

# Catalyzing Change

Our Fifth Year  
Anniversary Report



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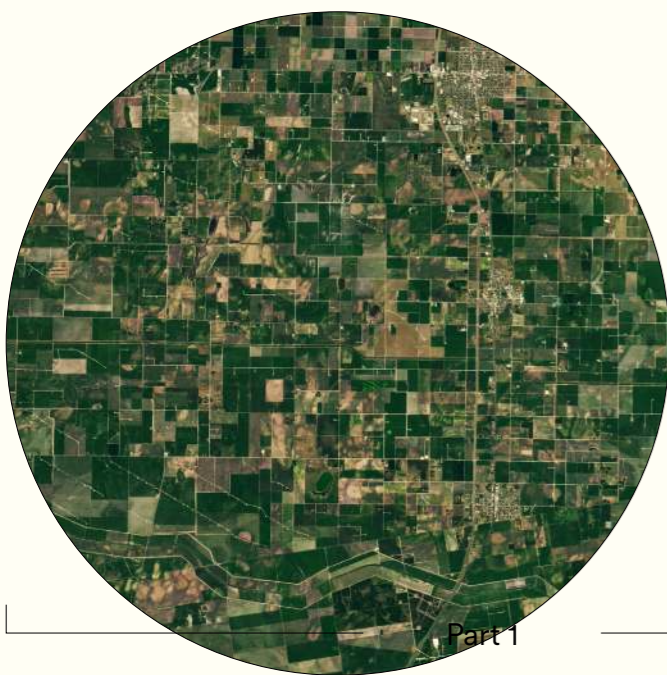
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# Part

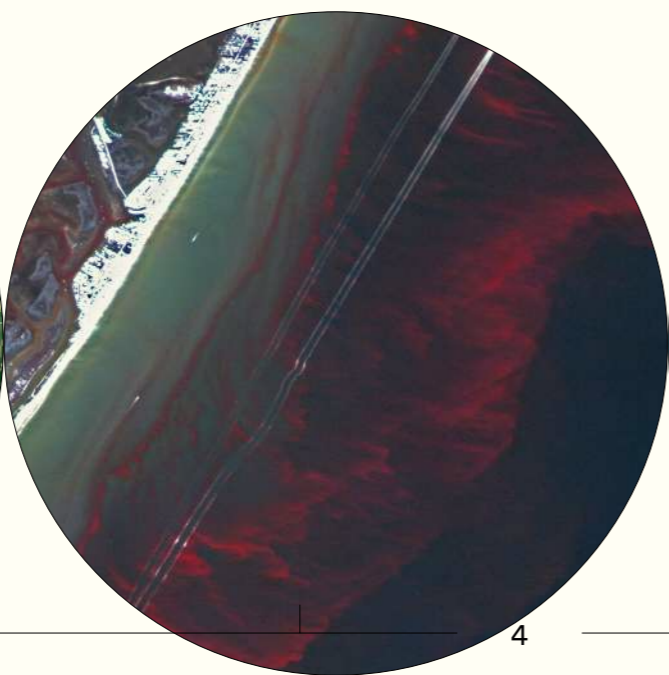
Five Years of  
Empowering  
Innovation and  
Unwavering  
Commitment  
to Driving  
Planet-Positive  
Change



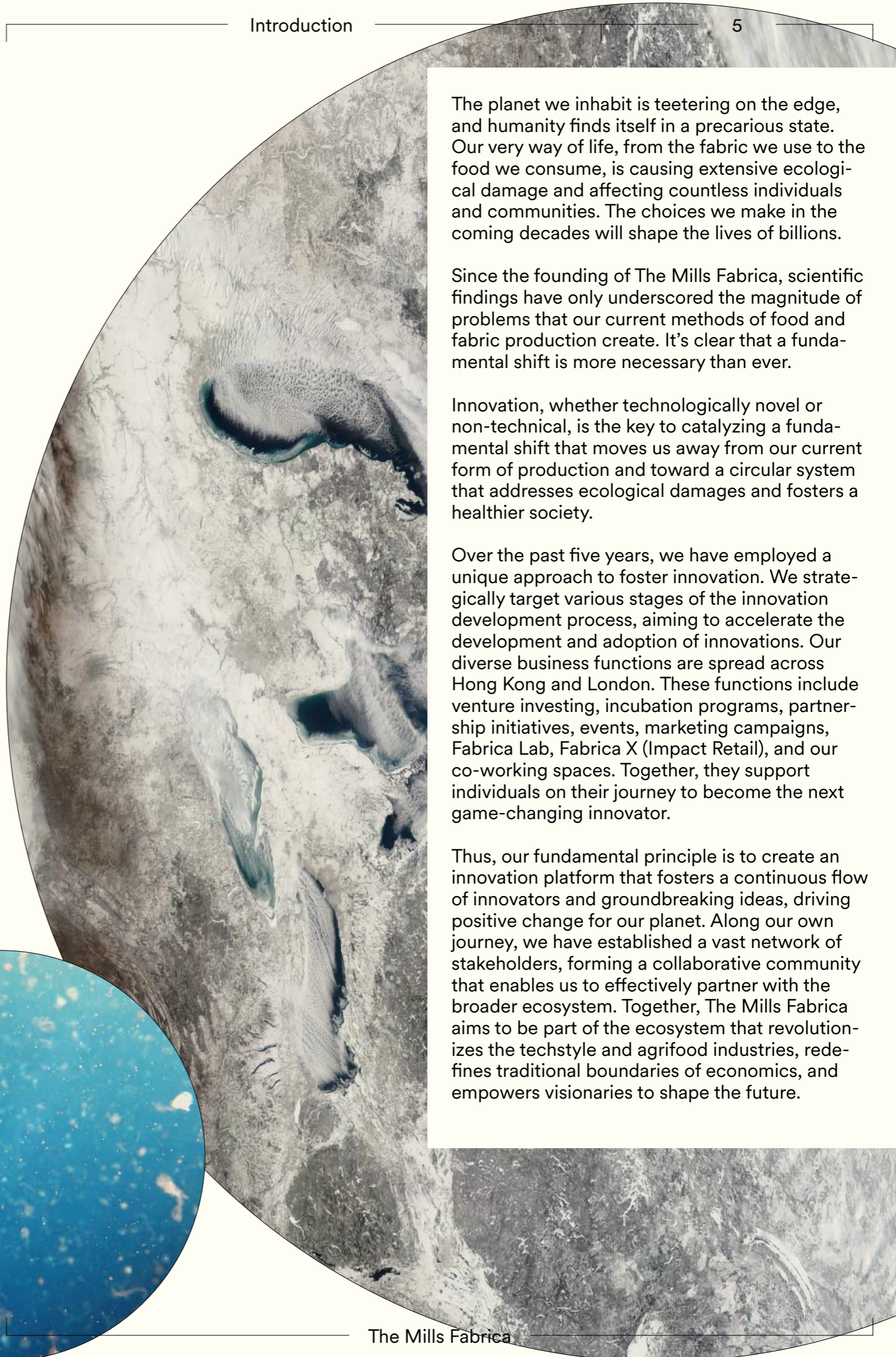
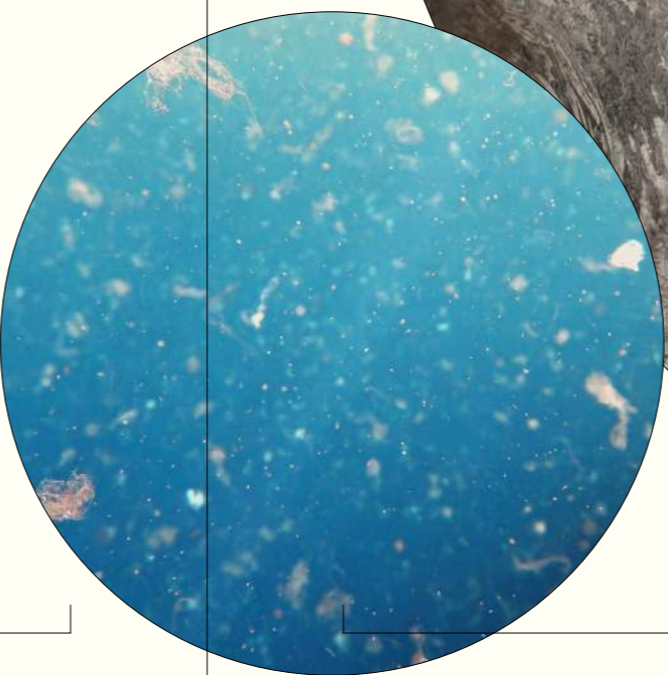
As we enter our 5th year, we are proud to have fostered, accelerated, and supported innovators making a real difference for our planet. Ultimately, the work that we do at The Mills Fabrica is about creating an innovation platform that generates a pipeline of innovations that can lead to planet-positive change.



