CHINA FEATHER AND DOWN INDUSTRIAL ASSOCIATION
中国羽绒工业协会

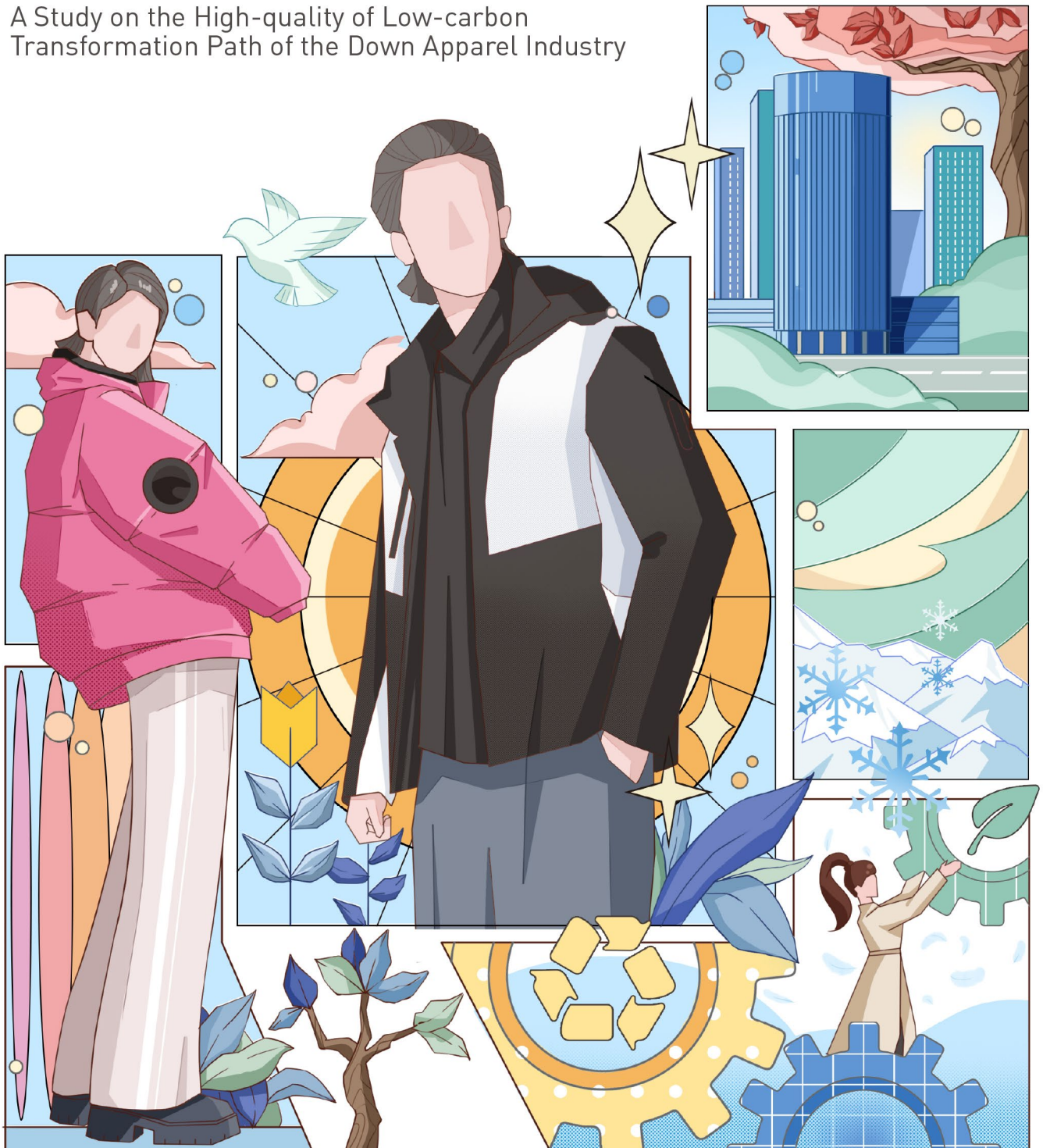
商道纵横
SynTao—Sustainability Solutions

迈向净零排放

Towards Net Zero EMISSIONS

羽绒服行业高质量低碳转型路径研究

A Study on the High-quality of Low-carbon Transformation Path of the Down Apparel Industry



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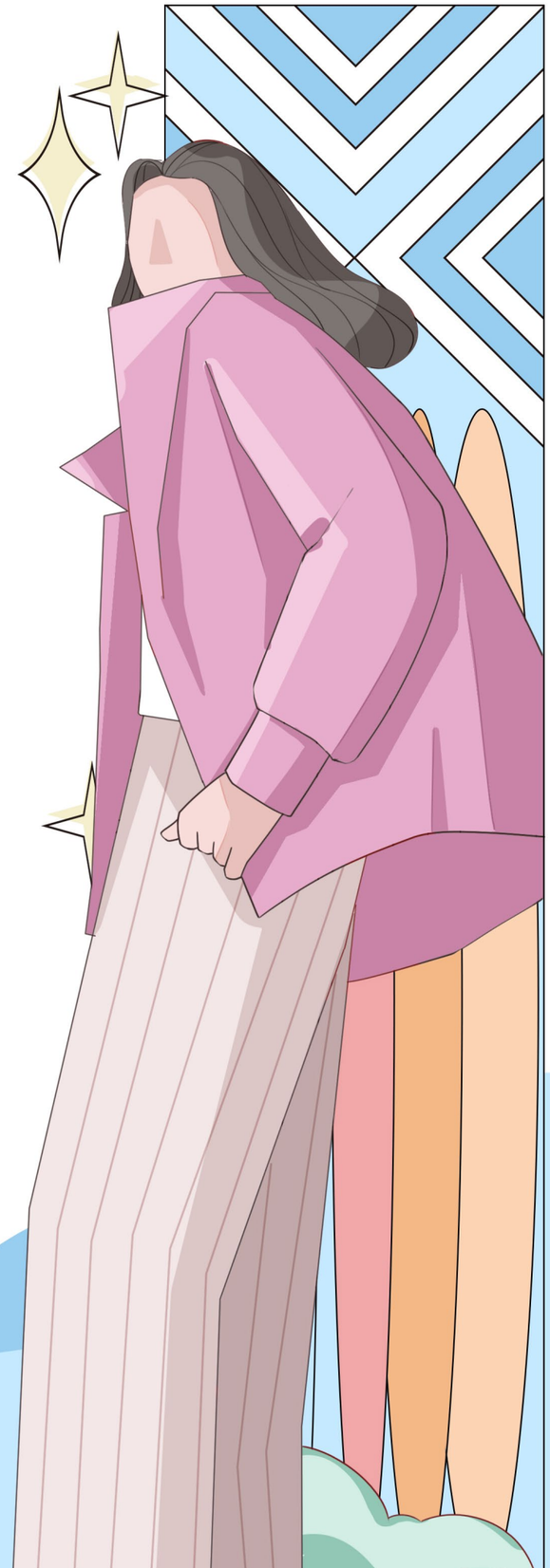
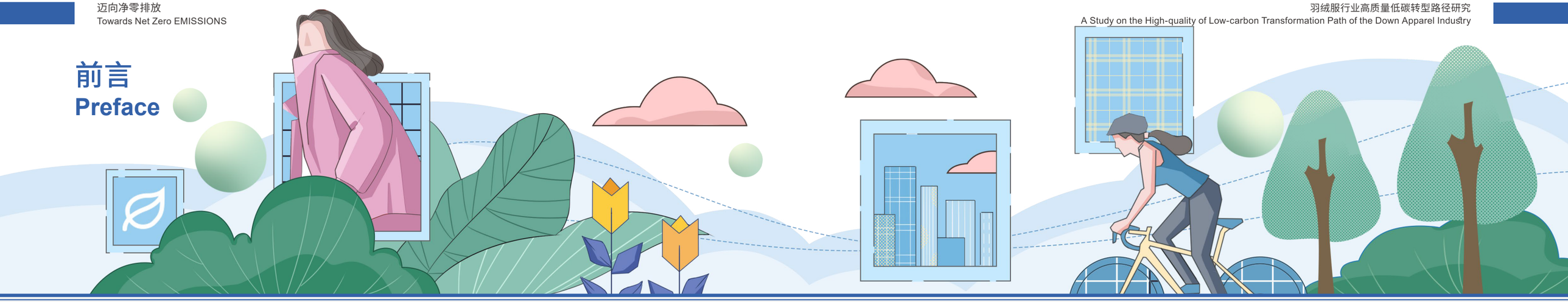


前言
Preface



中国是世界上最大的羽绒及制品的生产国、出口国，也是最大的消费国。据联合国粮农组织的统计，全球 97% 的鹅产自中国，74% 的鸭产自中国。因此，中国也是最大的羽绒资源国。作为羽绒大国，在低碳转型的研究及落实方面，中国应该走在世界的前列。

羽绒是一种可持续、可再生的资源，是天然的保暖材料。据美国一家专业评估公司 Long Trail Sustainability 的一项全生命周期评估（LCA）结论显示：羽绒填充材料对环境的影响比聚酯填充材料低 85-97%，测评的 5 个领域包括人体健康、生态系统、资源、能源需求和气候变化。

China is the largest manufacturer, exporter and consumer of down and down products in the world. According to the statistics from the Food and Agricultural Organization of the United Nations (FAO), 97% of the goose and 74% of the duck in the world come from China. Therefore, China is also the largest source of down. As a huge down country, China should lead the world in research and implementation of low-carbon transformation.

Down is a sustainable and renewable resource and a nature thermal material. According to the conclusion of a full-life cycle assessment (LCA) of Long Trail Sustainability, a professional assessment company of America, down materials' impact on the environment is 85% to 97% lower than that of polyester filling materials. The assessment covers 5 areas, being human health, ecosystem, resources, energy demand and climate change.

目前，在国家碳达峰和碳中和目标的感召下，节能减排，低碳转型，可持续发展，已经成为行业发展的任务，成为企业必备的社会责任。但就目前中国羽绒行业发展的现状，虽然近年来对羽绒加工企业煤改气的推广、污水回用系统的设立、行业污水排放标准的制定、废旧羽绒服的回收、拆解及回用等等，在节能减排方面做了大量的改善，但就达到低碳转型的目标及自觉落实相关社会责任上，还大有潜力可挖。

《迈向净零排放: 羽绒服行业高质量低碳转型路径研究》，站在羽绒服行业的平台，以零碳经济的专业视角，系统分析了羽绒服装产业链各个环节低碳转型的方向及落点，为行业今后的节能减排可持续发展指明了路径，展示了未来，是一篇颇具指导意义的行动指南，值得在业内推广和运用。

Currently, inspired by the national call of carbon-peak and carbon neutrality, energy conservation and emission reduction, low-carbon transformation and sustainable development have become the duties for the development of the industry and a requisite social responsibility of an entity. However, as for the status quo of the down industry in China, although the promotion of coal-to-gas in down processing enterprises, the establishment of sewage recycling system, the formulation of industrial standards for sewage emission, and the recycling, dismantling and reuse of used down apparel in recent years have greatly improved energy conservation and emission reduction, there is a long way to go to reach the goal of low-carbon transformation and active fulfillment of relevant social responsibilities.

Towards Net Zero: A Study on the Low-Carbon Transition Pathways of Down Apparel Industry, systematically analyzed the direction and landing point of low-carbon transformation in each process of the down apparel industry chain from the professional perspective of zero-carbon economy and at the platform of the down apparel industry, which provides a path for the energy conservation and emission reduction and sustainable development of the industry in the future. It presents the future, which is a meaningful action guideline and is worthy promoting and applying across the industry.

中国羽绒工业协会 理事长
国际羽绒羽毛局　副主席
姚小蔓
2023 年 11 月 27 日于北京

Chairman of China Feather and Down Industrial Association
Vice-president of International Down and Feather Bureau
Yao Xiaoman
27 November 2023
Beijing

摘要
Abstract

服装行业在现代经济和社会发展中扮演着重要角色。一方面，服装产品在满足基础消费的同时也延伸展现了消费者对生活质量提升的需求，另一方面，服装行业为国家提供可持续的经济发展机会。

然而，服装行业也是温室气体排放的重要来源，并面临日益增加的排放量和由此产生的气候变化的风险。研究估计，服装行业贡献了全球温室气体年排放量的约 4% (McKinsey & Global Fashion Agenda, 2020)。

羽绒服行业是服装行业的一个分支，其相比其他服装行业具有明显的行业特点，例如更依赖生物基材料、更持久的产品使用寿命等。因此，在中国承诺到 2060 年实现碳中和的目标下，有必要单独研究羽绒服行业的脱碳之路。本报告作者回顾了各种报告和研究，并根据自身过往经验，提出了羽绒服行业为实现高质量低碳转型应该关注的领域。

本报告主要立足于品牌商视角，但价值链中的主要成员都可以在本报告中找到可以参考的行动，包括零售商、制造商、材料供应商等。报告的主要成果和发现载于本摘要。

提高商业效率将助力行业减排

品牌注重的商业效率与羽绒服行业的脱碳潜力密切相关，通过重新定义产品设计、生产、流通和销售体系，品牌可以全面提升行业的资源和能源效率，推动价值链各个环节实现直接或间接减排。

工艺环节脱碳是重中之重

羽绒服行业价值链上游生产端贡献了行业碳排放的接近一半，是实现价值链净零排放的重点。在行业的脱碳进程中，生产侧需要以前所未有的速度和规模进行变革。这需要品牌和供应商的共同努力，尽可能早的转向可再生电力，并对生产环节的工艺技术进行革新。

羽绒服行业有能力推动社会减排

羽绒服行业在减小自身的碳足迹的同时，具有明显的推动价值链以外减排的潜力——“碳手印”。文中提出了羽绒服行业可以带动其他行业和居民生活场景减排的三种途径。羽绒服行业有能力推动社会减排。

The apparel industry plays an important role in modern economy and social development. On the one hand, apparel products, traditionally as consumer staples, are increasingly reflecting consumers' demand for higher living standards; on the other hand, the apparel industry creates opportunity for sustainable economic development for many countries.

However, the apparel industry is also an important source of greenhouse gas (GHG) emissions and exposes to the risks of increasing emission and climate change arising therefrom. It is estimated that the apparel industry accounts for approximately 4% of the annual GHG emissions worldwide (McKinsey & Global Fashion Agenda, 2020).

The down apparel industry, a branch of the apparel industry, has distinct industry features compared with other apparel industries. For instance, it relies on bio-based materials and usually has longer lifetime. As such, with China's target to achieve carbon neutrality by 2060, it is necessary to examine the decarbonization path of the down apparel industry. In this report, the author reviewed different reports and papers, combined with their own experience, suggested areas the down apparel industry should focus on to ensure a sustainable low-carbon transition.

This report is written mainly in the view of brands. However, major players in the value chain, including retailers, manufacturers, and material suppliers, can find valuable insights and recommendations they can refer to. Major results and findings are set out in the abstract.

Improving business efficiency will drive emissions reduction in the industry

The business efficiency that brands focus on is closely related to the decarbonization potential of the down apparel industry. By redefining product design, production, distribution and circulation system, brands can improve the resource and energy efficiency of the industry, and drive direct or indirect emissions reduction along the value chain.

Decarbonization in the manufacturing process presents the biggest emissions reduction opportunity

The upstream production contributes to nearly half of the emissions along the industry's value chain. Decarbonization in the manufacturing process is crucial for the industry to become net zero. During this process, the production side needs to undergo systematic change at an unprecedented speed and scale, including switching to renewable electricity as soon as possible and exploring innovating production way. This will require joint efforts of brands and suppliers.

The down apparel industry has the capability to drive beyond value chain mitigation

While bearing the responsibility to reduce its own carbon footprint, the down apparel industry also has the potential to drive beyond value chain mitigation – growing its carbon handprint. This report examines three potential ways the industry can take advantages of to drive emissions reduction in other industries and daily life.

羽绒服行业和气候变化
Down Apparel Industry and Climate Change

行业概述
Industry Overview

与许多传奇发明一样，羽绒服的历史也源于一次意外。1935 年，西雅图体育用品店老板、户外活动家埃迪·鲍尔在与朋友钓鱼时因疲劳而晕倒，险些死于体温过低。在这次事件之后，鲍尔意识到自己需要一件轻便、温暖且防水的外套。在与一些羽毛商人交流后，第一件羽绒服“The Skyliner”(天空线) 应运而生。

Like many legendary inventions, the history of down apparel also starts from an accident. In 1935, Eddie Bouwer, an owner of a sporting goods store in Seattle and an outdoor activist, fainted from fatigue while fishing with friends and nearly died of hypothermia. After the accident, Bouwer realized that he needed a light, warm and water-proof coat. After a couple of exchanges with some feather merchants, the first down jacket - The Skyliner was born.

羽绒服行业早期主要关注提高产品的保暖性和功能性，以满足消费者在寒冷的环境下的需要。随着消费升级，在过去十年中，品牌开始注重产品的外观设计，致力于将时尚元素融入到设计中，以满足消费者更高的审美要求。如今，随着消费者对道德消费的需求不断提高，品牌们开始注重产品的环境和社会责任，使可持续性成为羽绒服行业新一轮升级的关键词。

In early years, the down apparel industry mainly focused on improving the warmth retention and functionality of products to meet the needs of consumers in cold environments. With the upgrade of consumption, brands have begun to pay attention to the appearance design of products, and are integrating more fashion elements into the design to meet the higher aesthetic requirements of consumers. Today, as consumers' demand for ethical consumption continues to rise, brands are beginning to pay attention to the environmental and social responsibilities their products carry, making sustainability a key word in a new round of upgrades in the down apparel industry.

