between planted and original forest of origin fibres. In the report, we chose to round the numbers to 50% and 50% to calculate the total tonnes of global wood pulp for paper and dissolving pulp for viscose/Man Made Cellulosic Fibres that comes from original vs planted forests (i.e., 50% of 184 million tonnes of wood pulp is from planted and 50% is from original forests).

Original/primary forests are comparable to elements of Canopy’s defi nition of Ancient and Endangered forests, in reference to forests that have not previously been industrially logged

https://canopyplanet.org/wp-content/uploads/2018/11/CanopyQuickGuideAncientEndangeredForests.pdf

More research is required to determine exactly how many tonnes of pulp for paper is coming from Ancient and Endangered Forests.

COUNTRY	FOREST ZONE	PULP FOR PAPER - PRODUCTION %	% PLANTED FOREST	% ORIGINAL/ PRIMARY FOREST
USA	Temperate	26	11.7	14.3
Brazil	Tropical	10	6.5	3.5
China	Temperate	9	4.05	4.95
Canada	Temperate	9	4.05	4.95
Sweden*	Temperate	6	2.7	3.3
Finland	Temperate	6	2.7	3.3
Japan	Temperate	5	2.25	2.75
Russia	Boreal	5	0.7	4.3
Indonesia	Tropical	4	2.6	1.4
India	Tropical	3	1.9	1
Chile	Temperate	3	1.35	1.65
Unassigned	Tropical**	14	9.1	4.9
TOTAL		100	49.65	50.35

**we sssume the 14% unassigned portion is coming from tropical zones to be conservative.

APPENDIX 2
INVESTMENT BY REGION

AGRICULTURAL FIBRE PULP MILLS

REGION / COUNTRY	NUMBER OF AGRICULTURAL FIBRE PULP MILLS FOR PAPER	INVESTMENT (In Billions of US$)						PRODUCTION (Millions of Tonnes)
		Year 1 (US$)	Year 2 (US$)	Year 3 (US$)	Year 4 (US$)	Year 5 (US$)	Total by 2030 (US$)	Tonnes of Recycled Microbial Fibre Pulp / Year
ASIA								
China	27	0.80	2.00	0.80	0.80	1.00	5.40	4.05
Vietnam	2	0.20	0.20	-	-	-	0.40	0.30
Indonesia	3	0.20	0.20	0.20	-	-	0.60	0.45
SOUTH ASIA								
India*	46	1.00	2.00	2.60	1.80	1.80	9.20	6.90
Pakistan	20	0.40	1.00	1.00	1.00	0.60	4.00	3.00
Bangladesh	7	0.20	0.20	0.40	0.40	0.20	1.40	1.05
SOUTH AMERICA								
Brazil	30	1.00	2.00	2.00	0.50	0.50	6.00	4.50
Ecuador	2	0.20	0.20	-	-	-	0.40	0.30
Peru	2	0.20	0.20	-	-	-	0.40	0.30
Venezuela	5	0.40	0.40	0.20	-	-	1.00	0.75
NORTH AMERICA								
USA	20	0.40	1.00	1.00	1.00	0.60	4.00	3.00
Canada	8	0.20	0.40	0.40	0.40	0.20	1.60	1.20
Mexico	2	0.20	0.20	-	-	-	0.40	0.30
LATIN AMERICA	5	0.20	0.40	0.20			1.00	0.75
EURASIA								
Ukraine	5	0.40	0.40	0.20	-	-	1.00	0.75
Germany	2	0.20	0.20	-	-	-	0.40	0.30
Russia	5	0.40	0.40	0.20	-	-	1.00	0.75
AFRICA								
Cote d'Ivoire	3	0.20	0.20	0.20	-	-	0.60	0.45
Ghana	3	0.20	0.20	0.20	-	-	0.60	0.45
South Africa	3	0.20	0.20	0.20	-	-	0.60	0.45
TOTALS	200	6.80	11.40	9.20	5.90	4.90	40.00	30.00

NON-WOOD DISSOLVING PULP MILLS FOR TEXTILES

REGION / COUNTRY	NUMBER OF AGRICULTURAL FIBRE PULP MILLS FOR PAPER	INVESTMENT (In Billions of US$)				PRODUCTION (Millions of Tonnes)
		Year 1 (US$)	Year 2 (US$)	Year 3 (US$)	Total by 2030 (US$)	Tonnes of Recycled Microbial Fibre Pulp / Year
ASIA						
China	3	0.2	0.2	0.2	0.6	0.45
Vietnam	2	0.2	0.2	-	0.4	0.3
Indonesia	1	0.2	-	-	0.2	0.15
SOUTH ASIA						
India*	2	0.2	0.2	-	0.4	0.3
Pakistan	1	0.2	-	-	0.2	0.15
Bangladesh	1	0.2	-	-	0.2	0.15
SOUTH AMERICA						
Brazil	2	0.2	-	0.2	0.4	0.3
NORTH AMERICA						
USA	2	0.2	0.2	-	0.4	0.3
Canada	1	0.2	-	-	0.2	0.15
EURASIA						
Sweden	1	0.2	-	-	0.2	0.15
France	1	0.2	-	-	0.2	0.15
TOTALS	200	6.80	11.40	9.20	40.00	30.00