Part 1



4



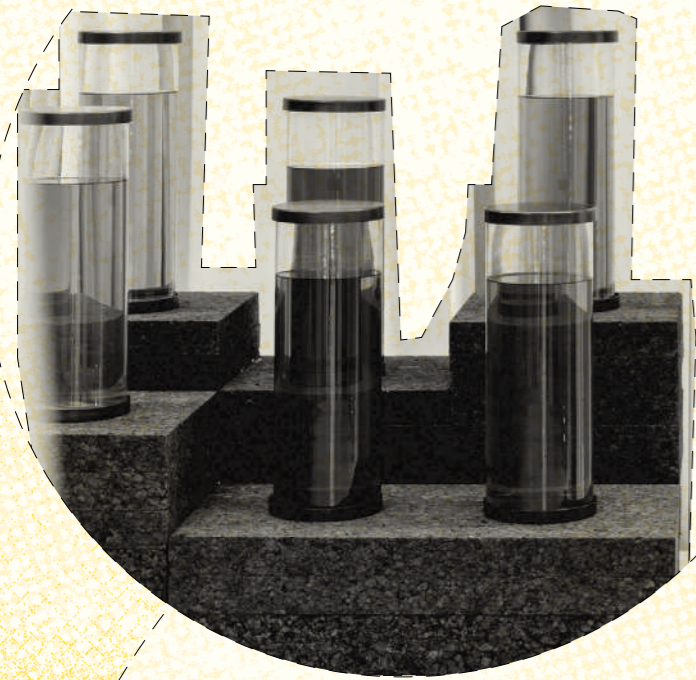
The planet we inhabit is teetering on the edge, and humanity finds itself in a precarious state. Our very way of life, from the fabric we use to the food we consume, is causing extensive ecological damage and affecting countless individuals and communities. The choices we make in the coming decades will shape the lives of billions.

Since the founding of The Mills Fabrica, scientific findings have only underscored the magnitude of problems that our current methods of food and fabric production create. It's clear that a fundamental shift is more necessary than ever.

Innovation, whether technologically novel or non-technical, is the key to catalyzing a fundamental shift that moves us away from our current form of production and toward a circular system that addresses ecological damages and fosters a healthier society.

Over the past five years, we have employed a unique approach to foster innovation. We strategically target various stages of the innovation development process, aiming to accelerate the development and adoption of innovations. Our diverse business functions are spread across Hong Kong and London. These functions include venture investing, incubation programs, partnership initiatives, events, marketing campaigns, Fabrica Lab, Fabrica X (Impact Retail), and our co-working spaces. Together, they support individuals on their journey to become the next game-changing innovator.

Thus, our fundamental principle is to create an innovation platform that fosters a continuous flow of innovators and groundbreaking ideas, driving positive change for our planet. Along our own journey, we have established a vast network of stakeholders, forming a collaborative community that enables us to effectively partner with the broader ecosystem. Together, The Mills Fabrica aims to be part of the ecosystem that revolutionizes the techstyle and agrifood industries, redefines traditional boundaries of economics, and empowers visionaries to shape the future.



# Part

## The Mills Fabrica as an Innovation Platform

# Accelerating Innovations Through Our Innovation Framework

As we approach an uncertain future full of mounting challenges such as climate change, population growth, and population pressure, the need for innovative solutions and technologies has never been more apparent and urgent.<sup>1</sup>

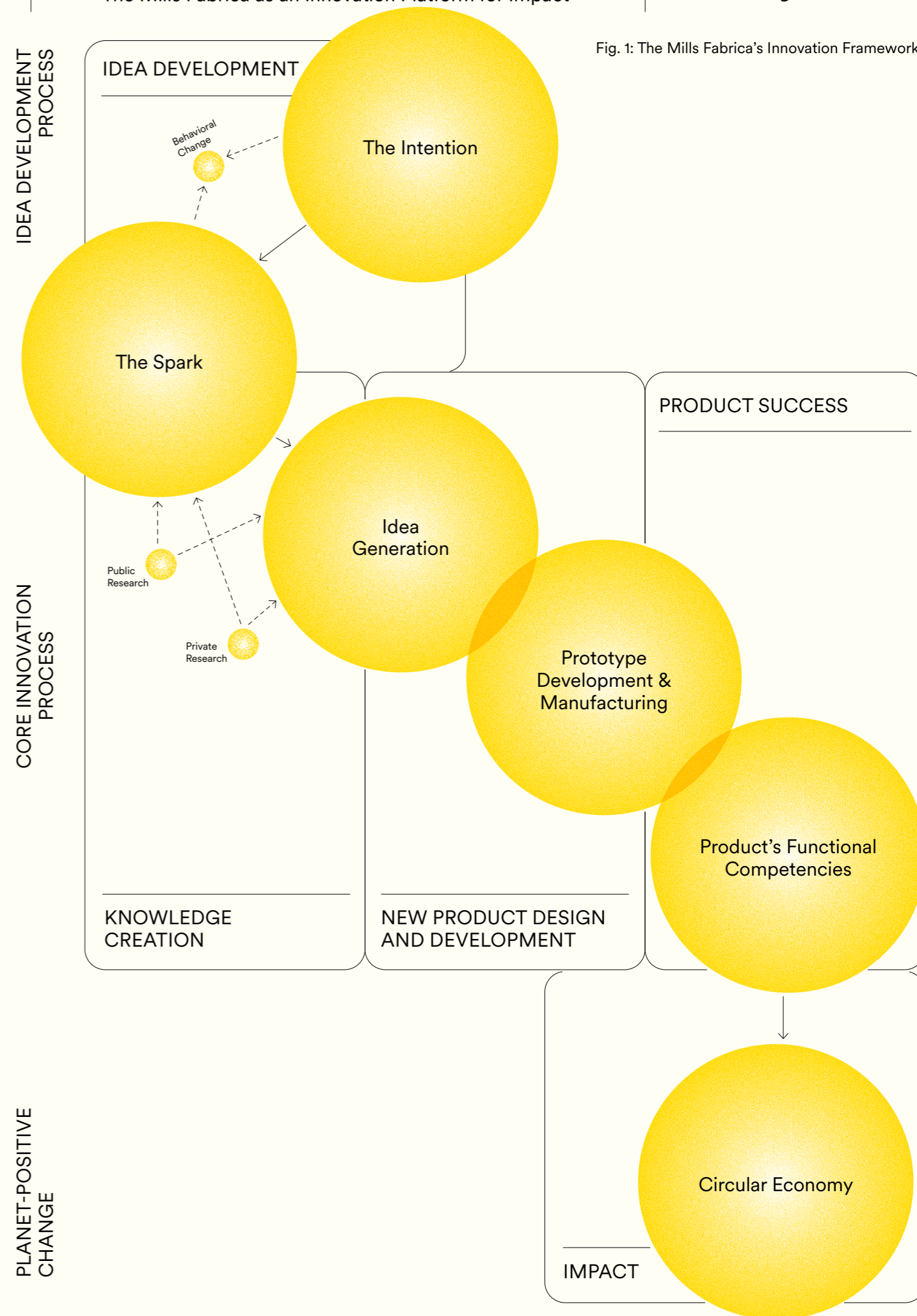
With five years of experience, we have established an innovation framework that underpins our innovation platform. This framework guides how we support innovations within the techstyle and agrifood industries, enabling us to navigate various stages of development, from fostering *The Intention* to effect change to bringing innovations to market.

By targeting the mechanisms that we think are vital for the development of innovations for the industries, this innovation framework ensures The Mills Fabrica can build a pipeline of innovation that can result in planet-positive change.

Our framework consists of three distinct phases (fig.1):

- The Idea-Development Process
- The Core Innovation Process
- The Process of Making and Measuring Planet-Positive Change

Fig. 1: The Mills Fabrica's Innovation Framework<sup>2</sup>



These phases are further divided into five stages: *Idea Development, Knowledge Creation, New Product Design and Development, Product Success, and Impact* (fig.1).<sup>3</sup> Along this continuum, we can support different stages of stakeholders (Fig. 2) by collaborating with our knowing community and creating a pipeline of innovations that promote circularity.<sup>4</sup>

The Mills Fabrica aims to generate positive outcomes across different levels of the economy, they include:

**Personal level**

- Facilitating knowledge transfers to shape individuals' understanding of circular economic principles.
- An increase in knowledge can increase the intentionality of individuals and, over time, could lead to individuals adopting a more conscious lifestyle.

**Entrepreneurial level**

- Providing avenues to inspire and support intrapreneurs and entrepreneurs in driving circularity initiatives and developing innovations within their domain.

**Organizational level**

- Curating partnerships between corporations and innovative startups to integrate circular solutions into operations.

**Industry level**

- Accelerating the development, growth, and deployment of innovative products through the Fabrica Investment Fund and Partnership opportunity to fast-track the transition toward circularity in both industries.
- The outcomes achieved at various levels outlined above seek to increase awareness and knowledge of socioenvironmental issues, promote lifestyle changes, foster entrepreneurship to develop novel innovations and accelerate the development and growth of innovations towards commercialization. Overall, our mission is to promote circular economic thinking and entrepreneurship to create planet-positive change.

At the heart of every breakthrough lies curiosity. Our mission is to cultivate a culture of knowledge sharing where we empower our community with insights, expertise, and the tools they need to ignite the flame of curiosity and sow the seeds of innovation.