羽绒服行业的主动变革引领了行业的持续成功。目前，羽绒服行业已成长为价值万亿的全球产业 (MarketWatch, 2023)。中国作为世界上最大的羽绒及制品生产国、出口国和消费国 (人民日报海外版 , 2023)，近年来羽绒服市场规模保持较快增长，2016-2021 年市场规模年均复合增长率达到 12.7%。在新冠疫情导致的经济形势相对低迷的情况下，2021 年羽绒服市场规模仍实现 12.8% 的增长，达到 1,562 亿元 (红星资本局 , 2022)。

The active transformation of the down apparel industry has led to the continuous success of the industry. Today, the down apparel industry has grown into a trillion-dollar worth global industry (MarketWatch, 2023). As the world's largest producer, exporter and consumer of down and down apparel products (People's Daily, Overseas Edition, 2023), the down apparel market of China has maintained rapid growth in recent years, at a compound annual growth rate (CAGR) of 12.7% from 2016 to 2021. In 2021, despite facing a relative sluggish economic environment due to COVID-19 pandemic, the market size of down apparel still recorded a 12.8% growth and reached to RMB156.2 billion (Red Star Capital Bureau, 2022).

中国羽绒服市场规模近年来保持较快增长，近 5 年 CAGR 达到

11.4%

Chinese down apparel market maintained rapid growth in recent years, at CAGR of 11.4% in recent 5 years.

低碳转型的驱动力
Driving Forces of Low-carbon Transformation

内部驱动力
Internal Driving Forces

中国拥有世界上最庞大和活跃的服装消费市场之一。2022 年，中国服装消费市场占据全球市场总规模的接近 20% (Statista, 2023)，并且是全球消费市场增长的主要动力。正如 McKinsey 预测的那样，尽管全球服装行业在 2023 年受到恶性通货膨胀和低迷的客户情绪的影响增长将继续放缓，但中国仍将获得良好的表现。其中，服装市场（不包括奢侈品行业）和奢侈品行业预计分别将增长 2%-7% 和 9%-14% (McKinsey, 2022)。

中国服装消费市场的增长呈现出消费分层叠加产业升级的新周期特征。在消费升级方面，消费者更加注重可以引发感情共鸣的品牌价值理念，并开始思考消费对环境的影响，推崇可持续时尚的新生代设计师得到更多关注。在产业升级方面，智能制造带来的流程革命为服装行业创建了新的供应链模型，并通过更加环境友好、高性能的创新技术给行业和产品带来新的演化动力。

China is one of world's largest and most active apparel consumer markets. In 2022, China's apparel consumer market accounted for nearly 20% of the total global market size (Statista, 2023), and was the main driver for the growth of the global consumer market. According to the estimates of McKinsey, China will continue to perform satisfactorily in 2023 despite the ongoing slowdown of the global apparel industry due to hyperinflation and sluggish customer sentiments. Among which, the apparel market (excluding the luxury segment) and the luxury segment are expected to grow by 2%-7% and 9%-14%, respectively (McKinsey, 2022).

The growth of China's apparel consumer market presents a new cyclical characteristics of consumption stratification and industrial upgrading. As to consumption upgrading, consumers are focusing more on brand values that can arouse emotional resonance, and are starting to consider the impact of their consumption on the environment. The new generation of designers advocating sustainable fashion is getting more attention. As to industrial upgrading, the process revolution brought by smart manufacturing are creating a new industry supply chain model, and the sustainable and innovating technologies are driving the wave of change for the industry and its products.

外部驱动力
External Driving Forces

政府
The government

2021 年 10 月，中国提出了更新的国家自主贡献目标，即二氧化碳排放力争于 2030 年前达到峰值，努力争取 2060 年前实现碳中和。这一目标也被写入了《“十四五”规划和 2035 年远景目标纲要》。随后，中国服装协会和中国纺织工业联合会先后发布了行业性的发展规划，对行业未来五年的发展提出了指引和要求。

In October 2021, China announced its updated nationally determined contributions (NDC) target, which outlines its ambition to achieve the peaking of carbon dioxide emissions by 2030 and strives to achieving carbon neutrality by 2060. This goal has been written into the “14th Five-year Plan and Outline of 2035 Long-term Goals”. Thereafter, China National Garment Association and China National Textile and Apparel Council issued successively the development planning of the industry, which puts forward guidelines and requirements for the development of the apparel industry under the NDC target.

中国纺织工业联合会《纺织行业“十四五”发展纲要》
China National Textile and Apparel Council “Development Outline during the ‘14th Five-year Plan’ Period for the Textile Industry”

“十四五”末，纺织行业用能结构进一步优化，能源和水资源利用效率进一步提升，单位工业增加值能源消耗、二氧化碳排放量分别降低 13.5% 和 18%，印染行业水重复利用率提高到 45% 以上。生物可降解材料和绿色纤维产量年均增长 10% 以上，循环再利用纤维年加工量占纤维加工总量的比重达 15%。

At the end of the “14th Five-year Plan” period, the energy consumption structure of the textile industry will be optimized, the energy and water resources utilization efficiency will be enhanced, energy consumption per unit of industrial added value and carbon dioxide emissions will be reduced by 13.5% and 18%, respectively, and the water reuse rate of the printing and dyeing industry will be increased to above 45%. Annual output of biodegradable materials and green fibers will be increased by above 10% on average and the proportion of annual processing volume of recycling fibers to the total volume of processing fiber will reach 15%.

中国服装协会《中国服装行业“十四五”发展指导意见和 2035 年远景目标》
China National Garment Association “Guiding Opinion for Development during the 14th Five-year Plan Period and 2035 Long-term Goals for Chinese Garment Industry”

“十四五”期间，围绕产品生命周期，形成绿色设计、绿色生产、绿色营销、绿色消费的可持续发展生态，重点形成服装产业绿色制造体系，突破一批废旧服装回收利用关键共性技术，提升服装纤维循环利用水平。

During the “14th Five-year Plan” period, a sustainable development ecology covering green design, green production, green marketing and green consumption will be formed focusing on product life cycle, and a green manufacturing system will be established in the apparel industry. A series of key common technologies for waste clothing recycling will be broken through and the level of clothing fiber recycling will be enhanced.

投资者
Investors

越来越多的投资者开始将 ESG 融入其投资战略，其中，气候变化是最受关注的可持续发展议题之一。投资者希望在他们的投资组合中包括那些在减少温室气体排放、提高能源效率和开发清洁能源等方面取得成功的公司，这为他们提供了可持续的投资机会，同时为保护环境做出积极贡献。根据 Bloomberg 预测，全球 ESG 资产规模将从 2020 年的 37.8 万亿美元增长到 2025 年的 53 万亿美元，占预计全球管理资产规模的超过三分之一 (Bloomberg, 2021)，这意味着 ESG 投资将成为全球投资的主流趋势。

More investors are beginning to incorporate ESG into their investment strategies. Among which, climate change is one of the most concerned sustainability issues. Investors would like to demonstrate that companies in their investment portfolios are successful in reducing GHG emissions, improving energy efficiency and employing clean energy, which provide them with sustainable investment opportunities while making a positive contribution to environmental conservation. According to the forecast of Bloomberg, the global ESG asset size will grow from USD37.8 trillion in 2020 to USD53 trillion in 2025, accounting for more than one-third of the estimated size of global assets under management (Bloomberg, 2021), which means that ESG investment will become one of the mainstream trends of global investment.

ESG 投资对公司本身也有益处。随着 ESG 标准的提高，公司需要遵守更高的环境、社会和治理标准，以满足投资者和监管机构的要求。此外，ESG 投资可以提高公司的声誉和品牌形象，为公司带来更好的市场表现。因此，许多公司已经开始设定碳减排目标，并采取措施减少其对气候变化的影响，以满足 ESG 投资的需求。

ESG investment can also be beneficial for companies themselves. In view of the more demanding ESG standards, companies will need to comply with higher environmental, social and governance standards to satisfy the requirements of investors and regulatory agencies. In addition, ESG investment can improve a company's reputation and brand image, resulting in better market performance for the company. Therefore, many companies have started to set carbon reduction targets and take measures to reduce their impact on climate change to meet the demand of ESG investment.

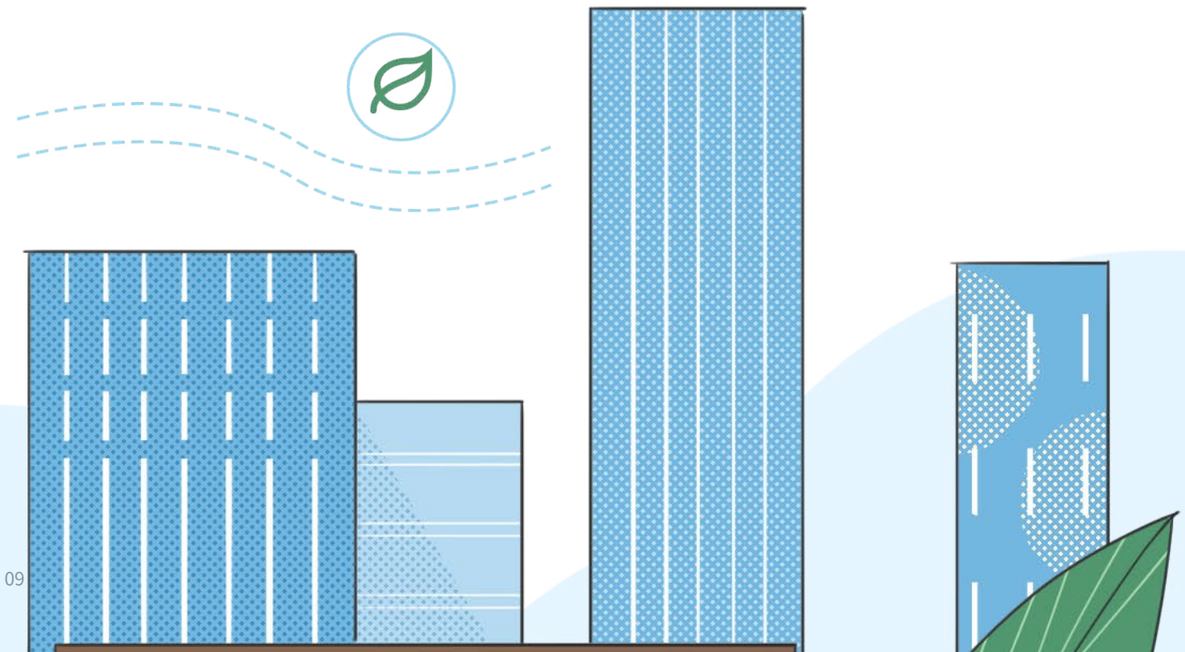
消费者
Consumers

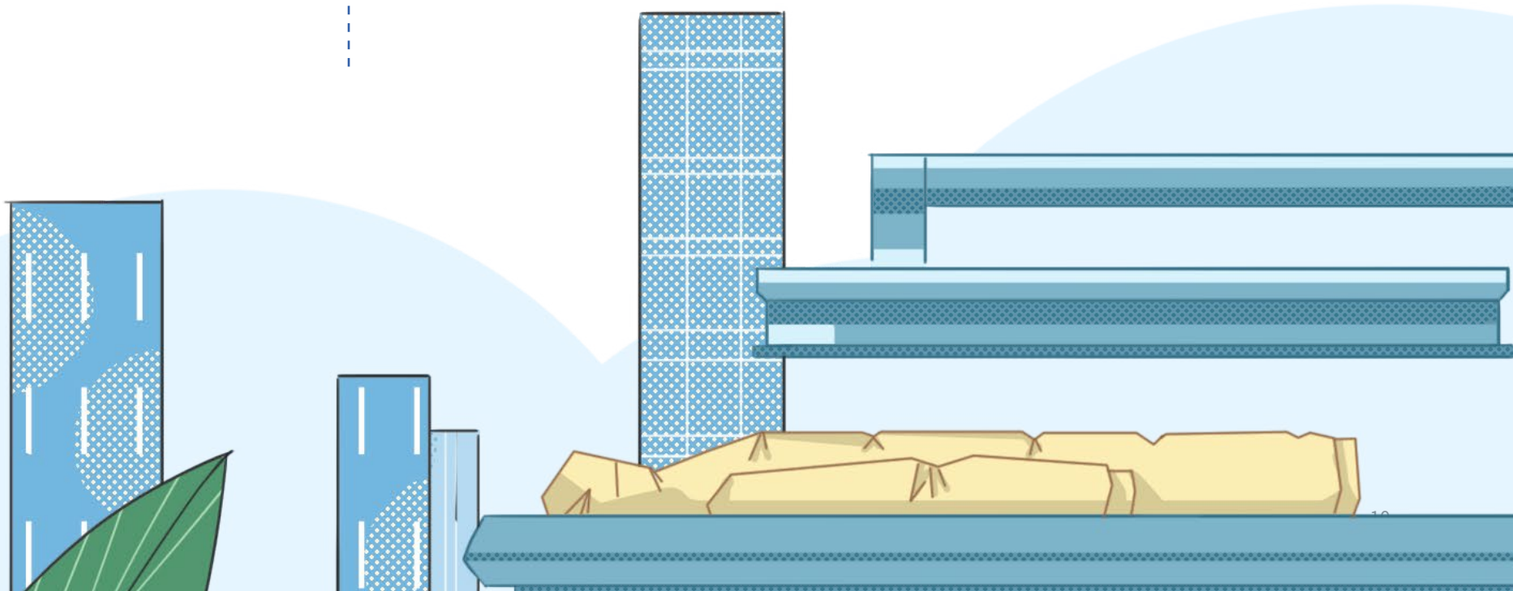
在新冠疫情危机期间，随着消费者开始重新评估自己的价值观以及其行为对地球的影响，可持续性已成为许多消费者关注的焦点。罗兰贝格近期的一份中国市场消费者调研强调了“可持续话题”的关注已成为中国市场主流意识，超过 85% 中国消费者认为“时尚消费”对环境产生负面影响 (罗兰贝格 , 2022)。

During the COVID-19 pandemic, as consumers start to reevaluate their own values and the impact of their behaviors on the planet, sustainability has become a focus for many consumers. Recent research by Roland Berger highlights that the attention to “sustainability issues” has become mainstream awareness in the Chinese consumer market, with more than 85% of Chinese consumers believe that “fashion consumption” has an adverse impact on the environment (Roland Berger, 2022).

这种态度的转变也改变了消费者对时尚品牌的期望。消费者现在更加关心品牌的社会和环境承诺：超过半数的消费者表示十分支持时尚品牌自身的可持续战略规划和相关项目、支持政府在监管上要求、督促品牌的可持续发展 (罗兰贝格 , 2022)。其中，Z 时代消费者和居住在一线及新一线较发达城市的消费者对于绿色低碳消费的认知度和接受度更高 (商道纵横 & 界面新闻 , 2022)。

The shift of this attitude has changed consumers' expectation on fashion brands. Consumers are now more concerned about brand's commitment to the society and the environment. More than half of the consumers express supports for brands to develop sustainable business strategies and relevant projects, and for the government to use policy tools to advance corporate sustainability efforts (Roland Berger, 2022). Among which, Gen Z consumers and those living in first-tier and newer first-tier cities show a higher awareness and acceptance of green and low-carbon consumption (SynTao & Jiemian News, 2022).





01

迈向净零排放：提升价值链效率

Towards Net Zero Emissions: Improving the Efficiency of Value Chain

时尚品牌作为直接与消费者对话、连接价值链上下游的枢纽，在羽绒服行业低碳转型的道路上扮演着至关重要的作用——通过新的产品定义、新的零售样式、新的生产与流通体系，全面提升羽绒服行业的资源效率和能源效率，可以推动价值链各环节实现直接或间接减碳。

Fashion brands, as the connecting point of the upstream and downstream of the value chain, plays a vital role in the low-carbon transition of the industry – through innovating product design, production, distribution, and circulation system, brands can improve the resource and energy efficiency of the industry, thereby driving direct or indirect emissions reduction along the value chain.

提高产品效率
Improving Product Efficiency

产品设计
Product Design

设计阶段对于羽绒服行业的绿色发展至关重要，其决定了羽绒服在使用和处置阶段能否带来“积极环境影响”。

The design process is vital to the green development of down apparel industry, which decides whether down apparel can bring “active environmental impact” in its use and disposal stages.

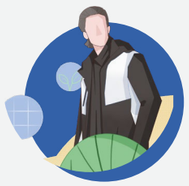
通过四个产品原则：多场景、耐用性、多功能和可拆卸——既可以促进服装产品增加使用频率、可修复和再利用，也能促进新技术、新流程在上游加工过程应用，从而提升资源利用率，减少边角料。

The four product principles, being multi-scenario, durability, multi-function and detachability, not only can promote the use frequency of apparel products, their repairability and reusability, but also promote application of new technology and new processes in upstream processing, thereby improving resources utilization and reducing offcut.

多场景 Multi-scenario

通过对不同使用场景产品系列的诠释，带动低碳羽绒产品在广泛服饰消费市场的适用性。

driving the applicability of low-carbon down products into the extensive apparel consumer market by interpreting products series in various scenarios.