APPENDIX 2
INVESTMENT BY REGION

RECYCLED PULP FOR PAPER MILLS

REGION / COUNTRY	NUMBER OF AGRICULTURAL FIBRE PULP MILLS FOR PAPER	INVESTMENT (In Billions of US$)						PRODUCTION (Millions of Tonnes)
		Year 1 (US$)	Year 2 (US$)	Year 3 (US$)	Year 4 (US$)	Year 5 (US$)	Total by 2030 (US$)	Tonnes of Recycled Microbial Fibre Pulp / Year
ASIA								
China	10	0.4	0.4	0.4	0.4	0.4	2	1.5
Japan	3	0.2	0.2	0.2	-	-	0.6	0.45
Vietnam	2	0.2	0.2	-	-	-	0.4	0.3
Indonesia	3	0.2	0.2	0.2	-	-	0.6	0.45
SOUTH ASIA								
India	10	0.4	0.4	0.4	0.4	0.4	2	1.5
Pakistan	5	0.4	0.4	0.2	-	-	1	0.75
Bangladesh	10	0.4	0.4	0.4	0.4	0.4	2	1.5
SOUTH AMERICA								
Brazil	10	0.4	0.4	0.4	0.4	0.4	2	1.5
NORTH AMERICA								
USA	20	0.4	1	1	1	0.6	4	3
Canada	8	0.2	0.4	0.4	0.4	0.2	1.6	1.2
Mexico	2	0.2	0.2	-	-	-	0.4	0.3
EURASIA								
Britain	4	0.2	0.2	0.2	0.2	-	0.8	0.6
France	4	0.2	0.2	0.2	0.2	-	0.8	0.6
Germany	4	0.2	0.2	0.2	0.2	-	0.8	0.6
Russia	5	0.4	0.4	0.2	-	-	1	0.75
Sweden	1	0.2	-	-	-	-	0.2	0.15
AFRICA								
South Africa	1	0.2	-	-	-	-	0.2	0.15
TOTALS	107	5.2	5.6	4.6	3.6	2.4	21.4	16.05

STATEMENTS OF SUPPORT FOR CANOPY'S ACTION PLAN

"Collaboration across supply chains, at scales beyond what has been considered before, is needed in order to address the climate and biodiversity challenges we face. We welcome Canopy's approach that breaks the action plan into components for producers, investors, and corporate purchasers of pulp products."

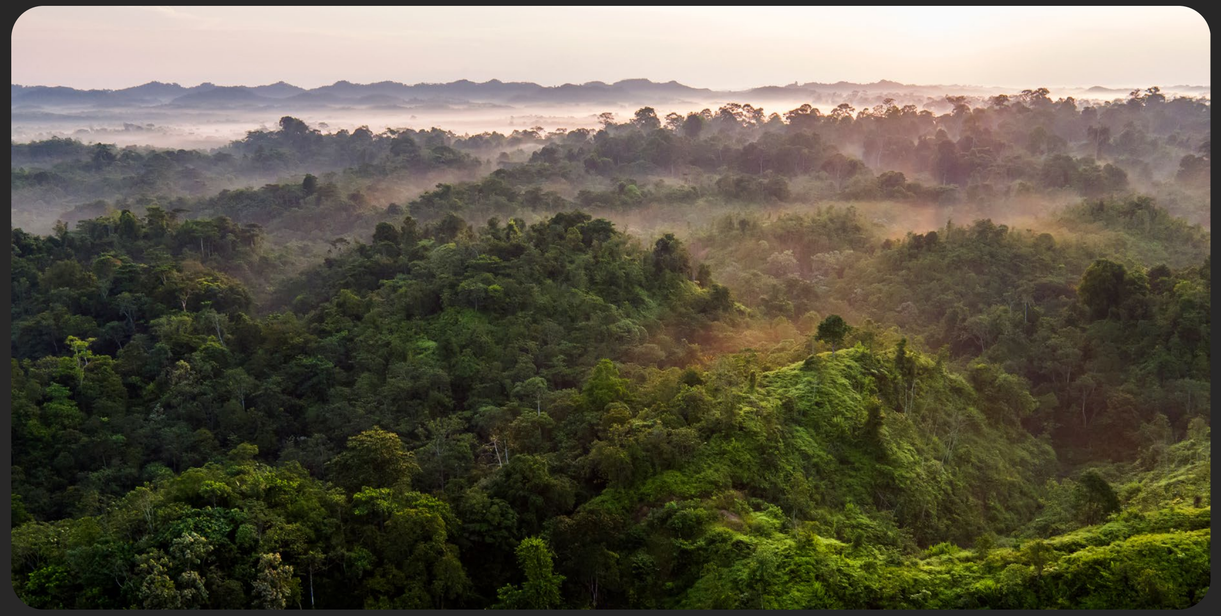
— MADELENE ERICSSON, ENVIRONMENTAL SUSTAINABILITY BUSINESS EXPERT AT H&M

"This is an ambitious strategy: one that is welcomed by UBS given the task before us of addressing the climate and biodiversity emergencies."

— MICHAEL BALDINGER, GLOBAL HEAD OF SUSTAINABLE AND IMPACT INVESTING AT UBS ASSET MANAGEMENT

"Canopy's call to action points to the essential role of the world's forests in mitigating the climate crisis and the growing sense of urgency to prevent further loss of biodiversity. In alignment with Canopy's ambitions, we are continuing the challenging work to diversify the fibre used in Kimberly-Clark's products, including progress toward our goal to replace 50% of the fibre we use from natural forests with alternative sources."

— LISA MORDEN, VICE PRESIDENT OF SAFETY & SUSTAINABILITY, KIMBERLY CLARK



"DWS believes that protecting global biodiversity and increasing carbon sinks from forests will play an instrumental role in sequestering carbon as a climate change mitigant on a global level. Approaches like Canopy's, targeting supply chain sustainability across the paper products and textiles industries, represent a critical component of this effort. DWS Group, with over 20 years of experience in impact investing, believes this represents another opportunity to deliver on circular economy-based investment solutions for corporate clients focused on minimizing their environmental footprint."

— ANDREW PIDDEN, GLOBAL HEAD OF SUSTAINABLE INVESTING AT DWS (FORMERLY KNOWN AS DEUTSCHE ASSET MANAGEMENT)

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