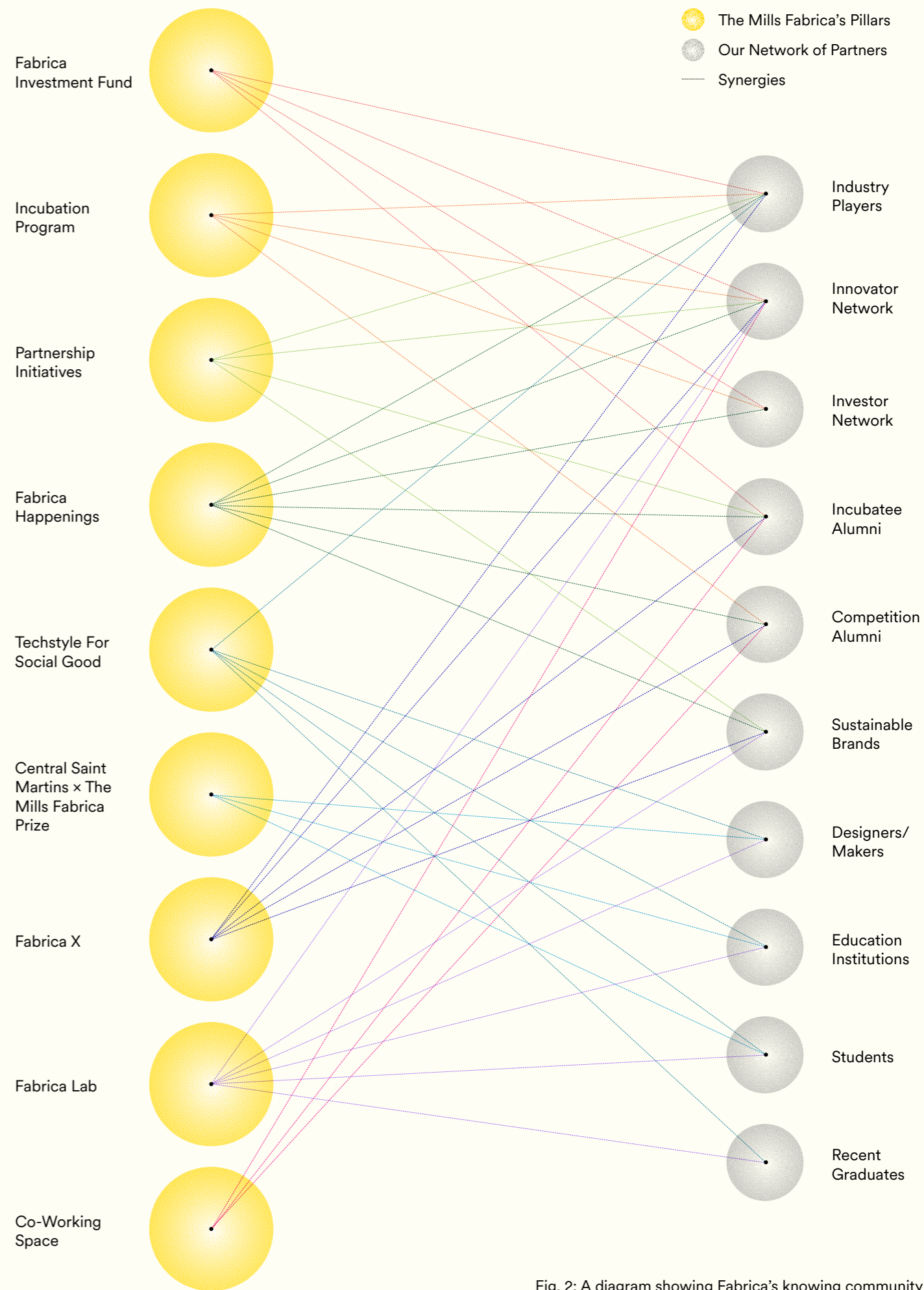


Fig. 2: A diagram showing Fabrica's knowing community



## 2.1 Idea-Development Process

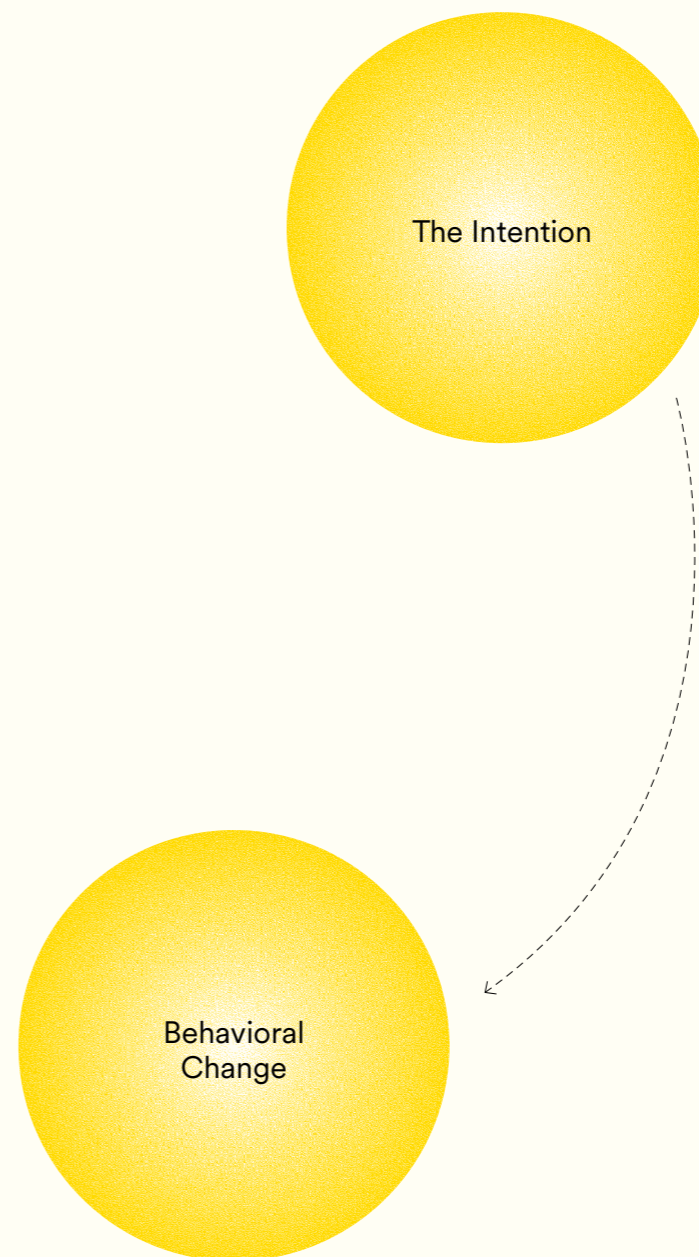
### The Intention

Inspiring Individuals to Cultivate Intentionality

“The Intention” refers to the conscious and deliberate commitment to use existing and new knowledge and experiences to identify problems and set goals to solve them. Through partnerships with our knowing community (fig.2), we create opportunities for individuals to gain knowledge and insights that motivate them to identify problems they want to solve.

→ Levers to Support the Development of The Intention

Fabrica X, Fabrica Lab, and Fabrica Happenings offer the ideal environment and resources to nurture intentions. Initiatives like Denim Futures and Biomaterials in our Impact Retail campaigns, along with events like the Fashion Summit and Ecosystem Summit in Hong Kong, provide knowledge, insights, and expertise to empower individuals in the techstyle industries. Combining various expertise and viewpoints unlocks curiosity and fosters innovation, building awareness and leading to potential personal behavioral changes.





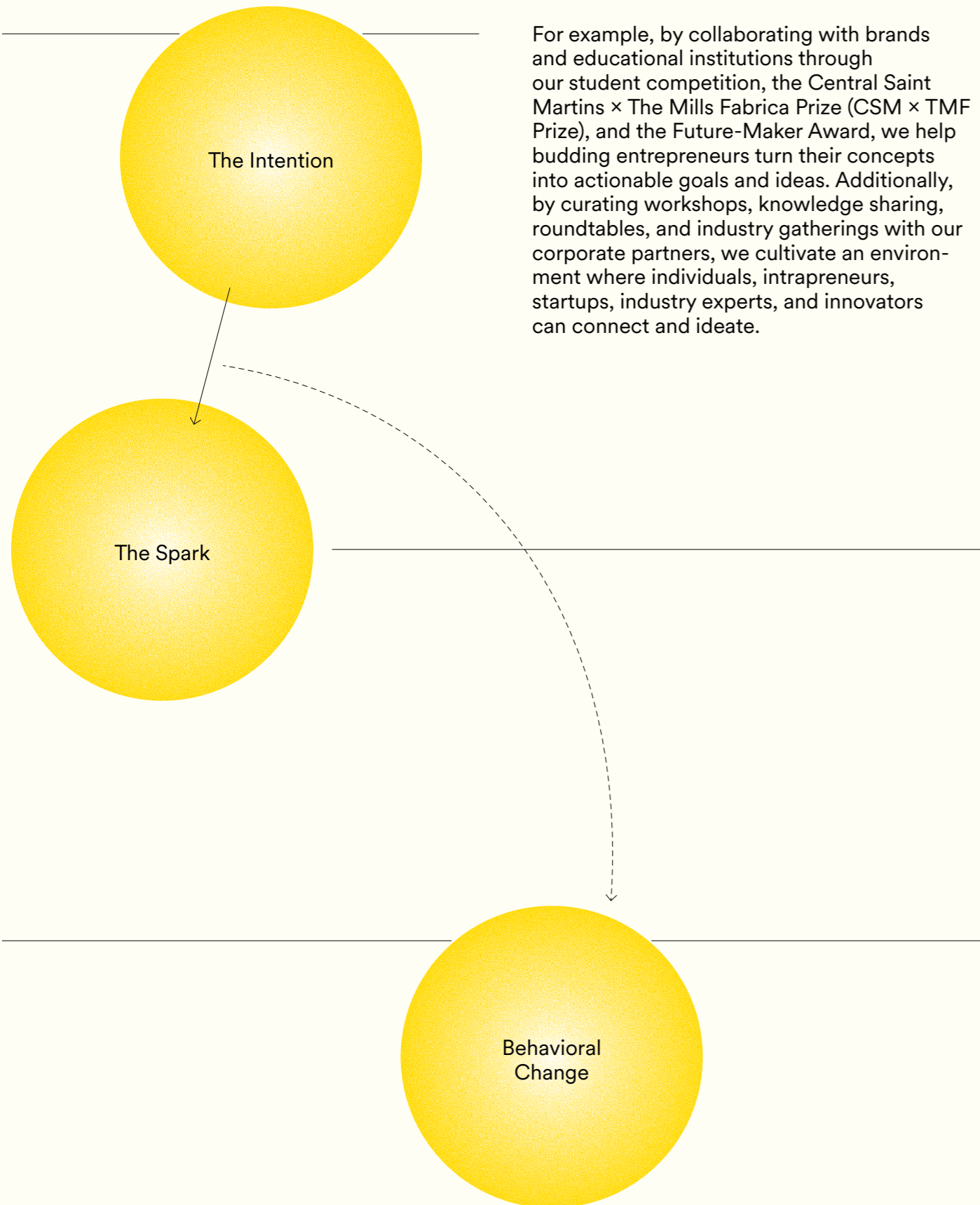
# The Spark

The Ignition to the Creative Process

“The Spark” represents the moment where an initial concept is created and is set in motion to be developed further with clear, actionable goals to pursue it into a selection of mature ideas. This is built from the foundation created by “The Intention”.<sup>5,6</sup>

→ Levers to Turn The Intention into Ideas

For example, by collaborating with brands and educational institutions through our student competition, the Central Saint Martins x The Mills Fabrica Prize (CSM x TMF Prize), and the Future-Maker Award, we help budding entrepreneurs turn their concepts into actionable goals and ideas. Additionally, by curating workshops, knowledge sharing, roundtables, and industry gatherings with our corporate partners, we cultivate an environment where individuals, intrapreneurs, startups, industry experts, and innovators can connect and ideate.