耐用性 Durability

选择高质量、耐用的面料和其他组件是设计耐磨损的羽绒服的关键。此外，合适的接缝构造方式也非常重要。通过增强羽绒服的耐用性，可以让它们更长久地持续使用，进而减少资源消耗和废弃物的产生。

the key to designing abrasion resistant down apparel is to select high quality and durable fabrics and other components. Besides, a suitable way of seam construction is also very important. By enhancing the durability of down apparel, it can be worn for a long time, thereby reducing resource consumption and waste generation.

案例 Case

波司登持续深耕户外羽绒服领域。一方面从穿着者的需求角度进行设计，同时也通过质材、制作与设计让产品更具有可持续元素。2022 年，波司登推出了舒适羽绒系列。通过研究百万亚洲人体型，该系列羽绒服产品分别将 15 种版型差异化地运用在三合一的外套与内胆中，采用三合一组合设计，可单穿、可叠穿，最低可抵御零下 10 度。一件羽绒服可适应不同温度与场合。

Bosideng keeps rooting in outdoor down apparel. While designing based on the wearer’s demand, the products are also made more sustainable from aspects of material, production and design. In 2022, Bosideng launched comfortable down series. By studying the body shape of a million Asian people, productions of this collection applied 15 silhouettes differently in 3-in-1 coat and liner. The 3-in-1 combination design allows the product to be worn alone or layered with other clothes and resistant to cold of below 10 degrees Celsius. A down apparel can be adapted to different temperatures and occasions.

多功能 Multi-function

通过根据产品属性，对轻薄羽绒服、冬羽绒等进行深度创新和研发，拉伸低碳羽绒服产品的有效销售时间及销售地域。

extending effective sales time and sales region of low-carbon down apparel products by conducting in-depth innovation and research and development on light down apparel and winter down products according to their properties.

可拆卸 Detachability

在设计羽绒服时考虑可拆卸性可以使羽绒服更容易维护、修理、再利用和回收。例如，可拆卸的内部填充物和面料使得羽绒服更容易清洗和维护。另外，可拆卸的组件还能够方便回收和再利用，降低了废弃物的产生，实现了更环保的生产和消费。

by taking into account the detachability of down apparel during the design stage, it can facilitate the maintenance, repair, reuse and recycling of the down apparel. For example, detachable inner padding and fabrics make down apparel easier to wash and maintain. In addition, detachable components can also facilitate recycling and reuse, reducing waste generation and realizing more environmentally friendly production and consumption.

保养和维修
Maintenance and Repair

提供便利的保养和维修服务，有助于延长产品的使用寿命，并提高消费者对品牌的信任和忠诚度。羽绒服属于价值高、保养和清洗频次低的服装品类，通过建立清晰的保养和维修指南、提供维修工具包和配件、建立便捷的维修通道、定期提供维护服务可以提升产品的长期使用性能和体验，避免不必要淘汰与更新。

Providing convenient maintenance and repair services helps extend the lifetime of products, and enhances consumer trust and loyalty towards the brand. Down apparel belongs to a high-value category of clothing with low maintenance and cleaning frequency. By establishing clear maintenance and repair guidelines, providing repair kits and accessories, setting up convenient repair channels, and providing regular maintenance services, brands can improve the long-term performance and user experience of their products and avoid unnecessary replacement.

保养和维修指南
Maintenance and repair guidelines

将清洗、干燥、保养等指南写在产品标签或说明书上，并向消费者提供简单易懂的指南。可以考虑在品牌网站上提供视频教程和FAQ，以帮助消费者解决常见问题。

Brands may print cleaning, drying, maintenance and other guidelines on product labels or manuals to provide consumers with simple and easy-to-understand guidelines. Video tutorials and FAQs can be provided on the brand website to help consumers with common questions.

维修工具包和配件
Repair kits and accessories

提供备用纽扣、线、补丁等维修工具包和配件，以帮助消费者自行修复衣物。此外，品牌还可以提供在线购买配件和工具的服务，以便消费者更方便地获取所需配件和工具。

Brands may provide repair kits and accessories such as spare buttons, threads and patches to help consumers repair the apparel by themselves. In addition, brands may also provide online services to purchase accessories and tools, so that consumers can obtain the required accessories and tools more conveniently.

维修通道
Repair and maintenance service

建立一个简单易用的维修申请流程，并提供方便的退货和换货服务。品牌可以与当地的维修服务提供商合作，以便快速修复产品。

Brands may establish a simple and easy-to-use repair request process along with providing convenient services for returns and exchanges. Brands may partner with local repair service providers for quick repair of products.

维护服务
Maintenance services

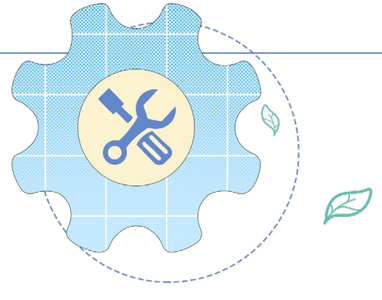
品牌可以为客户提供维护服务，例如为消费者的羽绒服做清洁和保养，或者提供羽绒服的柔软度和保暖度测试。这些服务可以提高消费者对品牌的满意度，并为品牌带来更多的商业机会。

Brands may provide customers with maintenance services, such as cleaning and maintaining of their down apparel, or softness and warmth tests for down apparel. These services can improve consumer satisfaction with the brand and bring more business opportunities to the brand.

案例 Case

加拿大鹅在其官网上提供了详细的羽绒服保存和清洗指南，并为客户提供了经认证的干洗服务提供商名单。此外，加拿大鹅承诺对于商品在使用过程中的非人为损坏或非正常穿着磨损提供终身免费维修服务。

Canada Goose provides detailed guidelines for down apparel storage and cleaning on its website, and provides customers with a list of certified dry cleaning service providers. In addition, Canada Goose promises to offer lifetime free repair services for manufacturing defects or defects due to abnormal wear and tear.



提高零售效率
Improving Retail Efficiency

绿色门店
Green Stores

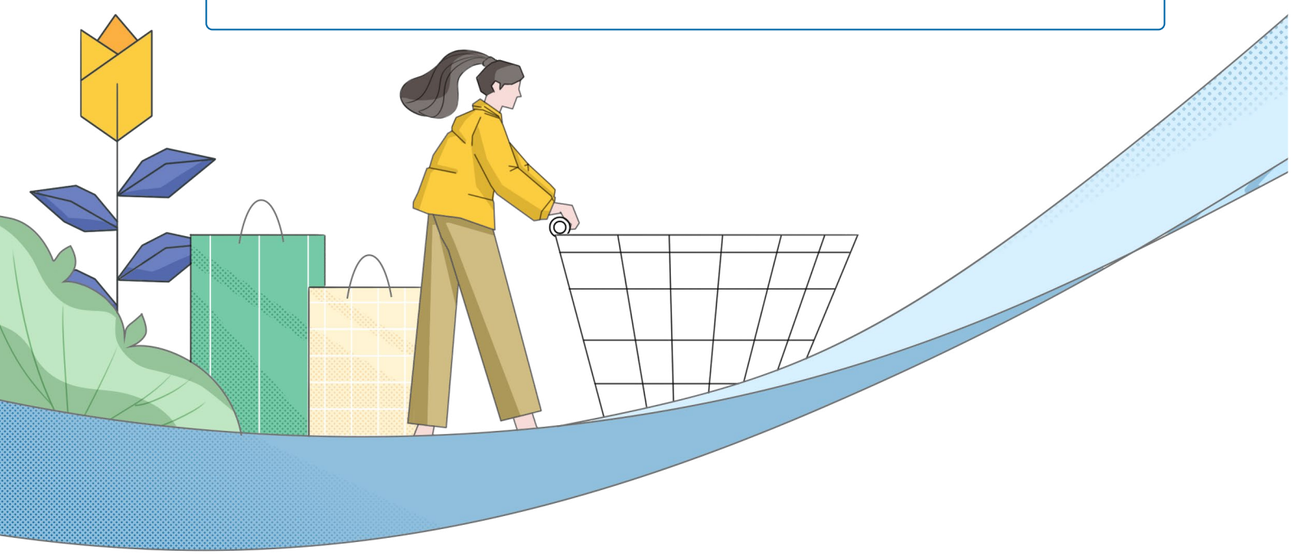
在持续演化的零售形态中，线下门店一直扮演者不可替代的角色，是品牌直接接触消费者的最直接场景，并在践行“减量”和推动“参与”方面发挥着重要作用。

In the evolving retailing landscape, offline stores have always been playing an irreplaceable role. They serve as the most direct touchpoint between brands and customers, and play an important role in practicing “reduction” and promoting “participation”.

绿色门店打造
Creating green stores

通过打造绿色门店，可以提高销售过程中的能源效率。对于新建门店，企业可以在选址、设计、物料使用等阶段考虑建筑电气化程度、绿色电力易得性、建筑能效与交通物流基础设施便利性等因素。对于现有门店，企业可以委托建筑物业采购绿色电力，以及应用智慧用能、能效提升技术措施提高门店能源效率。此外，企业还可以通过简化包装、应用再生材料、提供旧衣物回收终端等措施进一步提升门店的资源效率。

Creating green stores can improve energy efficiency during the sales process. For new stores, companies may consider factors such as the degree of building electrification, the availability of green electricity, building energy efficiency and the convenience of transportation and logistics infrastructure during site selection, design and material use stage. For existing stores, companies may engage building developers to purchase green electricity, as well as apply smart energy management and energy efficiency enhancement technologies to improve the energy efficiency of stores. In addition, companies may also further improve the resource efficiency of stores by simplifying packaging, using recycled materials, and providing used clothing collection services.



绿色理念倡导
Advocating green concepts

门店可以利用场景化的展示和体验方式，向消费者展示品牌的环保理念和产品的低碳特点，通过展示环保材料、可持续性生产过程、环保包装等方面的实践，激发消费者的环保意识。门店还可以通过提供环保知识和技巧，帮助消费者更好地了解可持续生活方式，并引导他们在日常生活中采取更加环保的行为和习惯。这样做不仅可以提升品牌的形象和信誉度，还有助于推动低碳生活理念的普及和推广。

Stores is an excellent platform to demonstrate brand's environmental values and the low-carbon features of their products through occasion-based marketing. By demonstrating practices such as the use of sustainable materials, clean production processes, and eco-friendly packaging, stores can inspire environmental consciousness among consumers. Stores can also provide environmental knowledge and tips to help consumers better understand sustainable lifestyles and guide them towards adopting more environmentally-friendly behaviors and habits in their daily lives. This not only can enhance the brand’s image, but also help promote the popularization of the concept of low-carbon lifestyle.

维修、保养和回收渠道
Providing repair, maintenance and recycling channels

通过提供产品的维护、保养服务，门店可以帮助消费者延长产品使用寿命，减少废弃物产生，实现低碳消费。此外，门店还可以积极回收消费者不需要的产品，通过再利用、回收等方式，实现资源的最大化利用，减少浪费，同时减少碳排放。这些努力都有助于门店为减少碳排放做出贡献，同时也满足了越来越多消费者对于可持续消费的需求。

By offering product repair and maintenance services, stores can help consumers extend the lifespan of their products, reduce waste generation, and promote low-carbon consumption. In addition, stores can actively participate in product recycling, maximizing resource utilization and minimizing waste and carbon emissions through reuse and recycling. These efforts will help stores to reduce carbon emissions and meet the growing demand of consumers for sustainable consumption.

案例 Case

致力于零售网络的可持续发展是普拉达分销战略的核心。普拉达利用 Arc 技术平台来跟踪、管理和改善其商店在能源和水消耗、废物管理、产品运输和人们福祉方面的表现。截至 2021 年年底，普拉达全球现有商店获得了 80 项 LEED 认证。普拉达还承诺到 2024 年通过 LEED 认证的商店数量将增加到约 300 家。LEED 由美国绿色建筑委员会建立并推行，在世界各国的各类建筑环保评估、绿色建筑评估以及建筑可持续性评估标准中被认为是最完善、最有影响力的评估标准。

A commitment to the sustainability of the retail network is at the core of Prada’s distribution strategy. Prada leverages the Arc technology platform to track, manage and improve its stores’ performance in terms of energy and water consumption, waste management, product transportation, and people’s well-being. By the end of 2021, Prada’s existing stores worldwide had achieved 80 LEED certificates. Prada has also undertaken to increase the number of LEED-certified stores to about 300 by 2024. Established and implemented by the U.S. Green Building Council, LEED is considered to be the most complete and influential evaluation standard in various building environmental assessments, green building assessments and building sustainability assessment standards in countries around the world.

绿色电商
Green E-commerce

中国是全球电商渗透率 (28.5%) 第二高的国家，仅次于韩国 (海通国际 , 2022)，加上电商具有媒介效率高、信息传播维度广的优势，其对于羽绒服行业的低碳转型具有明显的影响。考虑到电商的平台属性，品牌主要可以从两个方面行动减少行业的碳排放。

China has the second-highest e-commerce penetration rate (28.5%) globally, second only to South Korea (Haitong International, 2022). With the advantages of high media efficiency and wide information dissemination dimensions, e-commerce has a significant impact on the low-carbon transition of down apparel industry. Considering the platform nature of e-commerce, brands can take action in two aspects to reduce the industry's carbon emissions.

传递产品低碳信息 Communicating low-carbon information about products

电商平台具有媒介效率高、信息传播维度广的优势，为品牌推广绿色羽绒服提供了更多的机会和方式。品牌可以选择参与电商平台的绿色购物活动，通过平台推广、互动活动等方式向广大消费者宣传品牌的绿色羽绒服。此外，品牌也可以在电商平台上建立特有的信息传播机制，通过发布绿色羽绒服的制作过程、环保认证、原材料等方面的信息，向消费者展示产品的环保属性和必要性。通过这种方式，品牌能够向消费者传达绿色理念，提高消费者对绿色羽绒服的认知度和接受度，并为品牌打造绿色形象。

E-commerce platforms, with their high media efficiency and broad dimensions of information dissemination, provide more opportunities and ways for brands to promote green down apparel. Brands can choose to participate in e-commerce green shopping activities, using platform promotion, interactive events, and other means to publicize their green down apparel to a wide range of consumers. In addition, brands can establish a unique information dissemination mechanism on e-commerce platforms by providing information about the production process, environmental certifications, raw materials, and other aspects of green down apparel. This allows brands to showcase the environmental attributes and necessity of their products to consumers. Additionally, brands can establish unique information dissemination mechanisms on e-commerce platforms by providing information about the production process, environmental certifications, raw materials, and other aspects of green down jackets. These allow brands to showcase the environmental attributes and necessity of their products to consumers. In this way, brands can convey the concept of sustainability to consumers, increase awareness and acceptance of green down apparels, and build a green image for their brands.

减少退换货 Reduce returns and exchanges

品牌通过展示详细的产品信息，包括产品描述、产品尺寸、360 度视图、试穿效果等，可以帮助消费者在购买前更好地了解产品细节，提高购买的准确性和满意度。此外，品牌还可以开发智能尺码推荐系统，通过消费者提供的身体尺寸和购买历史等信息，推荐最适合消费者的尺码，进一步降低因尺码选择不当引起的退换货率。降低退换货率不仅能够提升品牌的声誉和用户满意度，还能有效减少运输阶段产生的排放。

By displaying detailed product information, including product descriptions, sizes, 360-degree view, try-on effect, etc., brands can help consumers better understand product details before purchasing, thereby improving purchase accuracy and satisfaction. In addition, brands can develop an intelligent size recommendation system to recommend the most suitable size for consumers based on their body measurements and purchase histories, reducing the rate of returns and exchanges caused by improper size selections. Reducing returns and exchanges not only enhances brand reputation and customer satisfaction but also effectively reduces emissions generated during the transportation stage.

案例 Case

2021 年 11 月，作为“双 11”历史上的首次尝试，天猫上线了“绿色会场”，这是天猫首个以“绿色、低碳”为主题的购物会场。此外，天猫还携手 14 个品牌成立“绿色商家联盟”，以平台与商家的身份共同发出绿色低碳倡议，呼吁市场从更多元的维度扩大绿色低碳供给，在保障消费者品质生活的基础上，提供更丰富的“绿色产品”。

In November 2021, as the first attempt in the history of “Double 11”, Tmall launched the “Green Venue”, which is Tmall’s first shopping venue with the theme of “green and low-carbon”. In addition, Tmall also established the “Green Merchants Alliance” with 14 brands and jointly issued green and low-carbon initiatives in the capacity of platforms and merchants, calling on to expand green and low-carbon supply from more diversified dimensions, and provide richer “green products” on top of ensuring the living conditions of consumers.

绿色包装
Green Packaging

包装问题在线上购物浪潮下正在成为服装行业可持续发展的重要挑战。每年大约 1,800 亿个塑料包装袋用于服装产品的运输过程，其中，超过 90% 的塑料生产源于石油天然气等化石原料，其每年石油消耗量与整个航空部门相当 (Fashion for Good, 2019)。

The Packaging issue has become a significant challenge for the sustainable development of the apparel industry, especially in the context of the online shopping trend. Approximately 180 billion plastic packaging bags are used annually for the transportation of clothing products, with over 90% of plastic production originating from fossil fuels such as petroleum and natural gas. The annual petroleum consumption for plastic production is equivalent to that of the entire aviation sector (Fashion for Good, 2019).

通过优化产品和包装设计减少包装需求是最直截了当的做法。当前，在线订单以及供应链订单的包装层数远远超过必要的层数，减少品牌环境足迹的重要一步就是消除这部分多余的塑料 (Fashion for Good, 2019)。

The most straightforward approach to reducing packaging demands is through optimization product and packaging design. Currently, online and supply chain orders often uses far more layers of packaging than necessary, and an important step in reducing a brand's environmental footprint is to eliminate such unnecessary plastic packaging (Fashion for Good, 2019).

对于不可避免地包装，行业可以从材料来源入手，从“再生原料”和“生物原料”中寻找原生塑料的替代材料。

As for unavoidable packaging, the industry may tackle the source of materials by seeking for an alternative to virgin plastic from “recycled materials” and “bio-based materials”.

再生原料包装 Recycled raw material packaging

再生塑料存在 “分子级再生”和“材料级再生”两种工艺路线。分子级再生塑料通过化学反应将废弃塑料分子拆解成单体，再通过聚合反应重新组装成新的塑料产品。这种塑料具有与传统塑料相似的物理和化学性质 (Fashion for Good, 2019)。材料级再生塑料是将废弃塑料物理地破碎、清洗和加工成再生颗粒，然后将这些颗粒作为原材料，制造新的塑料产品 (Fashion for Good, 2019)。这种塑料通常不具备与传统塑料完全相同的性质，用于再生塑料的认证标准包括全球回收标准（GRS）和回收声明标准（RCS）。

Recycled plastics can be produced through two processes: "molecular recycling" and "material recycling." Molecular recycling breaks down discarded plastic molecules through chemical reactions into monomers, which are then reassembled through polymerization reactions to create new plastic products. This type of plastic exhibits similar physical and chemical properties to traditional plastics. Material recycling involves physically crushing, cleaning, and processing discarded plastic into recycled pellets, which are then used as raw materials to manufacture new plastic products. Material recycled plastics usually do not possess exactly the same properties as traditional plastics. Certification standards for recycled plastics include the Global Recycled Standard (GRS) and the Recycled Claim Standard (RCS) (Fashion for Good, 2019).

生物基包装 Bio-based packaging

生物基塑料是利用生物质材料（例如玉米或甘蔗）合成的塑料。与可生物降解塑料不同，生物基塑料强调原料来源是生物质材料，后者强调最终处置过程的生物可降解性。此外，纸基替代品也吸引了一些品牌的兴趣，但受限于防潮和防污表现，且存在上游毁林风险，仍有待市场的进一步验证。

Bio-based plastic is a plastic synthesized from biomass materials such as corn or sugar cane. Unlike biodegradable plastic, bio-based plastic emphasizes that it sources raw materials from biomass materials, while biodegradable plastic emphasizes the degradability of the final disposal process. In addition, paper-based alternatives have also attracted the interest of some brands, but due to the performance of moisture and pollution resistance and the risk of upstream deforestation, they need to be further verified by the market.

案例 Case

2021 年 2 月，威富宣布其旨在到 2025 年消除所有一次性塑料包装，包括塑料袋。所有非塑料包装都将减少，并来自可持续来源，且具有可重复使用或可回收设计。此外，威富的可持续包装目标还包括，到 2023 年，产品包装中的所有一次性塑料将 100% 采用可回收、生物基成分或两者的组合，到 2023 年，所有纸质包装将采用可回收成分、第三方认证的原始成分或两者的组合，威富还将致力于在行业联盟和政策倡议中发挥领导作用，以建立循环包装基础设施，使其能够实现 2025 年的承诺。

In February 2021, VFC announced its intention to eliminate all disposable plastic packaging, including plastic bags, by 2025. Apart from reducing the usage of non-plastic packaging, all non-plastic packaging will come from sustainable sources and adopt a reusable or recyclable design. In addition, one of VFC's sustainable packaging goals is that all disposable plastics in product packaging will be made entirely of recyclable or bio-based ingredients or a combination of both by 2023, and all paper packaging will feature recycled content, third-party certified virgin ingredients or a combination of both by 2023. VFC also endeavors to play a leadership role in industry alliances and policy initiatives to build a circular packaging infrastructure that will enable it to meet its 2025 commitments.

案例 Case

波司登尽量减小包装材料对环境的影响，其采取的行动包括：

Bosideng minimizes the impact of packaging materials on the environment and takes actions including:

- 在库内流转环节对纸箱和塑料周转箱进行重复利用；

  Reuse of cartons and plastic turnover boxes in the circulation stage in the warehouse;

- 上线自动纸盒包装机，优化包装和装载效率，避免使用打包带和封箱胶带；

  On-line automatic carton packer to optimize packaging and loading efficiency, and avoid the use of packing tape and sealing tape;

- 提高使用纸质包装的比例，减少使用塑料气泡袋；

  Increase the use of paper packaging and reduce the use of plastic bubble bags;

- 使用可重复利用和 / 或二次回收的包装，例如生产环节的纸箱经过拆零后用于销售环节的包装。

  Use reusable and/or secondary packaging such as the packaging of cartons in the production process after being dismantled for sales process.

旧物回收
Obsolete Items Recycling

循环经济为消费品牌带来了巨大的机遇和挑战。在电子消费市场，旧物回收已经被证明能在商业层面和环境层面实现“双赢”。伴随服装行业消费升级和产业升级，拥抱循环经济，利用旧衣回收提升营销效率、降低行业碳足迹的可行性值得探索。

The circular economy presents great opportunities and challenges for consumer brands. In the consumer electronics market, the recycling of old products has proven to be a "win-win" solution both commercially and environmentally. With the upgrading of consumption and industry in the fashion sector, embracing the circular economy and exploring the feasibility of utilizing clothing recycling to enhance marketing efficiency and reduce the industry's carbon footprint is worth exploring.

延展用户关系
Strengthening customer relationship

品牌对创建废旧衣物回收及资源化利用模式具有积极的带动和促进作用，在此过程中，提高消费者的亲密感和忠诚度的潜力是巨大的。营销人员需要放弃传统的“线性”思维方式，从接受制造浪费模式转变为基于再利用的模式。

Brands play a positive role in creating models for the recycling and resource utilization of old garments, and there is enormous potential to enhance consumer intimacy and loyalty in this process. Brands need to abandon traditional "linear" thinking and shift from a waste-based manufacturing model to a reuse-based model.

创造二次销售
Creating secondary sales

羽绒服品牌可尝试结合零售渠道，联合合作伙伴共同搭建羽绒产品回收体系。同时，通过旧衣回收返还新衣购物抵用券、推出与回收相关的新品等消费者激励机制，品牌可以创造新的营销机会。

Down apparel brands can collaborate with retail channels and partners to establish a recycling system for down products. Furthermore, by offering incentives such as voucher rewards for recycling old clothes and launching new products related to recycling, brands can create new marketing opportunities.

探索逆向物流
Exploring reverse logistics

相比其他品类，羽绒产品具有更高的回收价值及回收潜力。除线下渠道外，品牌还应尝试与电商平台、物流服务商合作，打造经济可行的“逆向物流”模式，持续回收羽绒产品，同时对包装进行回收利用，避免产品处置阶段的碳排放。

Compared with other product categories, down products have higher recycling value and potential. Apart from offline channels, brands should also consider collaborating with e-commerce platforms and logistics service providers to develop economically viable "reverse logistics" models. This allows ongoing collection of down products and recycling of packaging, thereby avoiding carbon emissions in the disposal stage.

案例 Case

日本的羽绒回收体系“绿色羽绒项目”（Green Down Project）已运行多年，该项目旨在通过回收羽绒来利用有限的资源。为此，日本在全国建立了大量收集点，含绒量在 50% 或以上的羽绒服产品都可以被回收。该项目还构建了以残疾人为核心的羽绒回收体系，为残疾人创造了就业机会。

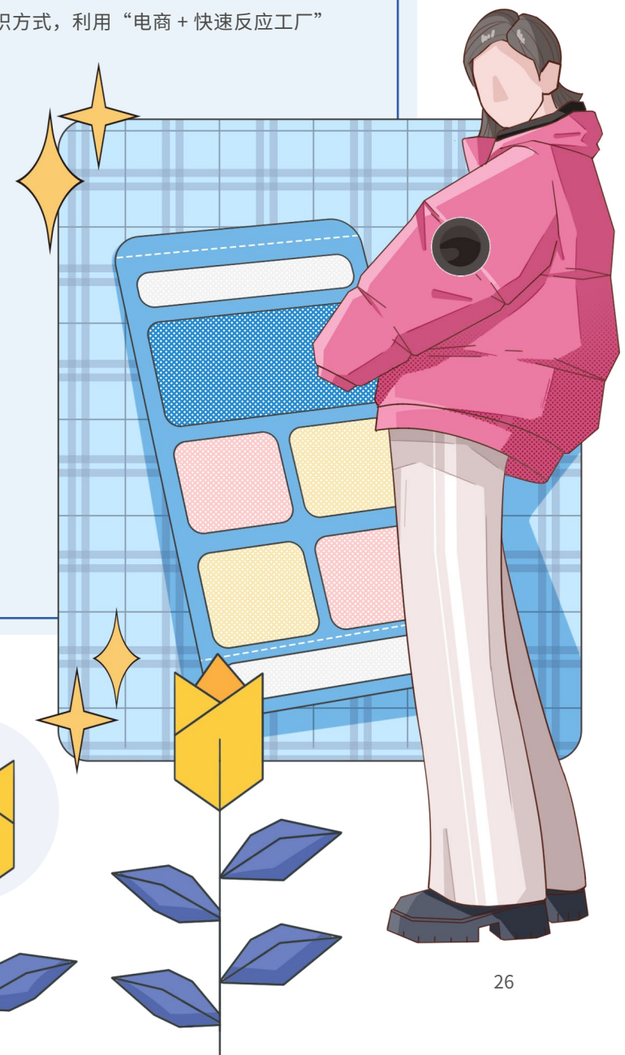
Japan’s down recycling system, the Green Down Project, has been running for many years, which aims to utilize limited resources by recycling down. To this end, Japan has established a large number of collection points throughout the country, and down apparel products with a down content of 50% or above can be recycled. The project also built a down recycling system with the handicapped at its core, creating employment opportunities for them.

提高流通效率
Increasing Circulation Efficiency

柔性生产
Flexible Production

服装行业一个经常被忽视但又很重要的问题是生产过剩。服装行业尚未摆脱传统的”规模化代加工 + 库存 + 分销”模式。当务之急，服装企业应着力解决设计和制造过程冗长导致的低效问题——产品的开发和营销周期长，品牌难以对准确的市场需求作出精确判断，加之部分制造商还在订单方面设有最低门槛，超额订购很多时候成为品牌“迫不得已”的选择。用户大数据和智能制造的结合，有望变革服装行业生产组织方式，利用“电商 + 快速反应工厂”模式提升效率。

An often overlooked but important problem in the apparel industry is overproduction. Currently, many clothing companies still follow the traditional model of "mass production + inventory + distribution," leading to lengthy design and manufacturing processes, long product development and marketing cycles, and difficulties for brands in accurately gauging market demand. Additionally, some manufacturers have minimum order requirement, forcing brands to over-order. To address this problem, the industry needs to focus on tackling inefficiencies and transforming production mode through the integration of big data and intelligent manufacturing, adopting an "e-commerce + quick-response manufacturing" model to improve efficiency.



例如，通过对门店进行数字化管理，配合实时监控销售数据和消费者反馈有助于优化供应链的生产和库存管理，提高供应链效率和响应速度。数字化门店还能通过了解消费者需求和购买行为，帮助制造商进行产品迭代和生产优化，以满足消费者需求，并提高产品质量和生产效率。

For example, digitalizing store management and utilizing real-time monitoring of sales data and consumer feedback can help optimize production and inventory management in the supply chain, thereby enhancing supply chain efficiency and responsiveness. Digital stores can also help manufacturers carry out product iteration and production optimization by understanding consumer needs and purchasing behaviors, thereby meeting consumer needs and improve product quality and production efficiency.

定制化生产也可以在一定程度上改变现状。通过这种模式，品牌不再需要预选生产和储存产品，因为只有在客户下订单后才开始生产，这也需要品牌对生产环节拥有更多的控制。此外，限时发布限量版商品的“drop”式上新也可以作为一种缓解办法，其保证了商品既不会生产过剩，也能让消费者对品牌产品总是抱有新鲜感。

Customized production can also help change the current situation to some extent. With this model, brands no longer need to pre-produce and store products, as production only starts after customers place orders, which requires brands to have greater control over the production process. In addition, the limited-time release of limited-edition products through a "drop" model can serve as a mitigation measure, ensuring that there is neither overproduction nor a lack of novelty for consumers regarding the brand's products.

案例 Case

波司登早在 2010 年就开始引入智能化生产装备。公司采用“总体规划、分步实施、持续迭代”的方法，持续推进智能制造工厂建设，并建立了智能化管理平台。从 2018 年起，波司登的快反供应占比超过 60%，首批则生产订单量的不到 40% 用于渠道铺货，剩余部分根据销售情况来快速补货。这一模式可实现单季度下单 6 至 8 次，两周内完成生产并交付市场。2022 年波司登更是向 Top 款敏捷极速供应模式突破，首次提出将 Top 款捕获可得率提升至 99% 的高挑战目标，及时针对市场销售情况做出敏捷反馈。

Bosideng began to introduce intelligent production equipment as early as 2010. It continuously promoted the construction of intelligent manufacturing factories by way of “overall planning, step-by-step implementation and continuous iteration”, and established an intelligent management platform. Since 2018, Bosideng’s responsive supply accounted for more than 60%, and less than 40% of its first batch of production orders was used for channel distribution, and the rest was quickly replenished according to sales. This model enables 6 to 8 orders per quarter, and production and delivery to the market within two weeks. In 2022, Bosideng made a breakthrough to the Top Sellers immediate supply model, which put forward the challenging target of increasing the availability rate of replenishment of the Top Sellers to 99% for the first time, achieving agile feedback on the market sales in a timely manner.

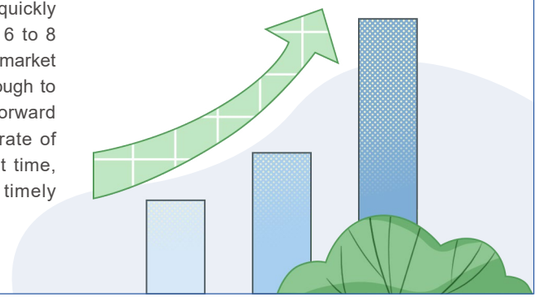
到 2018 年，波司登的快反供应占比超过

60%

By 2018, Bosideng’s responsive supply accounted for more than **60%**

实现了首批仅生产订单量 **40%** 用于渠道铺货

and only **40%** of its first batch of production orders was used for channel distribution



高效流通
Efficient Circulation

商品分销的挑战在于准确地在消费者需要的时间和地点提供需要的商品。精确的需求预测和基于人工智能的解决方案可以实现高效的仓库规划，并确保在工厂、仓库和商店之间采用最高效的运输路线——在此过程中减少二氧化碳排放。此外，准确预测客户需求可以最大限度地减少商店之间不必要的库存转移。由于交通运输业排放了全球大约五分之一的温室气体，这也会对羽绒服行业的碳足迹产生重要影响。

The challenge of product distribution is to deliver exactly what consumers need, when and where they need them. Accurate demand forecasting and AI-based solutions enable efficient warehouse planning and ensure the most efficient transport route between factories, warehouses and stores – reducing GHG emissions in the process. In addition, accurately predicting customer demands minimize unnecessary inventory transfers between locations. Since the transportation sector accounts for approximately one-fifth of the global GHG emissions, this will have a significant impact on the industry’s carbon footprint.

品牌还可以通过其他措施进一步展示其气候领导力。在仓库层面，可以打造低碳物流园区，广泛采用新能源设备，实现园区全面电气化，并在园区仓库屋顶铺设光伏发电设备，逐步提高可再生能源利用比例。在物流层面，推行绿色配送，在技术可行的情况下使用电动物流。同时，寻找可以提供智能供应链绿色解决方案的合作伙伴，共同打造智能供应链综合服务平台。

Brands can further demonstrate their climate leadership through other measures. At the warehouse level, building low-carbon logistics centers through adopting renewable energy equipment, increasing electrification rate, and installing PV power generation equipment on the warehouse roof to gradually increase the use of renewable energy. At the logistics level, implementing green delivery and utilizing electric logistics whenever technically feasible. Additionally, seeking partnerships with providers of green supply chain solutions to jointly build comprehensive intelligent supply chain service platforms.

案例 Case

2020 年 12 月，波司登上线了数据中台并实现了全渠道数据一体化运营，成为中国服装业阶段性完成全面智能改造的先锋制造企业。该中台以数据赋能全业务链条，沉淀了四大业务模型——商渠匹配、智能销量预测、库存一体化、产销协同。通过整合分散在各地仓库与门店的线上线下数据，再进行结构化梳理，波司登可基于大数据展开智能营销与按需定制，在超 1,300 家门店实现了精细化的商渠匹配。

In December 2020, Bosideng launched a data center and realized comprehensive channel data integrated operation, becoming a pioneer manufacturer that has completed a comprehensive intelligent transformation in Chinese garment industry in stages. The center empowers the whole business chain with data, and precipitates four major business models: business channel matching, intelligent sales forecasting, inventory integration, and production and marketing coordination. By integrating online and offline data of warehouses and stores of various regions, and then structuring it, Bosideng can carry out intelligent marketing and on-demand customization based on big data, achieving refined business channel matching in more than 1,300 stores.