## 2.2 Core-Innovation Process

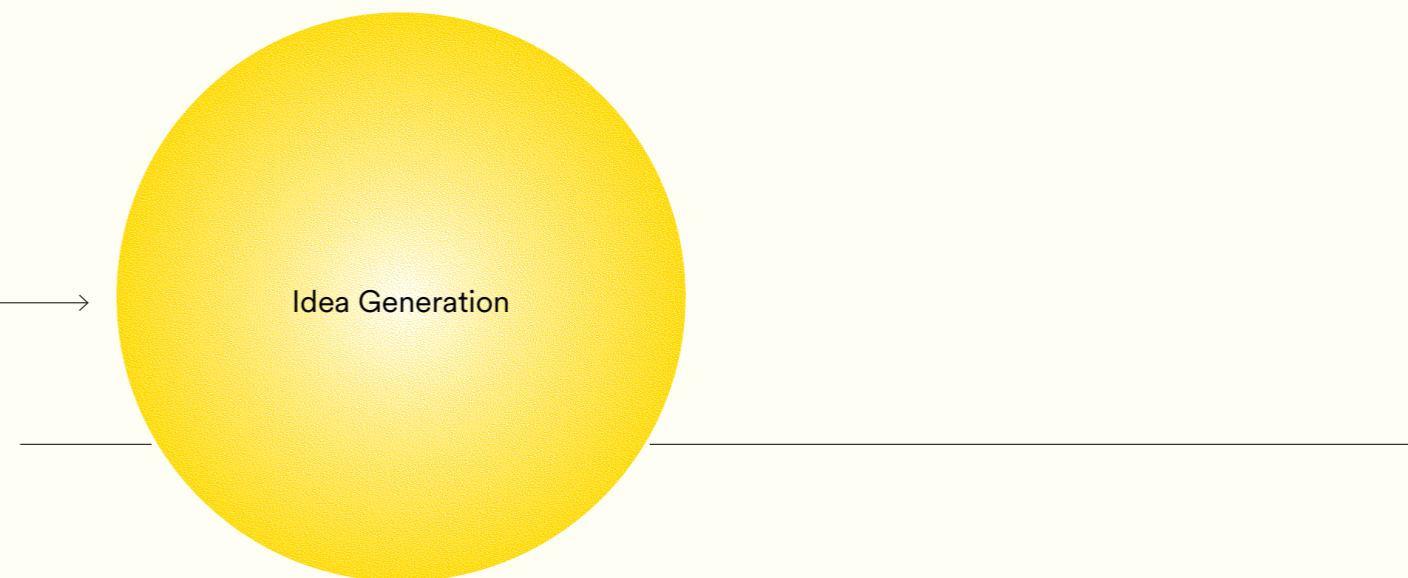
### Idea Generation

Turning Ideas and Goals into The Idea

The various ideas generated during “The Spark” are evaluated and refined. The most promising ideas are then developed and tested to identify “The Idea” that demonstrates the best market product fit. This selected idea is further nurtured into a commercially viable product.

→ Levers Used to Turn Ideas into The Idea

Fabrica facilitates this through our Incubation Program, Partnership Initiatives, Techstyle for Social Good, and Fabrica Lab. These pillars empower ideators, entrepreneurs, and startups with feedback, validation, testing, and iterative opportunities for further product development.



When many ideas become one, this is where an innovator’s journey takes off

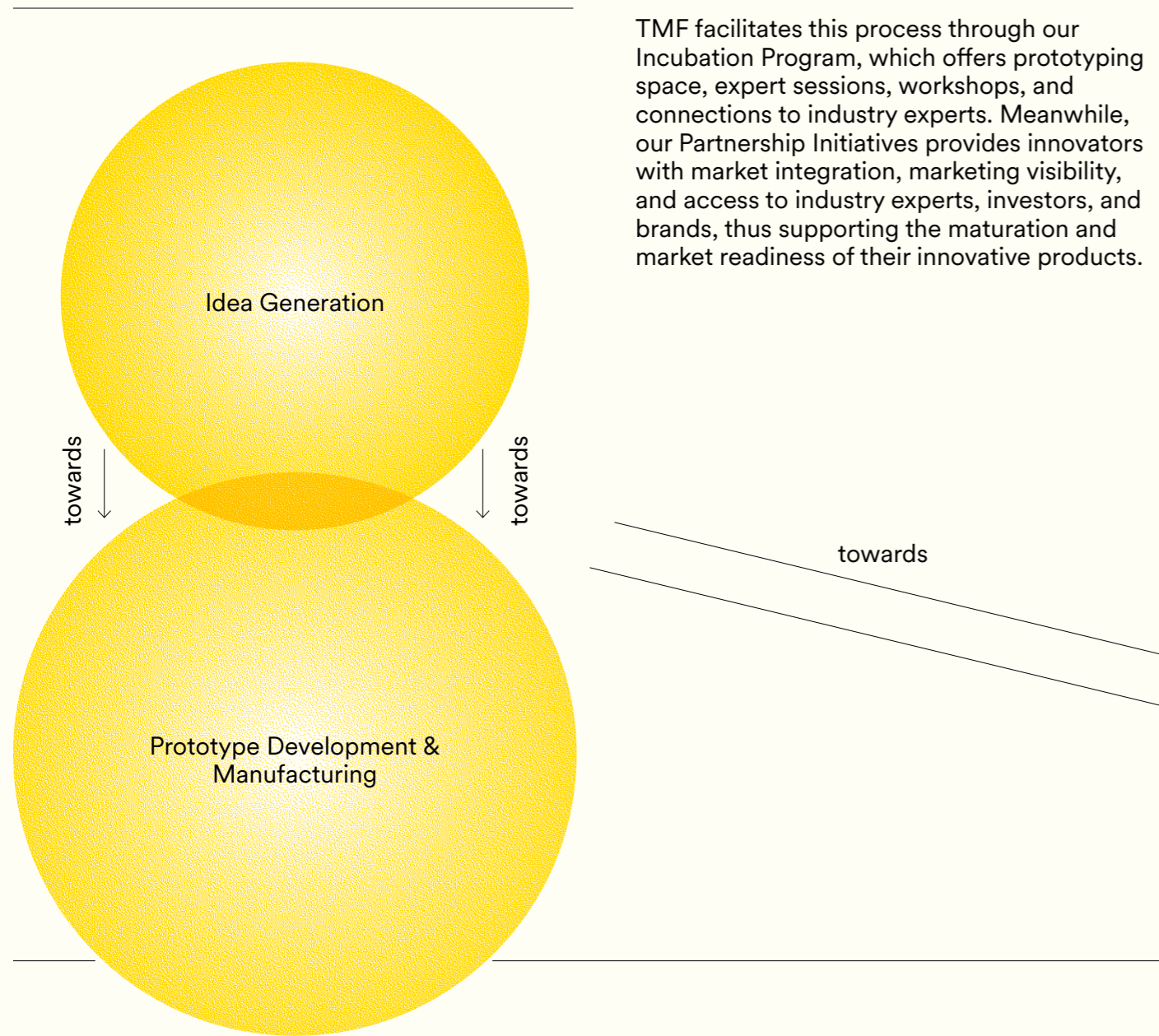
# Prototype Development and Manufacturing

Supporting the Evolution of The Idea into a Prototype

Turning “The Idea” into a prototype is crucial in commercializing innovation. The Mills Fabrica supports the iterative refinement of “The Idea” into a proof of concept or early prototype and provides opportunities for collaboration and feedback.<sup>7</sup> We aim to support entrepreneurs in expanding their ideas to reach a broader audience, allowing the ideas to evolve, adapt to market needs, and transform into proof-of-concepts or early prototypes.<sup>8</sup>

→ Levers Used to Support the Development of Prototypes

TMF facilitates this process through our Incubation Program, which offers prototyping space, expert sessions, workshops, and connections to industry experts. Meanwhile, our Partnership Initiatives provides innovators with market integration, marketing visibility, and access to industry experts, investors, and brands, thus supporting the maturation and market readiness of their innovative products.