02

迈向净零排放：推动工艺环节脱碳

Towards Net Zero: Driving Decarbonization in the Manufacturing Process

价值链上游的碳排放是羽绒服行业碳足迹的主要来源，也是实现价值链脱碳的重点。本节根据行业上游运营的排放特征，介绍了不同层级的供应商的潜在脱碳路径。鉴于行业价值链主要由买方驱动，价值链上游的减排责任不应该仅是供应商自身的，工艺环节脱碳愿景的实现将依赖品牌和供应商的共同努力。

The carbon emissions in the upstream of the value chain are the main source of carbon footprint in the down apparel industry and a key focus for decarbonizing the value chain. This chapter introduces potential decarbonization pathways for suppliers at different tiers based on the emission characteristics of upstream operations in the industry. Given that the industry value chain is mainly driven by buyers, the responsibility for reducing emissions in the upstream should not solely rest on the suppliers themselves. Delivering the decarbonization target in the manufacturing process will require joint efforts from both brands and suppliers.

扩大低碳材料使用
Scaling the Use of Low-carbon Materials

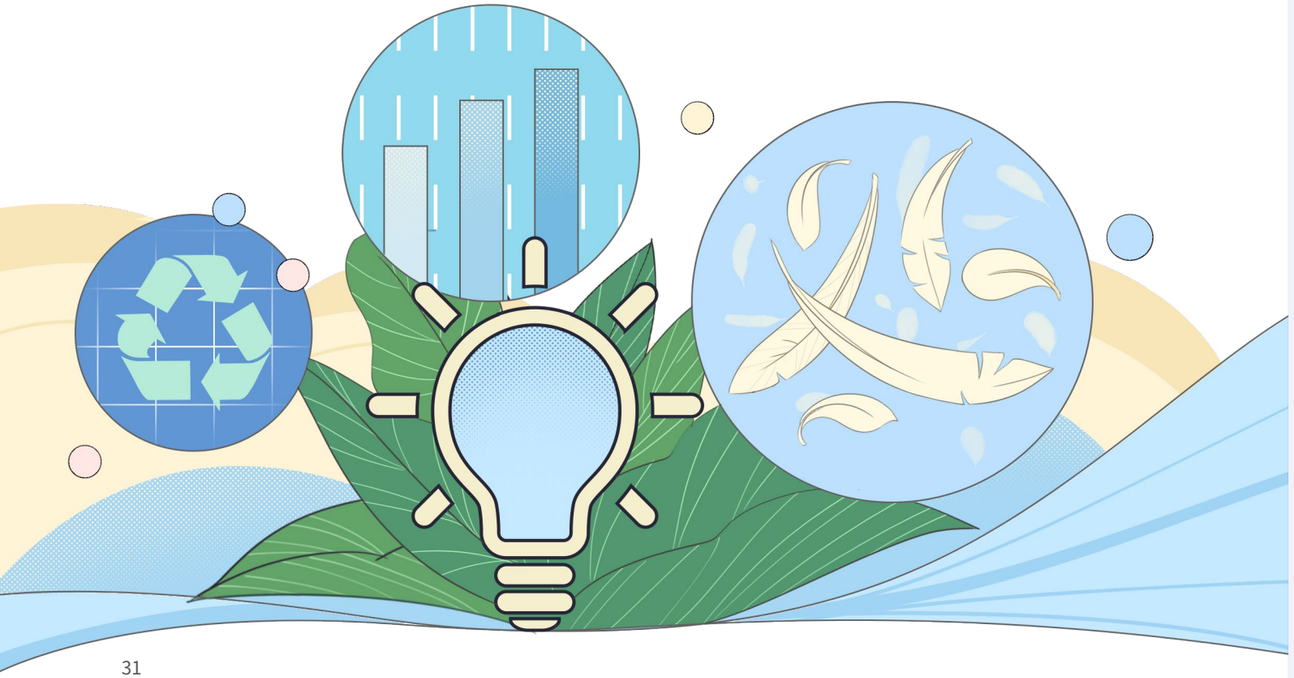
增加低碳 / 优选材料的使用是减少原材料排放的关键。纺织品交易所（Textile Exchange）将优选材料定义为“通过整体方法转变原料纤维和材料生产系统，为气候、自然和人类带来持续的有益成果和影响的原料纤维或材料”(Textile Exchange, 2022)。优选材料通常都经过了某种形式的外部标准认证，以确保其声称的环境和 / 或社会效益。本小节介绍了羽绒服行业的三种关键材料的现状。

Increasing the use of low-carbon/preferred materials is key to reducing emissions from raw materials. Textile Exchange defines preferred materials as “a fiber or raw material that delivers consistently reduced impacts and increased benefits for climate, nature, and people against the conventional equivalent, through a holistic approach to transforming production systems” (Textile Exchange, 2022). Preferred materials are often certified to some form of external standard to ensure their claimed environmental and/or social benefits. This section describes the current status of three key materials in the down apparel industry

羽绒
Down

羽绒是鹅、鸭、鸟等禽类的毛绒层，经过采集和加工后可以制成各种羽绒制品。在现代经济中，羽绒通常是禽类养殖的副产品 (IDFB, 2019)。在一定程度上，羽绒的使用可被视为循环经济的一部分，其不仅减少了食品行业的环境足迹，也为服装行业提供了低碳的生物基原料。

Down is the down layer of geese, ducks, birds and other poultry, which can be made into various down products after collection and processing. In the modern economy, down is often a by-product of poultry farming (IDFB, 2019). To some extent, the use of down can be seen as part of the circular economy, which not only reduces the environment footprint of the food industry, but also provides the apparel industry with low-carbon bio-based raw materials.



原生羽绒
Virgin down

全球羽绒原料市场高度分散，有许多中小型生产商。羽绒服行业对动物福祉的关注带动了羽绒标准的制定，包括负责任羽绒标准（RDS）和 Downpass (Textile Exchange, 2022)。这些标准旨在杜绝强迫喂食、活拔羽绒等行为，并关注更广泛的动物福利（取决于标准）。

The global down materials market is highly fragmented with many small and medium-sized producers. The down apparel industry’s concern about animal well-being has led to the formulation of down standards, including the Responsible Down Standard (RDS) and Downpass (Textile Exchange, 2022). These standards aim to eliminate activities such as forced feeding and plucking down live, and focus on broader animal welfare (depending on the criteria).

中国是羽绒的最大生产国，产量约占全球羽绒产量 60% (Textile Exchange, 2022)。2021 年全球天然羽绒产量约为 565,000 吨，其中 RDS 和 Downpass 认证的羽绒产量约为 18,000 吨和 7,000 吨，相当于 2021 年羽绒总产量的 3.2% 和 1.2% (Textile Exchange, 2022)。RDS 认证羽绒的主要产地为中国，2021 年中国 RDS 认证羽绒产量近 15,000 吨，占全球 RDS 认证羽绒产量的约 83.5% (Textile Exchange, 2022)。

China is the largest producer of down, producing about 60% of global down (Textile Exchange, 2022). Global natural down production in 2021 was approximately 565,000 tons, of which RDS and Downpass certified down production was approximately 18,000 tons and 7,000 tons, equivalent to 3.2% and 1.2% of total down production in 2021 (Textile Exchange, 2022). China is the major producer of RDS certified down, with a total production of nearly 15,000 tons in 2021, accounting for about 83.5% of the global production of RDS certified down (Textile Exchange, 2022).

再生羽绒材料
Recycled down

羽绒作为天然纤维，经过再次水洗加工，高温烘干，消毒灭菌等工序，仍能保持原有的特性，具有很高的应用价值 (史晓菲 , 2022)。2021 年，全球回收羽绒的产量约为 5,580 吨，约为全球羽绒产量的 1.0% (Textile Exchange, 2022)。用于回收羽绒的标准包括回收声明标准（RCS）和全球回收标准（GRS）。中国羽绒工业协会近期也在积极推动再生羽绒羽毛的管理规范制定工作 (中国羽绒信息网 , 2022)。

As a natural fiber, down can still maintain its original characteristics after re-washing processing, high-temperature drying, disinfection and sterilization, and has high application value (Shi Xiaofei, 2022). In 2021, global recycled down production was approximately 5,580 tons, accounting for approximately 1.0% of global down production (Textile Exchange, 2022). Standards for down recycle include the Recycling Claimed Standard (RCS) and the Global Recycling Standard (GRS). The China Feather and Down Industrial Association has also been actively promoting the formulation of management standards for recycled down and feathers recently (cfd.com.cn, 2022).

涤纶
Polyester

涤纶，也称聚酯纤维，是一种合成纤维，由聚酯化合物制成。涤纶具有高强度、高韧性、耐用性、可清洁性等特点，因此广泛用于羽绒服产品的外层材料。2021 年，全球涤纶产量约为 6,100 万吨，约占全球纤维产量总市场份额的 54% (Textile Exchange, 2022)。目前涤纶工业生产主要利用石油原料，每年约有 7,000 万桶石油用于服装中涤纶的制造 (Textile Exchange, 2022)。

Polyester, or polyester fiber, is a synthetic fiber made from polyester compounds. Polyester has the characteristics of high strength, excellent toughness, durability, cleanability, etc., and is therefore widely used as the outer material of down apparel products. In 2021, global polyester production was approximately 61 million tons, accounting for about 54% of the total global fiber production market share (Textile Exchange, 2022). At present, polyester is mainly produced industrially from petroleum feedstocks, and about 70 million barrels of oil are used every year to manufacture polyester in clothing (Textile Exchange, 2022).

使用再生涤纶和生物基涤纶是减少涤纶材料气候影响的主要途径。

Using recycled polyester and bio-based polyester is a major way to reduce the climate impact of polyester materials.

2021 年，全球涤纶产量约为

6,100

万吨

In 2021,
global polyester production was approximately

61

million tons

每年约有

7,000

万桶石油用于服装中涤纶的制造

about

70

million barrels of oil are used every year to manufacture polyester in clothing

再生涤纶
Recycled polyester

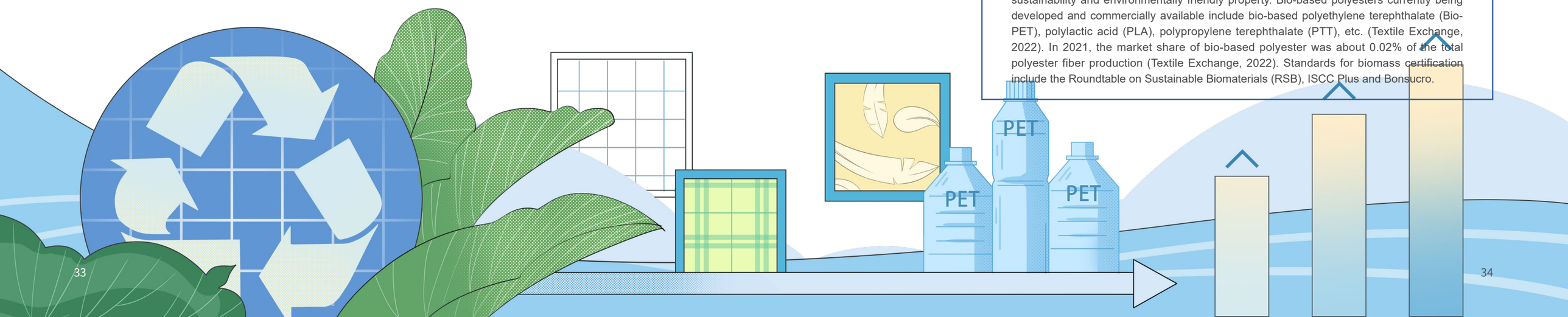
再生涤纶是一种可持续性较高的纤维材料，它主要由废弃的聚酯塑料制成。相比于原生涤纶，再生涤纶的碳足迹较小，因为再生涤纶的生产过程避免了石化原料的消耗以及处置阶段的固体废弃物的焚烧。目前，再生涤纶的生产主要依赖于废弃的 PET 塑料瓶，这约占再生涤纶产量的 99% ，其余的再生涤纶来自其他消费后塑料，如海洋垃圾、废弃纺织品和织物废料等（Textile Exchange, 2022）。全球再生涤纶的产量在 2021 年约为 900 万吨（Textile Exchange, 2022）。用于确保再生涤纶的可持续性的主要标准包括全球回收标准（GRS）和回收声明标准（RCS）。

Recycled polyester is a more sustainable fiber material made primarily from waste polyester plastic. Compared to virgin polyester, recycled polyester has a smaller carbon footprint because the production process of recycled polyester avoids the consumption of petrochemical feedstocks and the incineration of solid waste in the disposal stage. Currently, the production of recycled polyester mainly relies on waste PET plastic bottles, accounting for about 99% of recycled polyester production, and the rest of recycled polyester is from other post-consumed plastic, such as marine litter, waste textiles, fabric waste, etc. (Textile Exchange, 2022). In 2021, global recycled polyester production was around 9 million tons (Textile Exchange, 2022). The main standards used to ensure the sustainability of recycled polyester include the Global Recycling Standard (GRS) and the Recycling Claimed Standard (RCS).

生物基涤纶
Bio-based polyester

生物基涤纶是一种可调节的聚酯材料，它使用可再生原料（如农作物或生物废物）作为原料，具有广泛的应用领域。近年来，由于其可持续性和环保性，生物基涤纶受到越来越多的关注。目前正在开发和可用于商业用途的生物基涤纶包括生物基聚对苯二甲酸乙二醇酯（Bio-PET）、聚乳酸（PLA）、聚对苯二甲酸丙二醇酯（PTT）等 (Textile Exchange, 2022)。2021 年，生物基涤纶的市场份额约为涤纶纤维总产量的 0.02% (Textile Exchange, 2022)。生物质认证的标准包括可持续生物材料圆桌会议 (RSB)、ISCC Plus 和 Bonsucro。

Bio-based polyester is an adjustable polyester material using renewable feedstocks, such as crops or biological waste, as raw materials, and has a wide range of applications. In recent years, bio-based polyester has attracted more and more attention due to its sustainability and environmentally friendly property. Bio-based polyesters currently being developed and commercially available include bio-based polyethylene terephthalate (Bio-PET), polylactic acid (PLA), polypropylene terephthalate (PTT), etc. (Textile Exchange, 2022). In 2021, the market share of bio-based polyester was about 0.02% of the total polyester fiber production (Textile Exchange, 2022). Standards for biomass certification include the Roundtable on Sustainable Biomaterials (RSB), ISCC Plus and Bonsucro.



锦纶
Nylon

锦纶是羽绒服外层材料中另一种重要的合成纤维。2021 年，全球锦纶产量约为 590 万吨，约占全球纤维总市场份额的 5% (Textile Exchange, 2022)。锦纶与涤纶类似，目前生产依赖于石油原料。

Nylon is another important synthetic fiber for the outer material of down apparel. In 2021, global nylon production was about 5.9 million tons, accounting for about 5% of the total global fiber market share (Textile Exchange, 2022). Similar to polyester, nylon production currently relies on petroleum feedstocks.

再生锦纶
Recycled nylon

再生锦纶是利用再生基材生产的一种合成纤维，主要来源于消费前或消费后的废物。这些废物包括加工废料、织物边角料、硬质聚酰胺废料、废弃渔网、地毯或其他使用过的纺织品等（Textile Exchange, 2022)。然而，再生锦纶的市场份额仍然很低，仅占 2021 年所有锦纶纤维产量的 1.9%，这主要是由于技术挑战、原材料质量和可用性相关的限制以及化石基锦纶的低价造成的 (Textile Exchange, 2022)。用于再生锦纶的主要标准包括全球回收标准（GRS）和回收声明标准（RCS）。

Recycled nylon is a synthetic fiber produced from recycled substrate, mainly pre-consumed or post-consumed wastes. These wastes include processing waste, fabric scraps, hard polyamide waste, discarded fishing nets, carpets or other used textiles (Textile Exchange, 2022). However, the market share of recycled nylon remains low, accounting for only 1.9% of all nylon fiber production in 2021, primarily due to technical challenges, limitations related to raw material quality and availability, and low prices of fossil-based nylon (Textile Exchange, 2022). The main standards used for recycled nylon include the Global Recycling Standard (GRS) and the Recycling Claimed Standard (RCS).

生物基锦纶
Bio-based nylon

与生物基涤纶情况类似，2021 年，全球生物基锦纶纤维产量约为 20 万吨，仅占锦纶纤维市场的 0.4%（Textile Exchange, 2022)。

Similar to the situation of bio-based polyester, global bio-based nylon fiber production was around 0.2 million tons in 2021, accounting for only 0.4% of nylon fiber market (Textile Exchange, 2022).

案例 Case

- 2022 财年，**波司登**使用的 100% 羽绒都通过了 RDS 认证。

  In the financial year of 2022, 100% of the down that **Bosideng** uses passed RDS certification.

- 2022 财年，**加拿大鹅**的 99.8% 羽绒为 RDS 羽绒，0.2% 羽绒为再生羽绒；并承诺到 2025 年 90% 的原材料来自优选材料（PFMs）。

  In the financial year of 2022, **Canada Goose**'s 99.8% down was RDS down and 0.2% of its down was recycled down; it promised to sourcing 90% of its raw materials from Preferred Fibers or Materials (PFMs).

- 2022 财年，**威富**采购的 100% 羽绒都符合 RDS 标准，并承诺到 2026 财年 50% 涤纶来自再生材料。

  In the financial year of 2022, **VFC** sourced 100% of its down which complies with RDS standard, and promised to sourcing 50% of nylon from recycled materials by the financial year of 2026.

最大化能源效率
Maximizing Energy Efficiency

提高能源利用效率是任何减排战略的重要组成部分，其通常可以以相对较低的投资和较高的投资回报率带来显著的节约。能源效率的减排潜力因设施规模、层级和计划而异。据统计，使用当前技术可以节省的能源平均占总能源使用量的 15% (Fashion for Good & Apparel Impact Institute, 2021)。因此，在当今的制造环境中，能效投资是一项合理的商业战略。表 1 列出了一些潜在的能效项目的例子。

Improving energy efficiency is an essential component of any emission reduction strategy, as it can typically lead to significant savings with relatively low investment and high return on investment. While the emission reduction potential of energy efficiency varies by facility size, tier, and program, it is estimated that energy savings with current technology can account for an average of 15% of total energy consumption (Fashion for Good & Apparel Impact Institute, 2021). Therefore, energy efficiency investment is a rationale business strategy in today's manufacturing environment. Table 1 lists some examples of potential energy efficiency projects.

表 1：潜在能效项目举例
Table 2: Examples of Potential Energy Efficiency Projects

照明效率 Lighting efficiency	用 LED 灯代替荧光灯 安装运动传感器以优化灯光的开 / 关时间 安装额外的灯开关以实现更好的分区控制 Replacing fluorescent lamps with LED lights Installation of motion sensors to optimize light on/off time Installation of additional light switches for better zoning control
空气压缩机 Air compressor	通过将热废气转移到室外来降低进入空气压缩机的入口空气温度 优化压缩空气分配管路系统 引入定期压缩空气泄漏检查程序 The air temperature at the inlet of the air compressor is reduced by transferring the hot exhaust gas to the outside Optimization of compressed air distribution piping systems Introduction of regular compressed air leak inspection procedures
锅炉 / 热力 Boiler/heat	在冷凝水管上安装疏水阀以限制熨烫过程的蒸汽流量 安装用于废气热回收的省煤器 锅炉或油加热器的空燃比优化 Installation of traps on condensate pipes to limit steam flow during the ironing process Installation of economizers for exhaust gas heat recovery Air/fuel ratio optimization for boilers or oil heaters

然而，由于缺乏关于如何执行能源效率措施的资料，许多即使是具有成本效益的方案也往往没有实施，特别是考虑到大多数纺织厂作为中小型企业获得这种资料的资源有限，因此，建议品牌编制和向纺织厂传播关于能源效率技术和做法的专门知识，促进羽绒服行业的能源高效利用。

However, due to the lack of information on how to implement energy efficiency measures, many of the cost-effective programs are often not materialized, especially given that most textile factories, as small to medium-sized enterprises, have limited resources to access such information. Therefore, brands are recommended to develop instructions on the best practices of energy efficiency technologies and disseminate it to textile factories to promote the efficient use of energy in the down apparel industry.

案例 Case

阿迪达斯拥有一个稳健的环境项目来指导并支持其供应商减少环境足迹。为帮助其供应商了解潜在的节能减排机会，阿迪达斯在 2018 年发布了环境良好实践指南及工具。在该指南中，阿迪达斯根据供应商类型，提供了常见的能效改造项目，并列出了潜在的投资和回报。该行动也在很大程度上推动了阿迪达斯自身可持续发展目标的实现。

Adidas has a robust environmental program to guide and support its suppliers in reducing their environment footprint. To help its suppliers understand potential energy conservation and emission reduction opportunities, Adidas published environmental good practice guidelines and tools in 2018. In the guidelines, Adidas provides a list of common energy efficiency retrofit projects based on vendor type, as well as potential investments and returns. This action has also contributed significantly to the achievement of Adidas' own sustainable development goals.

煤炭淘汰和工艺革新
Eliminating Coal and Exploring Manufacturing Process Innovation

服装行业供应链的很大一部分（主要为二级供应商）依赖热能进行加工，例如染色和整理过程。据估计，热能可占二级供应商能源消耗的 75%-90%，且主要通过燃煤（发展中国家）提供，是价值链最主要的排放源之一 (Fashion for Good & Apparel Impact Institute, 2021; UNFCCC, 2020)。

A large portion of the apparel industry's supply chain, mainly tier-2 suppliers, relies on thermal energy for processing, such as dyeing and finishing. It is estimated that thermal energy accounts for 75-90% of the energy consumption of tier-2 suppliers and is primarily sourced from coal combustion (in developing countries), making it one of the major sources of emissions along the value chain (Fashion for Good & Apparel Impact Institute, 2021; UNFCCC, 2020).

行业应尽快推动非燃煤供热技术应用，其中“燃料脱碳”和“再电气化”是减少煤炭消耗的有效手段。中国纺织工业联合会于 2021 年也提出“十四五”期间纺织行业应进一步提高二次能源占比 (中国纺织工业联合会 , 2021)，国际能源署（IEA）同样预测包括纺织行业在内的轻工业将主要通过“电气化 + 可再生电力”实现净零排放 (IEA, 2021)。

The industry should actively promote the application of non-coal heating technology. In particular, “fuel decarbonization” and “electrification” are effective measures to reduce coal consumption. The China National Textile and Apparel Council also proposed an increase in the proportion of secondary energy sources during the “14th Five-Year Plan” period in 2021. The International Energy Agency (IEA) similarly predicts that light industries, including the textile sector, will achieve net-zero emissions mainly through electrification and renewable electricity (IEA, 2021).

燃料脱碳 Fuel decarbonization

短期内，通过“煤改气”，即利用天然气锅炉或天然气热电联产供热替代燃煤锅炉供热是技术最成熟的方案，在许多天然气价格低廉的地区也具有经济性。尽管天然气仍属于化石燃料，但其被认为是向可再生能源系统转型的过渡燃料，在相同条件下，天然气提供同等热量的碳排放比煤炭低 50%-60%。

In the short term, "coal-to-gas" conversion, which involves using natural gas boilers or combined heat and power (CHP) systems fueled by natural gas, is the most mature and economically viable solution, especially in regions with low-cost natural gas. Although natural gas is still a fossil fuel, it is considered a transitional fuel towards renewable energy systems. Under similar conditions, natural gas emits 50%-60% less carbon compared to coal while providing an equivalent amount of heat.

电气化 Electrification

供热设备电气化是中低温热力中长期脱碳的主要途径之一。常见的电气化技术包括电热锅炉和热泵技术。其中，热泵技术通过电力驱动制冷剂在低温环境中吸收热量，再在高温环境中释放热量，通常可以实现超过 1.5 的性能系数（COP），这使得该技术在使电力成本与天然气或煤炭相比具有竞争力的背景下非常有吸引力。目前，高温热泵技术正在纺织行业开展应用试点 (Zuberi et al., 2023)，预计未来将具有巨大的应用潜力。

Electrifying heating equipment is one of the main pathways for medium- to long-term decarbonization of low- to medium-temperature heat. Common electrification technologies include electric boilers and heat pump systems. Heat pump technology, in particular, uses electricity to drive refrigerants to absorb heat in low-temperature environments and release heat in high-temperature environments, which allows heat pump to achieve a coefficient of performance (COP) of over 1.5, making this technology highly attractive in terms of cost competitiveness compared to natural gas or coal. At present, high-temperature heat pump technology is being piloted in the textile industry (Zuberi et al., 2023), and is expected to have great application potential in the future.

另一个值得关注的方向是通过干法加工避免热力需求。在传统的湿法工艺中，预处理、染色、印花和整理步骤都在一个非常大的水浴中进行，水浴中充满了需要持续保持高温的水，这是湿法工艺碳排放量较高的根本原因。 因此，从湿法工艺转向需要很少或不需要水的干法工艺可以大幅减少能源消耗 (Fashion for Good, 2022)。 2022 年 6 月，Fashion for Good 启动了 D(R)YE Factory of the Future 项目，汇集了纺织品预处理和染色方面的多项创新，旨在加速从湿法加工向干法加工的转变 (Fashion for Good, 2022)。据估计，选定的创新有可能减少此阶段高达 89% 的排放量（Fashion for Good, 2022)。

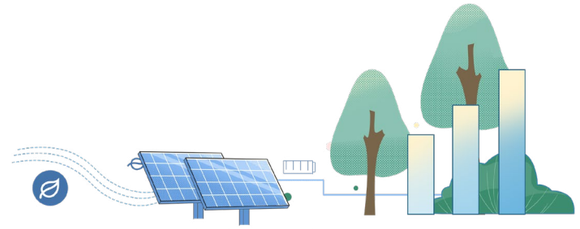
Another direction worth attention is to avoid heat demand through dry processing. In the conventional wet process, pretreatment, dyeing, printing and finishing are carried out in a huge tank filled with hot water. This is the root cause of the high carbon emissions associated with wet processing. Therefore, transitioning from wet processing to dry processing, which requires minimal or no water, can significantly reduce energy consumption (Fashion for Good, 2022). In June 2022, Fashion for Good launched the D(R)YE Factory of the Future project, which brings together several innovations in textile pretreatment and dyeing to accelerate the transition from wet to dry processing (Fashion for Good, 2022). It is estimated that selected innovations have the potential to reduce emissions by up to 89% at this stage (Fashion for Good, 2022).

案例 Case

波司登始终致力于促进上游工厂的燃料低碳化和用能电气化。自 2013 年起，波司登开始对上游工厂进行调查评估，为供应商逐步淘汰燃煤设备提供策略指导和技术支持，并在 2017 年帮助淘汰更新了全部必要的燃煤锅炉和电动机。该项目自启动以来累计节省能源消耗超 4,500 兆瓦时。

Bosideng has always been committed to promoting the decarbonization of fuels and the electrification of energy in upstream factories. Since 2013, Bosideng has been conducting surveys and evaluations of upstream factories, providing strategic guidance and technical support for suppliers to phase out coal-fired equipment, and helped phase out all necessary coal-fired boilers and electric motors in 2017. Since its launch, the project has reduced more than 4,500 MWh of energy consumption.

转向可再生能源电力
Switching to Renewable Electricity



转向可再生电力是实现服装行业脱碳的关键。具体而言，利用可再生电力对供应链不同层级的影响不同：一级和三级供应商的用能结构以电力为主，使用可再生电力可以实现快速脱碳；二级供应商的能源消费以热力为主，随着供热电气化技术的成熟和成本下降，可再生电力带来的减排潜力将逐步增长（Science Based Targets & World Resources Institute, 2019; World Resources Institute & Apparel Impact Institute, 2021)。表 2 总结了企业获取可再生电力的不同机制。

Deploying renewable electricity is key to decarbonizing the fashion industry. Specifically, the impact of renewable electricity varies depending on supply chain tiers: the energy consumption of tier-1 and tier-3 suppliers is dominated by electricity, and the use of renewable electricity will facilitate rapid decarbonization; the energy consumption of tier-2 suppliers today is mainly heat, but as heating electrification technologies mature and costs fall, the emission reduction potential from renewable electricity will increase (Science Based Targets & World Resources Institute, 2019; World Resources Institute & Apparel Impact Institute, 2021). Table 2 summarizes the main renewable electricity procurement mechanisms in China.

表 2：中国绿电采购模式 (落基山研究所 , 2022)
Table 2: Procurement Mechanisms of Renewable Electricity in China (Rocky Mountain Institute, 2022)

机制 Mechanism	描述 Description
可再生能源电力中长期交易（直购电） Medium and long-term trading of renewable energy electricity (direct purchased electricity)	可再生能源发电企业与企业用户（或由售电公司代理）之间签订的购售电合同 Electricity Purchase and Sales Contract signed by and between renewable energy generation corporations and corporate users or on behalf of power agents
绿色电力证书（绿证） Green Power Certificate (Green Certificate)	由国家可再生能源信息管理中心针对每兆瓦时非水可再生能源上网电量颁发的证书，用以证明环境属性和绿色电力消费 A certificate issued by the National Renewable Energy Information Management Centre for each MWh of non-hydro renewable energy on-grid electricity to prove environmental attributes and green electricity consumption
分布式市场化交易（隔墙售电） Distributed market-oriented transactions (electricity sales nearby)	企业用户可通过市场化交易从处于同一配网的分布式项目购买绿电 Corporate users may purchase green power from distributed projects in the same distribution network through market-based transactions
直接投资集中式风光项目 Direct investment in centralized wind power and photovoltaic projects	企业直接投资可再生能源发电项目，并拥有项目部分所有权 Corporations directly invest in renewable energy generation projects and have partial ownership of the projects
场内分布式风光项目 Distributed wind power and photovoltaic projects in the premise	企业在场内直接安装分布式光伏或分散式风电发电设备，产生的电力自己使用或余量上网 Corporations directly install distributed photovoltaic or distributed wind power generation equipment in the premise, and the electricity generated is used by themselves or for on-grid

案例 Case

作为“永远更好”可持续发展战略的一部分，彪马承诺到 2025 年将主要供应商使用再生能源的比例增加到 25%。彪马长期推动供应商购买可再生能源，目前中国供应商屋顶太阳能装机容量达 16.76 兆瓦，场外风能装机容量达 45 兆瓦，采购绿电达 1,500 万度。此外，部分供应商还通过购买国际可再生能源证书的方式获取绿电。

As part of its “Always Better” sustainability strategy, PUMA has pledged to increase the proportion of renewable energy used by major suppliers to 25% by 2025. PUMA has promoted suppliers to purchase renewable energy for a long time. Currently, Chinese suppliers have 16.76 MW of rooftop solar capacity, 45 MW of off-site wind energy, and 15 million kWh of purchased green power. In addition, some suppliers also obtain green electricity by purchasing international renewable energy certificates.

采购绿电达

1,500

万度

15

million kWh of purchased green power

来源：彪马官网
source: about.puma.com

环境影响负碳化
Carbon Negative Solutions

对于生命末期无法重复利用或需要淘汰的羽绒服组件，行业需要探索具有负碳作用的末端处置方式，从而减少甚至避免其作为固废垃圾填埋或焚烧。以生物基纤维面料为例，其原料中的碳来自植物在生产过程中通过光合作用从大气中吸收的二氧化碳。如果面料在破碎后加工成板材，作为公园长椅、建筑墙体和地板的材料，并在未来几十年甚至更长的时间内运行，可以客观上起到负碳的作用，助力羽绒服行业实现价值链净零排放。

For the end-of-life components of down apparel that cannot be reused or need to be phased out, the industry needs to explore end-of-life treatment methods to minimize or avoid landfilling or incineration as solid waste. Taking bio-based fabrics as an example, the carbon in their raw material comes from CO2 in the atmosphere absorbed by plants through photosynthesis. By processing shredded fabric into panels used for park benches, building walls, and floors, and ensuring their long-term operation for decades or more, these materials can contribute to a negative carbon impact. This approach helps the down apparel industry achieve net-zero emissions throughout the value chain.

案例 Case

上海捷答新材料通过技术创新，可以对混纺类废纺进行物理方式再利用，将原来不相融的涤纶和棉麻甚至纽扣拉链融炼成纺纤复合粒子，并通过挤塑、注塑、模压等方式制成家具、户外地板和墙板等，实现了真正意义上的负碳复合材料。

Through technological innovation, Shanghai Jieda New Materials (上海捷答新材料) can physically reuse blended waste spinning in the way of melting the originally incompatible polyester and cotton linen and even button zippers into spun fiber composite particles to make furniture, outdoor floors and wall panels by extrusion, injection, molding, etc., truly realizing carbon-negative composite material.