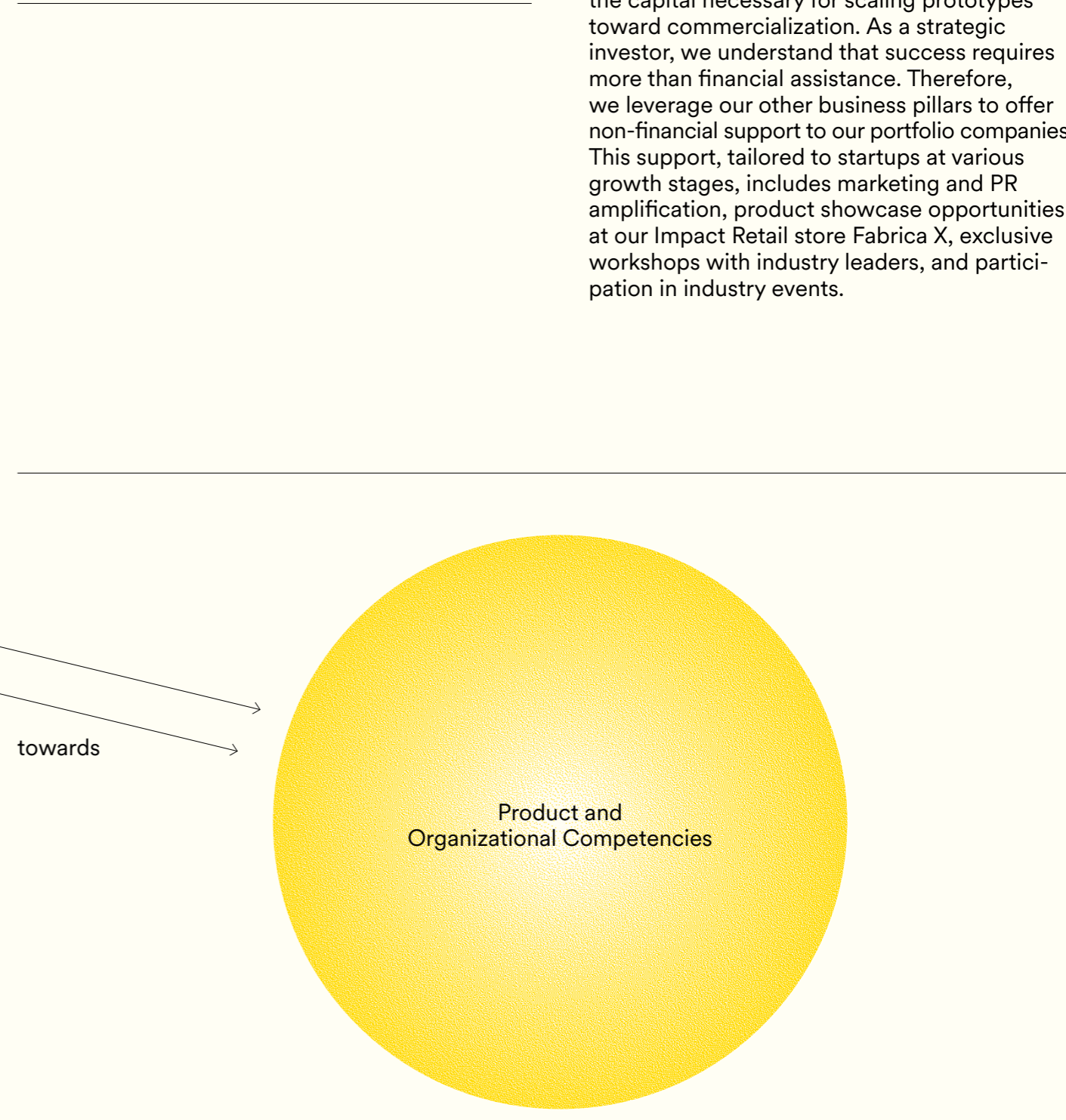
# Product and Organizational Competencies

From Prototype to Market-Ready Product

This stage marks a pivotal point where an innovative product can achieve planet-positive change through successful market integration. The development of the innovation and the founders’ ability to navigate the startup’s growth are crucial for ensuring its success.

→ Levers to Accelerate Innovations for Change

The Fabrica Investment Fund, encompassing both direct and fund investments, empowers high-impact potential innovations by providing the capital necessary for scaling prototypes toward commercialization. As a strategic investor, we understand that success requires more than financial assistance. Therefore, we leverage our other business pillars to offer non-financial support to our portfolio companies. This support, tailored to startups at various growth stages, includes marketing and PR amplification, product showcase opportunities at our Impact Retail store Fabrica X, exclusive workshops with industry leaders, and participation in industry events.



## 2.3

# Planet-Positive Change: System Thinking to Foster and Accelerate Innovations for Impact

Planet-positive change occurs when innovators, supported by The Fabrica Investment Fund, offer environmentally and socially superior solutions that surpass existing technologies. The solutions supported can be categorized within the ten circular economy strategies shown in Figure 4. As they mature, they replace incumbent technologies, generating positive socioenvironmental impact.

In our 2022 Impact Report, we illustrated how we align our impact thesis with planetary boundaries. This framework identifies nine critical boundaries that help us understand the limits of human activities to avoid causing irreversible harm to Earth's ecosystems (fig.5). By supporting innovations that align with the planetary boundaries, we can avoid ecosystem and human health damages by reducing our exposure to the outlined impact pathways and ultimately ensure we can safeguard our planetary health (fig.6).

This alignment also applies to our approach to partnerships, Impact Retail store content, and Fabrica-led events. Integrating these efforts with the planetary boundaries framework raises awareness and emphasizes the urgent need to address environmental issues. This also encourages individual behavioral changes, such as more conscious consumer behaviors, creating a positive impact on a personal level.

Fig. 4: Circular-economy strategies: The strategies illustrated can be applied to a product, individual, company, industrial, and regional level.<sup>9</sup>

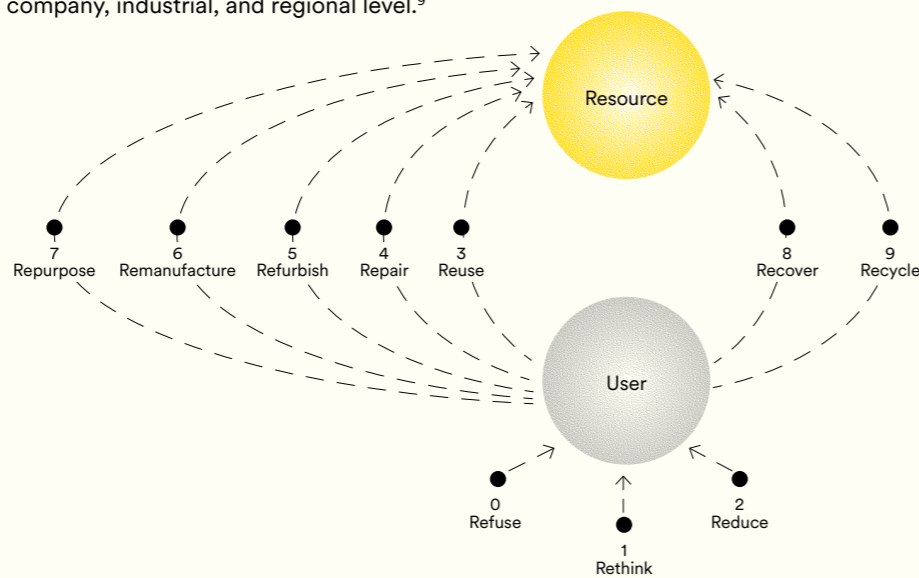
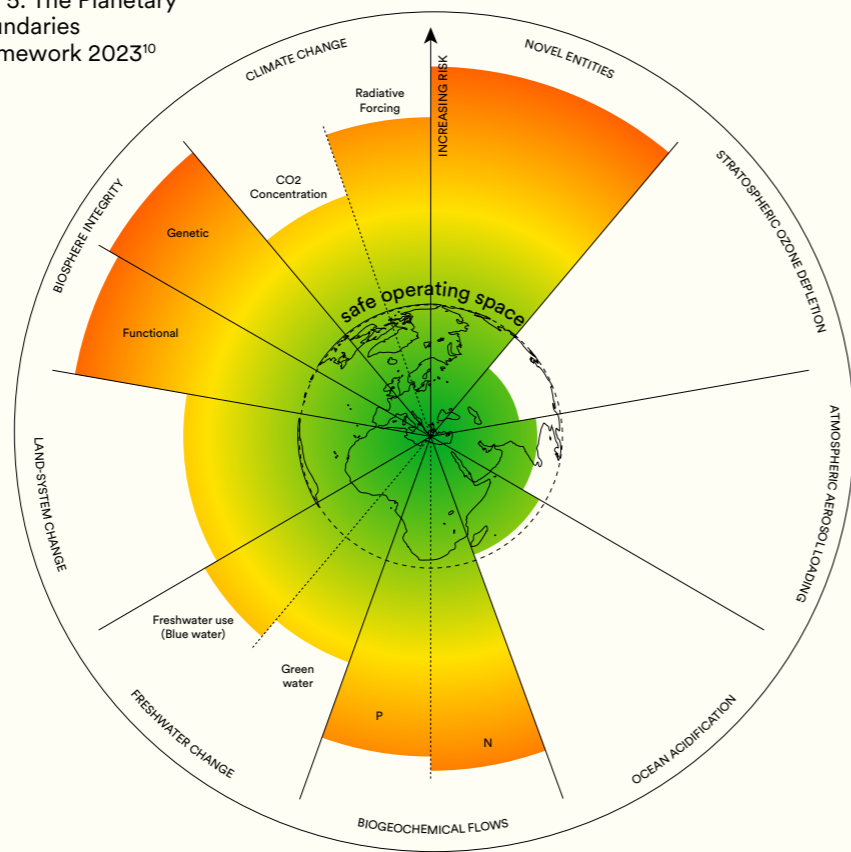


Fig. 5: The Planetary Boundaries Framework 2023<sup>10</sup>



By supporting innovations that aligns with the planetary boundaries, we are able to avoid the below impact pathways to ecosystem and human health damages.