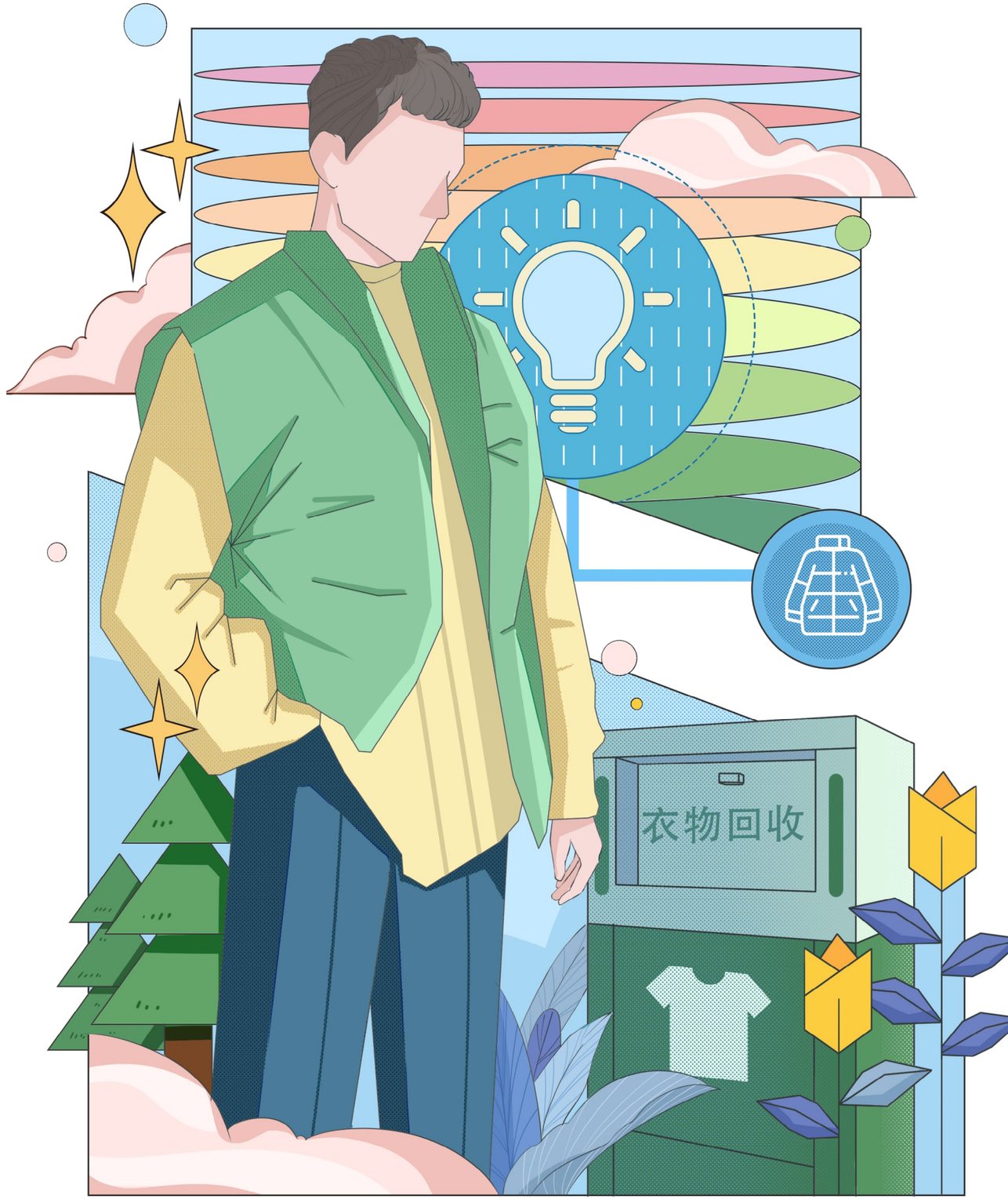
03

迈向净零排放：拓展价值链外的气候贡献

Towards Net Zero:
Becoming Climate Positive beyond Value Chain

羽绒服行业作为一个庞大的产业，不仅有责任减小自身的碳足迹，还应重视行业所具备的推动价值链以外减排的潜力——放大羽绒服行业的“碳手印”。本节介绍了羽绒服行业带动其他行业、居民生活场景减排的贡献和机遇。

Given its size and nature, the down apparel industry not only carries the responsibility to reduce its carbon footprint, but also showcase the potential to drive beyond value chain mitigation – growing its carbon handprint. This chapter presents the opportunities the industry possesses to drive emissions reduction in other industries and daily life.



推动纤维回收产业发展
Promoting the Development of Textile Recycling Industry

服装行业是一个具有巨大纺织材料需求的行业，其中包括了各种天然纤维如棉、麻、羽绒等以及合成纤维如涤纶、锦纶等。再生纤维为服装行业提供了一种可持续的纤维替代方案。

The apparel industry has a huge demand for fiber materials, including various natural fibers such as cotton, linen, down, etc., and synthetic fibers such as polyester, nylon, etc. Recycled fibers offer a sustainable fiber alternative for the apparel industry.

当前，再生纤维行业面临的主要挑战之一是回收成本高、缺乏规模经济效应。羽绒服行业凭借相对较高的产品价值可以成为推动纤维回收产业规模化的突破口之一。

At present, one of the major challenges that the textile recycling industry faces is high recycling costs and lack of economies of scale. The down apparel industry may leverage its relatively high product value to become one of the breakthroughs to promote the development of textile recycling industry.

支持纤维回收产业发展 Supporting the development of the fibre recycling industry

目前，再生纤维的生产成本通常较高，这使得采用再生纤维的产品价格通常要高于普通产品。考虑到快时尚的兴起和其赖以生存的低廉服装价格，毋庸置疑给纤维回收行业的发展增加了难度。相比之下，羽绒服因为具有较高的产品价格，使采用再生纤维可能给行业带来的影响相对较小，进而更容易提高使用再生纤维的羽绒服的市场接受度。

At present, the production cost of recycled fiber is usually high, which makes the products made from recycled fibers usually more expensive than regular products. Considering the rise of fast fashion and the its reliance on low-cost clothing, it is undoubtedly adds difficulties to the development of textile recycling industry. Comparatively, down apparel, with their higher product value, likely to face a relatively smaller impact when adopting recycled fibers, making it easier to increase the market acceptance of down apparel using recycled fiber.

与用户共同创建回收再生模式 Creating a recycling and regenerative model with users

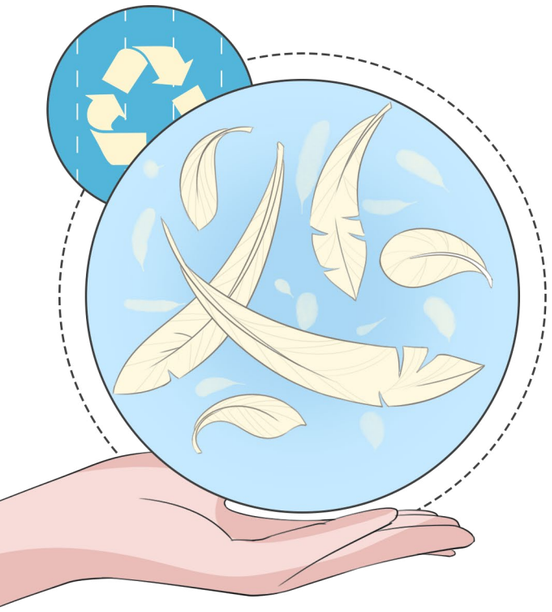
规模化的回收体系依赖于持续的原料供应，在很大程度上，其形成取决于行业能否建立一种对人们有足够吸引力的参与机制，以逐渐养成旧衣回收的生活习惯。考虑到当下社会行为很大一部分还不是由环保因素所驱动的，企业需要思考如何确保公众感知到旧衣回收带给他们的价值，包括现金和非现金奖励。

A scalable recycling system depends on a continuous supply of raw materials, which to a large extent depends on the industry's ability to establish a participatory mechanism that is attractive enough for people to gradually develop the habit of recycling old clothes. Companies need to think about how to ensure that the public perceives the value of recycling old clothes, including cash and non-cash incentives, considering that a large part of current social behavior is not yet driven by environmental factors.

合作培育再生纤维应用市场 Collaborating to cultivate the market for recycled fiber applications

新材料技术是羽绒服行业演化的重要推动力之一。企业通过与快消品（例如饮料行业）开展合作，建立从饮料包装到再生纤维的闭环链条，推出跨界联名产品，既实现了废物的资源化利用，也可以增加产品的差异化和话题性，吸引消费者的关注和购买欲望，为羽绒服行业 “出圈” 提供助力。

New material technologies play a crucial role in driving the advancement of down apparel industry. By collaborating with fast-moving consumer goods, such as the beverage industry, companies can establish a closed-loop chain from beverage packaging to recycled fibers. Through the launch of cross-industry collaborative products, companies not only reduce the waste production, but also enhance product differentiation and topicality. These actions capture consumers' attention and stimulate their purchase desire, ultimately empowering the down apparel industry to stand out.



扩大羽绒产品应用场景

Expanding the 0ccasions of Down Apparel Products

羽绒由于卓越的保暖性和轻量性，深受全球消费者的喜爱。然而，羽绒的价值远不止于此。在所有绝缘材料中，羽绒的碳足迹最低。相比之下，合成填充物具有巨大的碳足迹。据国际羽绒羽毛局称，天然羽绒对气候变化的影响比聚酯填充物小 18 倍 (IDFB, 2019)。同时，羽绒加工的所有副产品也是可生物降解的 (IDFB, 2019)。

Down is loved by consumers around the world due to its excellent warmth and lightweight nature. However, the value of down extends far beyond these aspects. Among all insulating materials, down has the lowest carbon footprint. According to the International Down and Feather Bureau, natural down has 18 times less impact on climate change than polyester filling (IDFB, 2019). Additionally, all by-products of down processing are biodegradable (IDFB, 2019).

在消费升级和产业升级的新发展阶段，行业应通过产品创新，打造跨季节、多场景服装，实现“一衣多穿” “一衣常穿”，持续扩大羽绒产品的应用场景。

Therefore, In the era of consumption and industrial upgrading, the industry should focus on product innovation to create clothing that can be worn across seasons and in various occasions, so as to realize the concept of “one garment, multiple uses and frequent use”.

打造跨季节产品 Creating cross-season products

通过应用创新的面料技术，开发舒适耐用、防污防水、透气保暖的羽绒产品，实现同一件羽绒服在更大温湿度跨度下的适用性，以提升羽绒服的利用率；或通过可拆卸设计、组合式设计，实现羽绒服从御寒服装向多季节服装转变。

Through innovative fabric technologies, develop down products that are comfortable, durable, stain-resistant, waterproof, breathable, and warm. This will enhance the versatility of down apparel across a wider range of temperature and humidity conditions, thereby increasing the utilization of down apparel. Alternatively, through detachable and modular design, transform down apparel from being solely for cold weather into garments suitable for multiple seasons.

开发多场景产品 Developing multi-occasions products

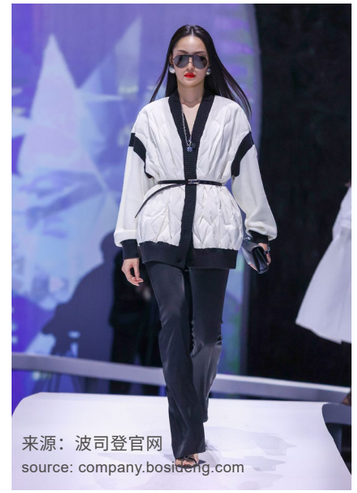
伴随服装需求场景化、功能化趋势，通过“轻量羽绒服 + 场景服装”设计思路，持续挖掘适合羽绒产品的细分品类。如对于商务场景，设计时加入商务元素，比如修身剪裁；对于办公室场景，设计时加入优雅元素，比如立领剪裁。让羽绒服在满足消费者日常保暖需求的同时，提供多样化的时尚造型。

With the trend of increasing occasion-specific and functionalized clothing demand, continuously explore sub-categories suitable for down products through the design concept of “lightweight down apparel + occasion-specific clothing”. For example, incorporating business elements such as a tailored fit for business settings and adding elegant features such as a stand-up collar for office environment. This allows down apparel to provide diversified fashion styles while meeting the needs of consumers for warmth.

案例 Case

2022 年 9 月，波司登在上海举办大秀，重新定义了轻薄羽绒服。波司登通过将不同理念运用到擅长的羽绒服上，将拥有百年传承的经典卫衣、针织等单品与保暖羽绒服融合，极大丰富了轻薄羽绒服的多样性，实现了多场景、跨季节的穿搭需求。“新一代轻薄羽绒服”也是继 1995 年提出羽绒服“时装化”，2001 年发起“防寒服绿色环保变革”后，波司登开启的第三次羽绒服行业“革新”。

In September 2022, Bosideng held a big show in Shanghai, at which the light down apparel was redefined. By applying different concepts to the down apparels that Bosideng excels at, Bosideng integrates classic sweatshirts, knits and other century-old items with thermal down apparels, which greatly enriches the diversity of ultralight down apparels and realizes multi-scenario and cross-seasonal wear needs. “New generation of ultralight down jackets” is also the third “innovation” that Bosideng launched in the down apparel industry after proposing the “fashioning” of down apparels in 1995 and initiating the “green environmental protection reform of cold-proof clothes” in 2001.



来源：波司登官网
source: company.bosideng.com

培育绿色生活方式
Cultivating Green Lifestyle among the Public

根据美国的一项调查显示，更多地参与户外活动可以为应对气候变化带来好处，因为人们通过增加与自然的联系感会产生对气候变化更大的关注，进而影响他们日常生活中的行为 (Knight & Hao, 2022)。

According to a survey conducted in the United States, increased engagement in outdoor activities bring benefits in combating climate change, as people can develop a greater concern for climate change by increasing their connection with nature, which in turn influences their daily behaviors (Knight & Hao, 2022).

近年来，越来越多的品牌推出了对户外新人更加友好的户外羽绒服，相比传统的户外羽绒服，它们具有更好的舒适感和穿搭性，也更利于培养公众对户外运动的兴趣。

In recent years, more brands have launched outdoor down apparels that are more friendly to outdoor newcomers. Compared to traditional outdoor down apparel, these garments provide better comfort and wearability, making them more conducive to cultivating public interest in outdoor sports.

另一方面，全天候全场景适用的装备产品，在满足消费者户外需求的同时，也为其城市生活的绿色出行提供了有效加持，让消费者可以更为便捷、愉悦地利用步行、骑行等低碳方式进行通勤。

Meanwhile, the all-weather and all-occasions products not only meet consumers' outdoor needs, but also provide necessary support for their green urban lifestyle, allowing consumers to commute in a low-carbon way such as by walking and cycling.

羽绒服行业可通过开展户外活动、打造绿色门店、开发适应产品等方法，在公众群体中培育绿色生活方式，推动更多的人开始关注气候和环境影响。

The down apparel industry can cultivate a green lifestyle among the public by organizing outdoor activities, creating eco-friendly stores, and developing adaptive products. These initiatives will encourage more people to pay attention to climate and environmental impacts and adopt green practices in their lives.The down apparel industry can cultivate a green lifestyle among the public by organizing outdoor activities, creating eco-friendly stores, and developing adaptive products. These initiatives will encourage more people to pay attention to climate and environmental impacts and adopt green practices in their lives.

案例 Case

2022 年，北面（The North Face）的秋季品牌活动 It's More Than A Jacket 是一项旨在纪念和庆祝公司 55 多年历史中创造的冒险记忆和故事的倡议。在过去的一年中，北面呼吁全球社区用户提交他们喜爱的北面产品的故事和图片，这些故事与北面的运动员和大使的故事一起，被陈列在北面与旧金山现代艺术博物馆合作推出的一个档案里，用于展示北面产品如何激发他们以及他们探索自然的好奇心。

In 2022, The North Face's fall brand event "It's More Than A Jacket" was an initiative that honored and celebrated the adventurous memories and stories created throughout the company's more than 55-year history. Over the past year, The North Face has called on global community users to share stories and images of their favorite North Face products, which along with the stories of North Face athletes and ambassadors, were displayed in an archive launched by North Face in partnership with the San Francisco Museum of Modern Art to show how North Face products inspire them and their curiosity to explore nature.

行业展望
Outlook

蒋南青 博士
Jiang Nanqing

中华环保联合会绿色循环普惠专委会秘书长，联合国环境署前国家项目官员

Secretary-General of the Green Cycle Inclusive Committee（绿色循环普惠专委会） of the All-China Environment Federation, and a former National Project Officer of the United Nations Environment Programme

纺织品行业长期与自然环境、人类社会息息相关。羽绒行业是纺织行业中独特产品，羽绒原材料上游来自于家禽行业，也与能源、纺织、包装材料都相关。我们既要让每个人都保暖，同时不会让地球变暖。

中国人均收入跨入万元时代，产品和服务的碳排放也占到全球碳排放的 45%，这表明我们已经进入了一个以消费为主要经济引擎的阶段。打通从生产端到消费端，既可以提高资源效率，也可以发现需求，推动创新和消费。在这转型过程中，传统的经济模式已经受到了挑战，超越了企业自身工厂大门，这既需要上下游产业链的协作，消费者参与其中，才可构建新的数字化低碳循环经济模式。

在全球气候变化协定、中国“十四五”发展纲要和双碳目标这些驱动力的作用下，政策在不断设置环境和社会目标，企业需要转型，降低能源和资源消耗成本，减少对能源的依赖，同时获得更大的利润，以及更多考虑消费者喜好和公众态度。

行业需要设定目标和减排目标，旨在实现碳中和工厂并覆盖到供应链脱碳，这需要企业改变运营方式。一方面，企业继续增加产量，就需要提高生产过程的能源效率，减少生产产品的能源消耗。另一方面，要采用更多的可再生能源和循环再生，与能源和资源脱钩。用全生命周期管理供应链，包括包装、运输、废物生产回收。

羽绒服价值链，从原材料，到产品设计，工厂生产，到产品销售，都具有实现低碳可持续发展的潜力。羽绒来自于家禽养殖行业避免了废弃物处理的碳排放。由于产品属于耐用产品可使用多年，碳排放很低。涤纶和尼龙服装面料，都可以使用再生材料。产品具有高附加值，为形成循环再生的闭环链条提供了保障。上游供应链的农业碳汇，生产过程的零碳工厂，下游的循环再生，都可以更好地进行与碳市场机制结合。虽然消费品市场碳减排目前还不能直接交易，未来企业在碳资产方面的投资将得到放大效应，为他们吸收的碳或者减少的碳获得更大回报。

中国已经拥有像波司登这样的品牌企业，品牌文化和时尚非常重要，品牌与供应链合作伙伴以及监管机构和决策者组成的更广泛生态系统，联手为绿色解决方案创造市场，使绿色解决方案更加经济。

The textile industry has long been closely related to the natural environment and human society. The down industry is a unique product in the textile industry, whose raw materials of upstream comes from the poultry industry and is also related to energy, textiles and packaging materials. We need to keep everyone warm without warming the planet.

Chinese per capita income has exceeded RMB10,000, and the carbon emissions of products and services also account for 45% of global carbon emissions, indicating that we have entered a stage where consumption is the main economic engine. Connecting from the production end to the consumption side can not only improve resource efficiency, but also discover demand and promote innovation and consumption. In this transformation process, the traditional economic model has been challenged, and goes beyond the boundary of its capacity, as such, the collaboration of upstream and downstream industrial chains and the participation of consumers are required in order to build a new digital low-carbon circular economy model.