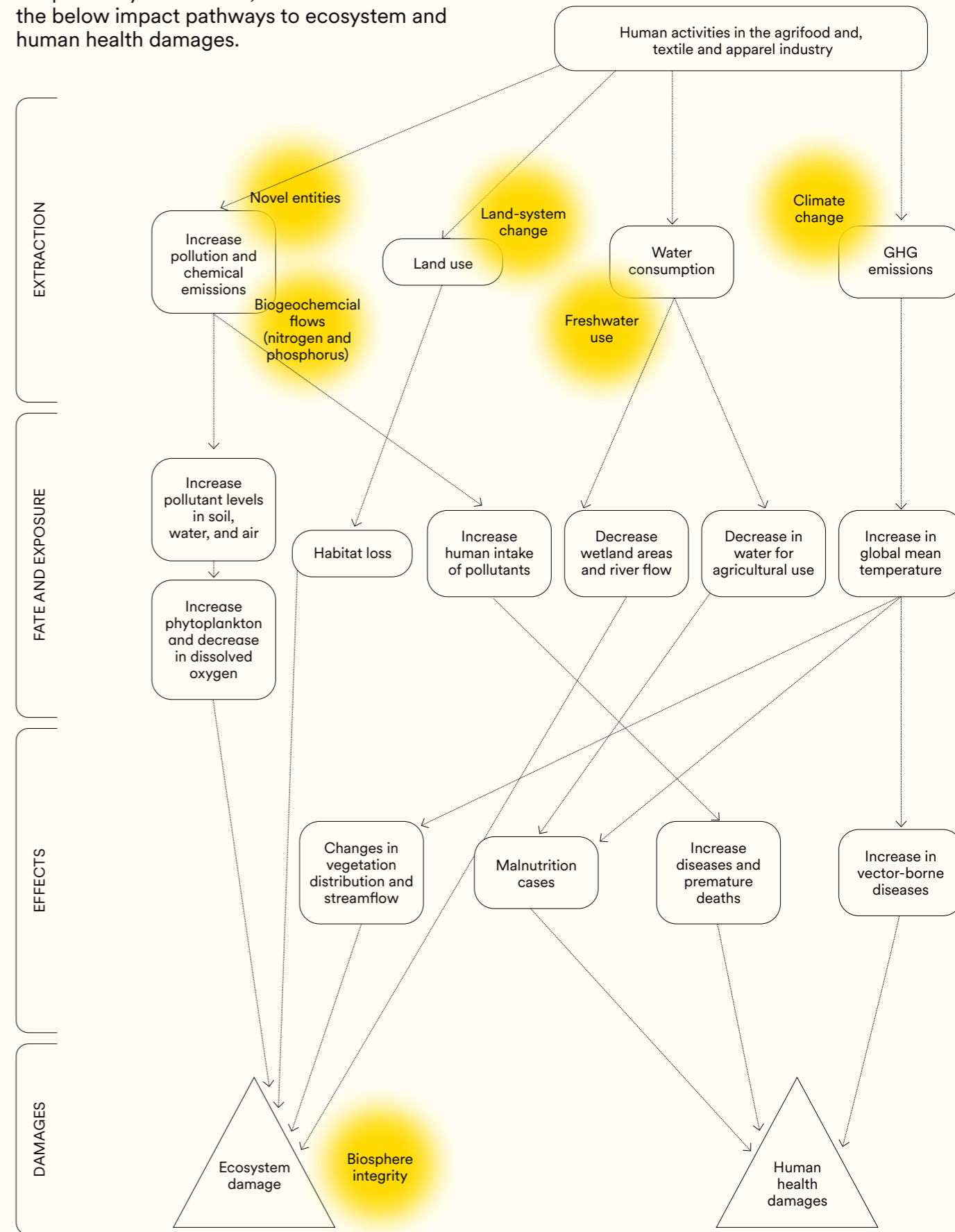
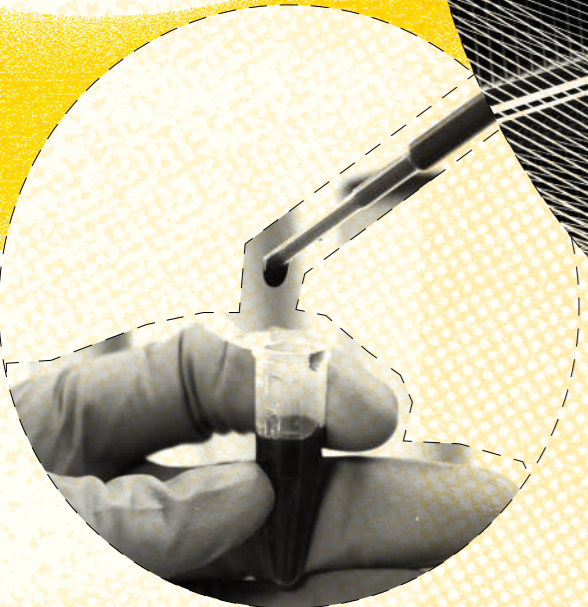
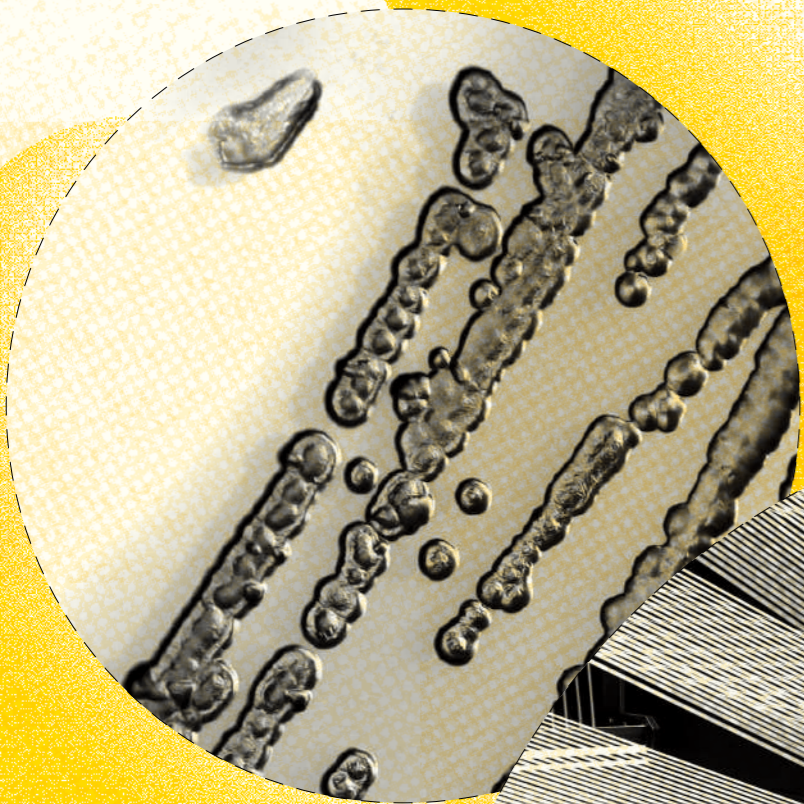


Fig. 6: Mapping of planetary boundaries with the impact pathway of human activities in the techstyle and agrifood industries. The diagram highlights the importance of reducing the transgression of various planetary boundaries to address impact pathways that could harm ecosystems and human health. It specifically represents certain impact pathways resulting from human activities in these industries.<sup>11</sup>



# Fabrica Investment Fund: Our First Step in Creating Planet- Positive Change by Accelerating Innovators with High-Impact Potential

Part

Since our establishment, we have invested strategically in over 20 pioneering startups and funds operating in the techstyle and agrifood industries. Our investment decisions are aligned with the planetary boundaries framework, ensuring that we avoid carbon tunnel vision.<sup>12</sup> This approach empowers us to invest in innovations that address not only climate change but also other crucial socioenvironmental challenges of equal significance. By broadening our focus, we can drive holistic solutions that create a positive impact across multiple dimensions.<sup>13,14</sup>

With our expanded portfolio, we now encompass innovations in upstream, midstream, and downstream supply chains for both industries. This comprehensive approach enables us to support a diverse range of innovations that revolutionize the way food and textiles are produced and consumed while also facilitating innovations that empower consumers to embrace a more conscious lifestyle.

As the climate crisis intensifies, our impact thesis has evolved to recognize that the majority of ecological impact within the two industries

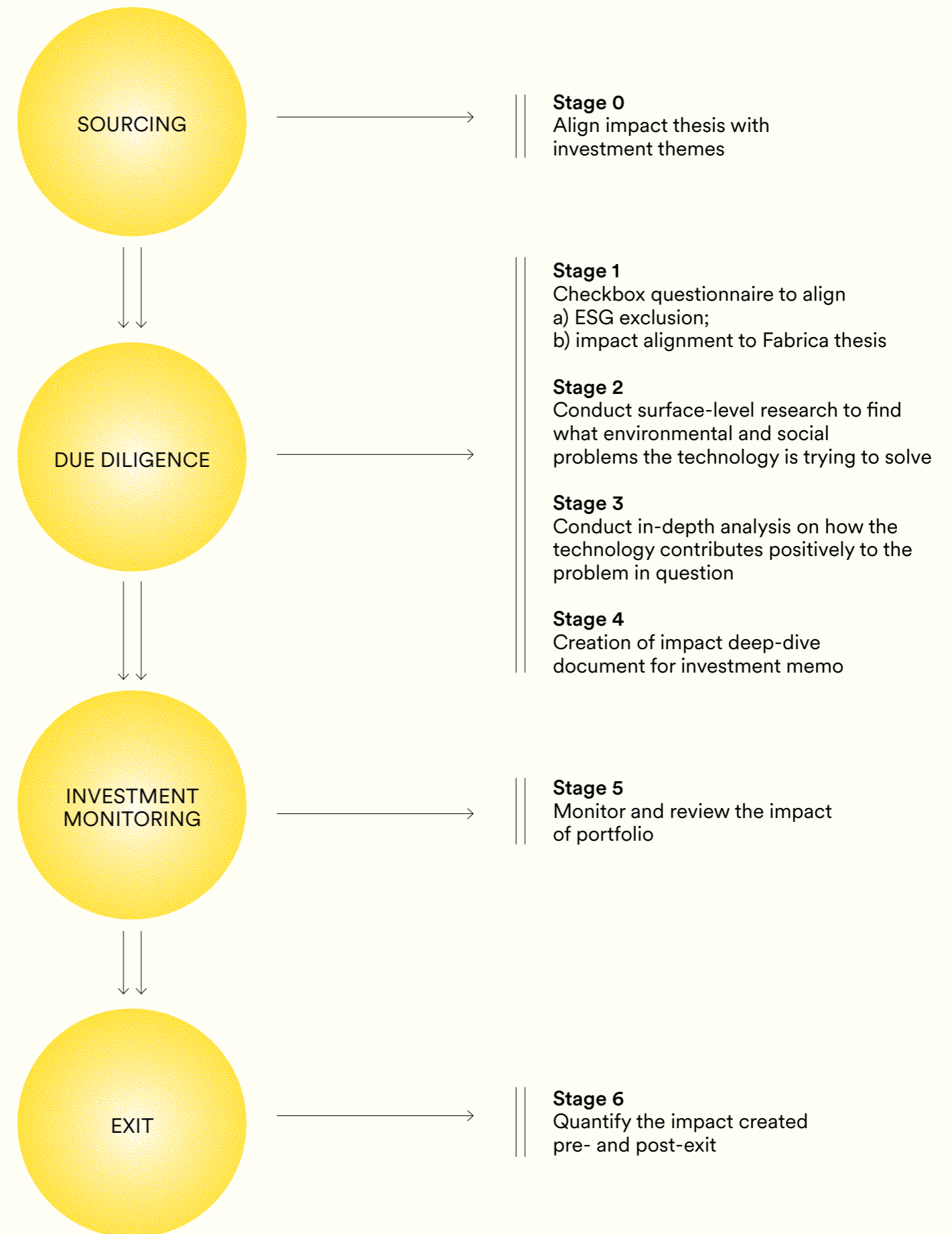
originates in the upstream segments of their supply chains. Therefore, our current and future focus lies in supporting upstream innovations that can fundamentally transform both industries.

In 2023, we strengthened our commitment to generating positive impact by integrating a tailored impact management process throughout our investment lifecycle (fig.7). This process entails a thorough analysis that spans from due diligence to portfolio management, ensuring a comprehensive evaluation of each deal's current and future impact potential.

To understand the impact potential of innovations at various stages, we employ a combination of bottom-up and top-down impact research approaches when evaluating each of our investments.<sup>15</sup> For example, requesting lifecycle analyses (LCA) to assess a company's environmental impact and mapping it against our impact thesis based on the planetary boundaries framework. By implementing this bespoke impact management process, we strive to maximize the positive outcomes derived from our investments.

**Igniting a paradigm shift in the techstyle and agrifood industries by targeting upstream innovation to unlock opportunities for fundamental transformation.**

Fig. 7: Impact Management Timeline





# Portfolio Highlights

## 3.1 Impact of Our Portfolio

Direct and fund investments play a crucial role in our innovation framework, facilitating the development, scaling up, and commercialization of innovative solutions. By doing so, we can reach a broader spectrum of startups, expanding the scope of impact generation. Our investments have already demonstrated significant potential for creating positive change within the techstyle and agrifood industries, and we will highlight some notable examples in the following section.

# Circ

Pioneering Recycling Technology that Redefines Possibilities

Circ's mission is to protect the planet by recycling polycotton-blend textiles using a proprietary hydrothermal process. This innovation is urgently needed to address the growing issue of "Waste Colonialism", where take-back schemes from cities like London often result in landfills in places like Bamako and contribute to an influx of 15 million pieces of used clothing in Ghana each week.<sup>16,17</sup> Circ's technological innovation has attracted collaboration from high-street brands like Zara to luxury players like Mara Hoffman:

In April 2023, Circ and Zara debuted the world's first-ever collection made from polyester-cotton waste, which can be recycled again. The collection features lyocell garments made with 50% recycled textile waste and polyester garments made with 43% recycled polycotton textile waste.<sup>18</sup>

In October 2023, Mara Hoffman became the first luxury brand to use Circ's recycled materials. The collaboration "The Dress that Changes Everything" looks and feels like it's made from "top-notch silk", said Hoffman in an interview.

At the end of the dress' life, the brand can take back, recycle, and create a new dress for the consumer, even going as far as committing to switch all of the label's virgin lyocell to Circ's regenerated lyocell over the next three years.<sup>19</sup>

In 2023, The Mills Fabrica nominated Circ for The Earthshot Prize, for its significant contribution to the industry and potential far-reaching impact. As a result, Circ became one of the finalists, solidifying its recognition and achievements. As a certified B Corp, Circ is perfectly placed to scale up in a way that's just and fair to its employees and suppliers, as well as fundamentally disrupting the fashion industry. It is currently engineering its first full-scale commercial facility.

As of the end of 2023, Circ has recycled over 114,000kg of polycotton textile waste, contributing an estimated reduction of 194,500kg of carbon emission equivalent.<sup>20</sup>

Recycled over

**114,000kg** of polycotton textile

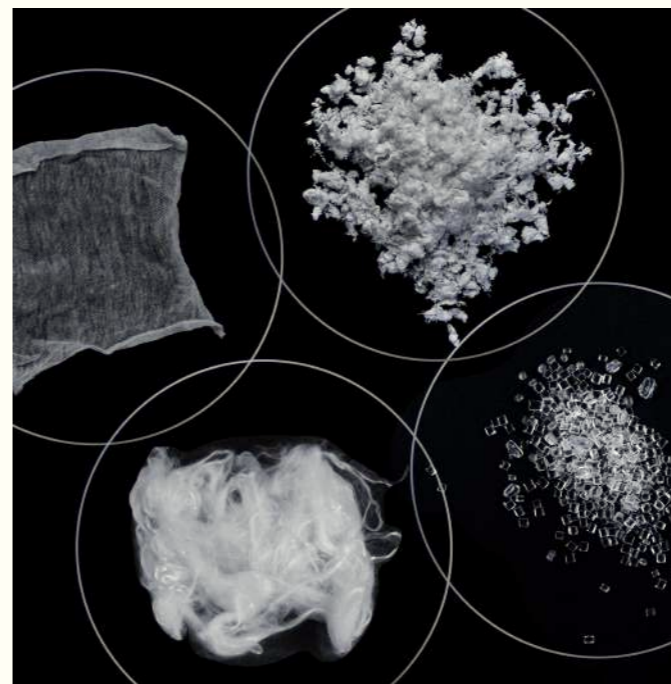
Avoided

**194,500kg** CO2 emission

Certified

**B** corporation

Circ's innovative recycled materials are utilized in United Arrows' Green Label Relaxing collection. Source: Circ



Circ's hydrothermal process turns polyester-cotton blend fabrics into cellulose and recycled polyester. Source: Circ



# Colorifix

Harnessing the Power of Nature to Transform Dyeing with Revolutionary Innovation

Colorifix, inspired by the founders' research on water contamination in Nepal, uses DNA sequencing to create engineered microorganisms that produce sustainable color pigments, significantly reducing the textile industry's environmental impact.

Recognizing Colorifix's remarkable achievements, The Mills Fabrica has nominated it in 2023 for both The Earthshot Prize and Dezeen's Material Innovation of the Year Award. It was a finalist of The Earthshot Prize and the winner of Dezeen's Material Innovation of the Year Award, firmly establishing Colorifix as a trailblazer in the fashion industry.

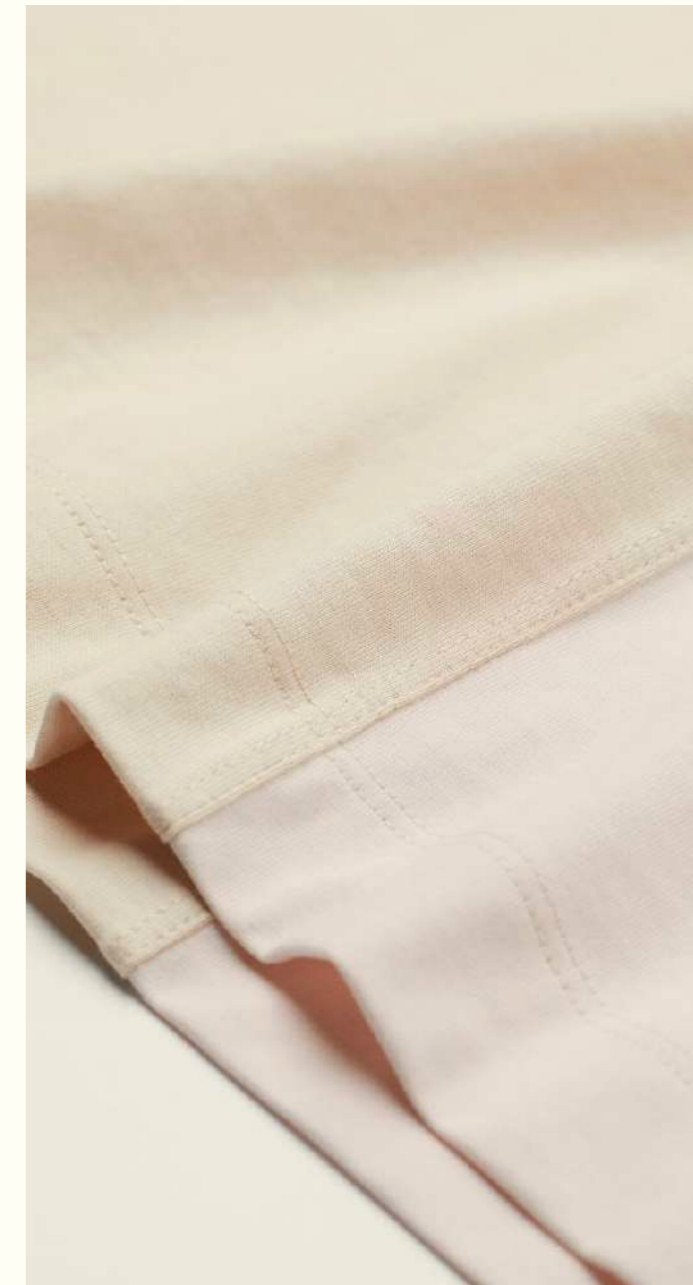
## Earned the Oeko-Tex Eco Passport certification