Driven by the global climate change agreement, the development outline during China’s “14th Five-Year Plan” period, and the dual carbon goals, policies are setting environmental and social goals, and companies need to transform to reduce energy and resource consumption costs, reduce energy dependence, and achieve greater profits, as well as consider more of consumer preferences and public attitudes.

The need for industries to set targets and emission reduction targets aimed at achieving carbon-neutral factories and covering supply chain decarbonization, which requires companies to change the way they operate. On the one hand, if companies continue to increase production, they need to improve the energy efficiency during the production process and reduce the energy consumption of the products produced. On the other hand, more renewable energy and recycling are needed to decouple from energy and resources. The supply chain should be managed with the full life cycle, including packaging, transportation, waste production and recycling.

The down apparel value chain, from raw materials to product design, factory production, and to product sales, has the potential to achieve low-carbon sustainable development. Down comes from the poultry industry, which avoids carbon emissions from waste disposal. Since it is durable and can be used for many years, the product has a low carbon footprint. Polyester and nylon clothing fabrics can be made of recycled materials. The high added value of the products ensures the formation of a closed-loop chain of recycling. Agricultural carbon sinks in upstream supply chains, zero-carbon factories in production processes, and downstream recycling can all be better integrated with carbon market mechanisms. Although carbon emission reductions in consumer goods markets cannot be traded directly at present, in the future, companies’ investments in carbon assets will be amplified, bringing them greater returns on the carbon they absorb or decrease.

China already has brands like Bosideng, where brand culture is equally important as fashion. Brands may join forces with a broader ecosystem of supply chain partners as well as regulators and decision-makers to create markets for green solutions and make them more economical

梁晓晖 博士
Liang Xiaohui

中国纺织工业联合会社会责任办公室首席研究员

Chief Researcher of Social Responsibility Office of China National Textile and Apparel Council

《纺织行业“十四五”发展纲要》为我国的纺织服装行业确立了“创新驱动的科技产业、文化引领的时尚产业、责任导向的绿色产业”发展方向，并据此为行业设定了明确而富有感召力的“2035 年远景目标”，即我国纺织工业要成为“世界纺织科技的主要驱动者、全球时尚的重要引领者、可持续发展的有力推进者”。

羽绒服是各类服装产品中充分体现了“科技、时尚和绿色”发展方向所带来的机遇和挑战的品类之一。羽绒服基本的防寒功能要求越来越丰富和精尖的科技含量，而防寒功能附随的臃肿感和科技负载也可能对羽绒服的“时尚性”提出挑战。另一方面，羽绒服相对复杂的制造工艺、多元的原材料、广泛的价值链和由于气候变化所带来的需求增长也对羽绒服行业的绿色低碳发展带来了压力。

“The Development Outline during the ‘14th Five-Year Plan’ Period for the Textile Industry” has established the development direction of “innovation-driven science and technology industry, culture-led fashion industry, and responsibility-oriented green industry” for China’s textile and garment industry, and set a clear and inspiring “2035 long-term goal” for the industry, that is, China’s textile industry should become “the main driver of the world’s textile technology, an important leader of global fashion, and a strong promoter of sustainable development”.

Down apparel is one of the categories that fully reflects the opportunities and challenges brought by the development direction of “science and technology, fashion and green” in various garment products. The basic cold-proof function of down apparels requires more abundant and sophisticated technological content, and the bloated feeling and technological element attached to the cold-proof function may also challenge the “fashionability” of down apparels. Moreover, down apparels’ relatively complex manufacturing process, diversified raw materials, extensive value chain and demand growth due to climate change have also put pressure on the green and low-carbon development of the down apparel industry.

中国作为全球羽绒服的设计、制造和消费中心，中国的羽绒服行业过去多年来在协调推进“科技、时尚和绿色”三个发展方向的关系上做出了很多有益的尝试，也取得了令人瞩目的进展。尤其是，在如何充分利用科技促进绿色发展，并在低碳发展中满足全球消费者与日俱增的时尚需求方面，中国的羽绒服行业正以“驱动者、引领者和推进者”的姿态阔步前行。

同时，“科技、时尚和绿色”的发展道路并无止境，中国的羽绒服行业仍须脚踏实地，深耕细作，踔厉奋进，持续探索更高质量的低碳发展模式，并妥善处理低碳转型中的各类矛盾。尤其是，如何在产品全生命周期视野中持续提升原材料、生产工艺和价值链的绿色低碳水平（包括旧衣回收再利用）仍然是行业需要与各个利益相关方合作应对的攻坚方向。

因此，希望这份《迈向净零排放：羽绒服行业高质量低碳转型路径研究》能够为中国的羽绒服行业企业提供可鉴的低碳发展理念、方法论和技术路线，同时也有助于唤起利益相关方，包括消费者对行业绿色低碳发展的关注和支持。

As a global center for the design, manufacture and consumption of down apparels, China’s down apparel industry has made many beneficial attempts in coordinating the relationship among the three development directions of “science and technology, fashion and green” in the past few years, and has also made remarkable progress. In particular, in terms of how to make full use of science and technology to promote green development and meet the increasing fashion needs of global consumers in low-carbon development, China’s down apparel industry is striding forward as a “driver, leader and promoter”.

In the meantime, the development path of “science and technology, fashion and green” is endless, and China’s down apparel industry must still be down-to-earth, deeply cultivated, and keep exploring a higher quality low-carbon development mode, and properly deal with various contradictions in the low-carbon transformation. In particular, how to continuously improve the green and low-carbon level of raw materials, production processes and value chains (including the recycling and reuse of used clothes) in the perspective of the whole life cycle of products is still a key challenge that the industry needs to address in partnership with various stakeholders.

Therefore, it is hoped that this “Towards Net Zero Emissions: A Study on the High-quality Low-carbon Transformation Path of the Down Apparel Industry” can provide enterprises in China’s down apparel industry with a good understanding of low-carbon development concepts, methodologies and technical routes, and also help arouse the attention and support of stakeholders, including consumers, for the green and low-carbon development of the industry.

曹原
Cao Yuan

商道纵横零碳企业行动倡议首席顾问，广东省碳普惠专家委员会成员

Principal Consultant of SynTao Zero Carbon Corporate Action Initiative, member of Guangdong Provincial Expert Committee on Carbon Inclusion（广东省碳普惠专家委员会）

1789 年，自从蒸汽机代替水力开始装备纺织厂，煤炭和蒸汽驱动的棉纺业，成为开启第一次工业革命的首个行业门类。两百多年后，以“新能源、新材料、新智能、新流程”为核心驱动力的零碳转型浪潮，正在改变众多传统行业的生产方式，也让纺织和服装这个历史悠久的行业萌发新生机。以羽绒服为例，未来 40 年的零碳变革对其价值链重塑的深度和广度，或将超过“蒸汽机缔造现代棉纺业”的过程。

零碳变革是一次系统性变革，羽绒服价值链贯穿了一、二、三次产业，实现自身的革新升级的同时，每个环节都可以为发展绿色经济要素创造应用场景。在工厂，以太阳能光伏为代表的绿色电力，开始驱动面料加工和成衣制造，通过热泵技术，也将逐步替代传统湿法工艺和蒸汽需求。在原料方面，除了羽绒外，面料革新也体现出零碳趋势——生物精炼、再生材料或 CO2 合成原料都赋予面料更多演化可能。

零碳变革是一次生产力变革，新智能和新流程正重塑服装价值链，不仅提升了效率、降低了价值链碳足迹，也在改善成本结构。以波司登为例，用“互联网 + 大数据 + 智能制造”模式，打通了前端销售、中端库存与后端供应链生产的流程，建成了国家级智能制造示范工厂、行业领先的中央智能配送中心，实现基于全渠道数据优化产品设计、系统自动匹配库存配送。“数智赋能”正把设计师到消费者的全链路变得更加敏捷高效，不仅摊薄了每件产品流通过程碳足迹，也做到了“规模化有效生产”，避免“大进大出”的粗放模式下的浪费。

In 1789 when the steam engine replaced water power and textile mills were equipped with coal and steam-powered cotton spinning, it became the first industry category to start the first industrial revolution. More than 200 years later, the wave of zero-carbon transformation with “new energy, new materials, new intelligence, and new processes” as the core driving force is changing the production methods of many traditional industries, and has also given new life to this long-established textiles and garment industry. Taking down apparels as an example, the depth and breadth of value chain reshaping by the zero-carbon transformation in the next four decades may go beyond the process of “steam engine creating modern cotton spinning industry”.

Zero-carbon transformation is a systemic change, and the down apparel value chain runs through the first, the second and the third industries. While realizing its own innovation and upgrading, each process can create application scenarios for the development of green economic elements. In factories, green electricity, represented by solar photovoltaics, has begun to drive fabric processing and garment manufacturing, and through heat pump technology, it will gradually replace the traditional wet process and steam demand. In terms of raw materials, in addition to down, fabric innovation also reflects the trend of zero carbon - biorefining, recycled materials or CO2 synthetic raw materials all give fabrics more evolutionary possibilities.

The zero-carbon transformation is a productivity revolution, with new intelligence and processes reshaping the apparel value chain, which not only increases efficiency, reduces the value chain’s carbon footprint, but also improves the cost structure. Taking Bosideng as an example, the “Internet + big data + intelligent manufacturing” model has been used to open up the process of front-end sales, mid-end inventory and back-end supply chain production, and a national-level intelligent manufacturing demonstration factory and an industry-leading central intelligent distribution center have been built to achieve product design optimization based on omni-channel data and inventory distribution automatically matched by the system. “Digital intelligence empowerment” is making the whole link from designers to consumers more agile and efficient, not only diluting the carbon footprint of each product’s circulation process, but also achieving “large-scale and effective production” to avoid waste under the extensive mode of “large inflow, large outflow”.

零碳变革是一次生活方式变革，新世代消费者已经深度参与可持续时尚塑造。羽绒服品牌，或将向“泛羽绒 + 绿色生活方式”品牌演化。羽绒服诞生于户外场景，而户外运动的兴起，也诠释了工业文明向生态文明的变迁的内涵——自然，不再单纯是人们的生产资料或征服对象，正在回归“栖居之所”和“凝望之地”。新一代消费者对服装的需求也从“功能需求”转向“体验需求”和“意义需求”升级——羽绒产品在其天然的环境友好性基础上，或可探索“黑科技 + 绿时尚”的高附加值单品、开展跨界联名的零碳产品创新，深度参与绿色生活方式塑造，以产品为媒介，向消费者诠释上游绿色价值链、循环再生体系的零碳价值。

迈向碳中和，机遇大于挑战。高质量零碳转型路径，呈现“负成本 - 零排放 - 正增长”的特征。中国拥有 14 亿人口基数、有 4 亿多中等收入群体的超大规模消费市场。着眼新时期的全球市场，以波司登为代表的国货品牌的崛起过程，不仅与中国服装价值链彼此成就、共同实现绿色升级，也将与新消费者携手开展气候行动、创建具有吸引力的绿色生活方式，以构建品牌意义内涵，支撑品牌影响力的国际化。

见微知著，中国羽绒服价值链在低碳理念和实践层面的探索，体现了中国供应链和消费市场绿色升级中的巨大潜力，对服装行业低碳转型和高质发展具有启发和示范作用。

To move towards carbon neutrality, the opportunities outweigh the challenges. The high-quality zero-carbon transition path presents the characteristics of “negative cost-zero emission-positive growth”. China has a population base of 1.4 billion and a super-large consumer market with more than 400 million middle-income groups. Focusing on the global market in the new era, the rise of domestic brands represented by Bosideng will not only achieve mutual achievements and green upgrading with China’s apparel value chain, but also work with new consumers to take climate action and create attractive green lifestyles to build brand meaning and support the internationalization of brand influence.

A straw shows which way the wind blows. The exploration of China’s down apparel value chain at the low-carbon concept and practice level reflects the great potential of green upgrading of China’s supply chain and consumer market, and has an inspiring and exemplary effect on the low-carbon transformation and high-quality development of the apparel industry.

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词汇表
Glossaries

巴黎协定

由联合国 195 个成员国在 2015 年气候峰会中通过的旨在应对气候变化减缓、适应和融资的国际条约。

Paris Agreement

An international treaty adopted by the 195 member states of the United Nations at the 2015 climate summit to address climate change mitigation, adaptation and financing.

道德消费

在购买产品或服务时，考虑到它们的环境、社会和伦理影响，以及公司或品牌的价值观和商业行为。

Ethical consumption

When purchasing products or services, take into account their environmental, social and ethical impacts, as well as the values and business practices of a company or brand.

低碳转型

将传统的高碳经济模式转变为低碳、环保、可持续发展的经济模式的过程。

Low-carbon transition

The process of transforming the traditional high-carbon economic model into a low-carbon, environmentally friendly and sustainable economic model.

电气化

通过更换或改造设备，实现利用电力供能满足动力、热力等能源需求，以替代原本会消耗的化石燃料。

Electrification

By replacing or transforming equipment, the use of electricity to meet power, heat and other energy needs so as to replace the fossil fuels that would otherwise be consumed.

ESG 投资

将企业的环境、社会和管治（ESG）要素纳入投资策略的考虑范围，或可达致可持续投资并降低潜在风险。

ESG investment

Incorporating corporate environmental, social and governance (ESG) elements into investment strategies that may lead to sustainable investment and lower potential risks.

国家自主贡献目标

各国政府根据《联合国气候变化框架公约》的要求，自主制定的减排和应对气候变化的目标和计划。

Goal of nationally determined contributions

According to the requirements of the United Nations Framework Convention on Climate Change, the governments of various countries independently formulate the goals and plans for emission reduction and response to climate change.

价值链

从原材料生产、加工、制造、运输和零售到产品使用和处置。

Value chain

From raw material production, processing, manufacturing, shipping and retailing to product use and disposal.

净零

在一个特定的时间段内将温室气体的净排放量减少到尽可能接近于零的目标。这意味着任何未能减少的排放量都将被其他机制吸收，例如通过海洋和森林的吸收作用。

Net zero

The goal of reducing net greenhouse gas emissions as close to zero as possible over a specified time period. This means that any emissions that fail to be reduced will be absorbed by other mechanisms, such as through oceans and forests.

可再生电力 / 绿色电力

由可再生能源通过不同的技术转化成的电力。

Renewable electricity/green electricity

Electricity converted from renewable energy through different technologies.

可再生能源

来自自然资源中的能源，例如太阳能、风力、潮汐能、地热能、水能、生物燃气，是取之不尽，用之不竭的能源。

气候变化

温度和天气模式的长期变化。

碳手印

在自身价值链之外对气候产生积极影响的行动。

碳中和

企业、组织或政府在一定时间的二氧化碳排放量，通过使用低碳能源取代化石燃料、植树造林、节能减排等形式，以抵消自身产生的二氧化碳或温室气体排放量，实现正负抵消。

碳足迹

由个人、事件、组织、服务或产品造成的温室气体总排放量。

温室气体

大气中吸收和重新放出红外辐射的自然的和人为的气态成分。《京都议定书》中规定了六种温室气体，包括二氧化碳（CO2）、甲烷（CH4）、氧化亚氮（N2O）、氢氟碳化物（HFCs）、全氟化碳（PFCs）和六氟化硫（SF6）。

一级供应商

负责组装和制造最终产品的供应商。

二级供应商

负责生产和加工成直接用于成品的材料的供应商。

三级供应商

负责将原材料加工成纱线和其他中间产品的供应商。

四级供应商

负责从地球、植物或动物中培育和提取原材料的供应商。

Renewable energy

Energy from natural resources, such as solar energy, wind power, tidal energy, geothermal energy, hydropower, and biogas, which is inexhaustible.

Climate change

Long-term changes in temperature and weather patterns.

Carbon handprint

Actions that have a positive climate impact outside their own value chain.

Carbon neutrality

The carbon dioxide emissions of enterprises, organizations or governments over a certain period of time being offset completely through the use of low-carbon energy to replace fossil fuels, afforestation, energy conservation and emission reduction, etc., achieving the offset of carbon dioxide or greenhouse gas emissions generated by the enterprises, organizations or governments themselves.

Carbon footprint

The total amount of greenhouse gas emissions caused by a person, event, organization, service or product.

Greenhouse gases

Natural and anthropogenic gaseous constituents of the atmosphere that absorb and re-emit infrared radiation. The Kyoto Protocol stipulates six greenhouse gases, including carbon dioxide (CO2), methane (CH4), nitrous oxide (N2O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs) and sulfur hexafluoride (SF6).

Tier 1 suppliers

Suppliers responsible for assembling and manufacturing final products.

Tier 2 suppliers

Suppliers responsible for the production and processing of materials that are used directly in finished products.

Tier 3 suppliers

Suppliers responsible for processing raw materials into yarn and other intermediate products.

Tier 4 suppliers

Suppliers responsible for cultivating and extracting raw materials from the earth, plants or animals.

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作者

曹原，商道纵横合伙人 零碳倡议项目首席顾问

张华轩，商道纵横咨询顾问

李雨馨，商道纵横助理咨询顾问

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如有任何疑问或需求，请联系 caoyuan@syntao.com

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Authors

Cao Yuan, SynTao Partner, Principal Consultant of the Zero Carbon Initiative

Zhang Huaxuan, SynTao Consultant

Li Yuxin, SynTao Assistant Consultant

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If you have any questions or needs, please contact caoyuan@syntao.com.

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