In 2023, Colorifix reached a significant milestone by earning the Oeko-Tex Eco Passport certification<sup>21</sup>. This is the first biological dye safety test that includes additional biocompatibility tests for skin allergenicity, skin irritation, and cytotoxicity, setting a new benchmark in the textile industry. The certification affirms that Colorifix's culture media and dyes meet the highest standards, including adherence to the Manufacturing Restricted Substance List (MRSL) Zero Discharge Hazardous Chemicals (ZDHC) at level 3 — the highest level in the current program and meeting the criteria set by Oeko-TEX for good product stewardship including occupational health & safety, and environmental and quality management. The process also shows that the dyed fabrics conform to the OEKO-TEX 100 Standard.

## Became the Finalist for the prestigious The Earthshot prize in 2023

## Winner of Dezeen's Material innovation of the year 2023

Committed to pushing the sustainability boundaries, Colorifix collaborated with Vollebak, a sportswear brand known for creating innovative, high-performance clothing, driven by their shared goal of driving progress in the techstyle industry, and launched a capsule collection dye with their technology. To make this technological breakthrough more widely available to customers, its technology is currently active on three customer sites across Europe across different stages of dyeing, including yarn, fabric, garment, and printing across a broad range of natural and synthetic fibers, while using existing industry standard dyeing machines. This truly showcases the versatility of Colorifix's revolutionary pigments and dye. With plans to expand beyond Europe to Brazil and Southeast Asia, consumers will likely see more of this technology used in the industry.



L: Pinpointing the exact genes that lead to the production of the pigment, and Colorifix then translates that DNA code into their microorganism. Source: Colorifix  
R: The technology was launched worldwide in 2021 through H&M's Color Story Collection. Source: Colorifix

Microorganisms have been our partners for millennia, helping us do everything from making bread to digesting our food. We have unlocked a way to use them to help us solve major environmental problems.

Orr Yarkoni, Colorifix CEO, Future World interview<sup>22</sup>



# Mango Materials

Tackling Climate Change and Plastic Pollution:  
Mango Materials' Breakthrough in Transforming Methane into Sustainable Biopolymers

More than 90% of global plastic production consists of virgin plastics derived from petroleum, which is energy-intensive and contributes to the release of greenhouse gases (GHGs). At the current trajectory, emissions from plastics production could be as high as 15% of the estimated carbon budget to keep warming below 1.5C.<sup>23</sup>

At the same time, an estimated 70% of plastics produced have already been discarded, ending up in landfills or entering rivers and oceans,<sup>24</sup> ultimately contributing to landfill methane gas releases and micro and nanoplastic pollution.

Mango Materials' innovation uses methane — a GHG 27 times more potent than CO2 and a key component in waste processes like wastewater treatment plants, landfills, and agricultural facilities — and turns it into poly(3-hydroxybutyrate) (P3HB), a member of the Polyhydroxyalkanoates (PHAs) family using ancient microbes.

Using this as the raw material, Mango Material creates YOPP and YOPP+, its PHA-based pellets. These pellets can be used in injection molding to create packaging, spun into fibers, or made into films. In 2023, Mango Materials' innovation gained massive momentum and captured the interest of multiple brands. In 2023, it collaborated with Allbirds, amongst other innovators, to create the world's first net-zero carbon shoe, MO.ONSHOT, to be released in 2024. Components like the logo badges are made using Mango Materials' PHA.

Beyond footwear, it has been manufacturing Natura's Biome soap dish in Brazil and received the largest reordered volume to date, showing Natura's confidence in Mango Materials' innovative material. The confidence in the material's versatility and durability is further demonstrated by the commitment made by Craze, which develops and produces (instant-reward) loyalty programs for market-leading FMCG brands, retailers, and agencies. Additionally, in December 2023,

Stella McCartney debuted a pair of sunglasses at COP28 in Dubai using Mango Materials' innovative technology.

Mango Materials' PHA can also biodegrade in marine environments. To leverage this feature, researchers from the University of Rhode Island collaborated with Mango Materials to explore the possibility of using its materials to create ocean products such as eel traps and ocean sensors. This could be a game-changing solution for oceangoing plastics, which degrade in the ocean, leading to microplastic pollution.

As plastic pollution's impact becomes more apparent, the techstyle and agrifood industries desperately need to shift away from single-use plastic packaging. With a material produced from methane gas that can safely biodegrade in the environment and a versatile material made into packaging or fibers, Mango Materials' PHA is an excellent substitute for traditional plastics.

Displaced

# 1.4 Tonnes

of plastics with their PHA<sup>(-26)</sup>

Avoided

# 836kg

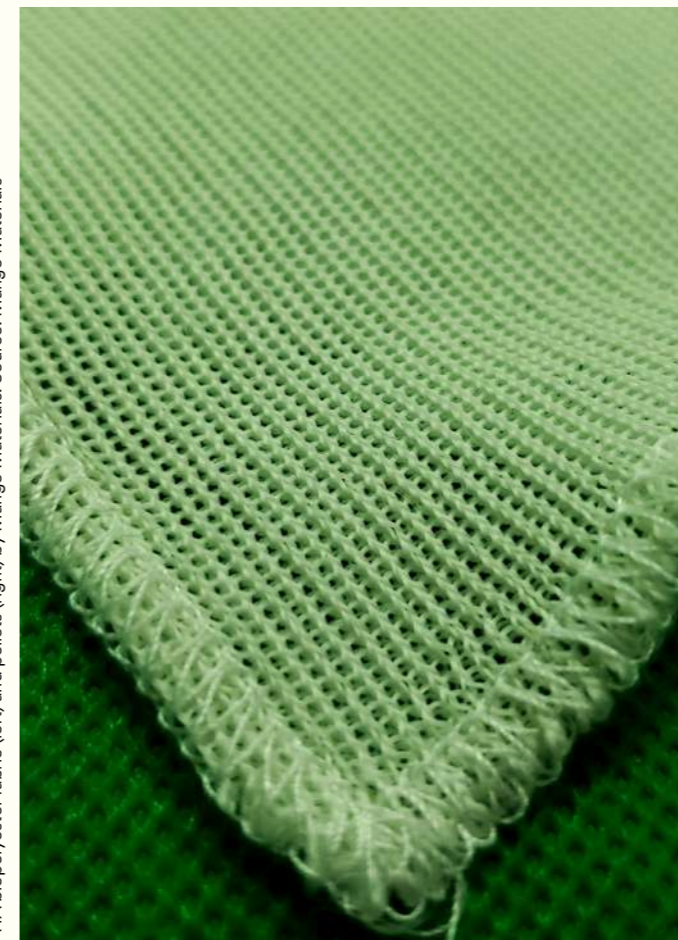
greenhouse gas emission equivalent (kgCO2e)

Certified

# B corporation

→ 25

PHA biopolyester fabric (left) and pellets (right) by Mango Materials. Source: Mango Materials



# unspun

Scaling a significant innovation for the apparel industry:  
3D weaving technology

unspun was founded to develop a scalable method for producing garments on demand, which would effectively eliminate overproduction and minimize fabric waste generated during production.

In 2023, unspun took its founding mission to a new level with the unveiling of Vega™, a proprietary robotic technology that has the potential to revolutionize fashion supply chains. Vega is the first-of-its-kind 3D weaving machine that produces seamless 3D woven textiles. This 3D weaving and technology is the fastest (10min), cleanest (>50% emissions reduction), and most cost-competitive way to make woven apparel.<sup>27</sup>

Because Vega™ 3D weaves semi-finished garments directly from yarn, it has the potential to shorten production lead times. It combines multiple stages of production: fabric preparation, weaving, material finishing, and cutting and sewing, fundamentally disrupting the way woven garments can be produced.

Vega™ also opens up the potential for localized micro-factories that support on-shore/near-shore and on-demand production of woven apparel.

This innovation dramatically reduces production lead times, with the actual weaving of pants taking only a few minutes.<sup>28</sup> This is a game-changer for the industry, offering unprecedented speed and efficiency.

By reducing the time it takes for raw materials to transform into woven garments for customers, brands can produce items in small batches with minimal inventory or adopt on-demand production without inventory. This increased agility allows companies to respond to the market's changing demands without overproduction. Simultaneously, the shorter supply chain provides stability by insulating firms from the uncertainties that often impact global supply chains.

On-demand production, made possible by Vega™, has been proven to dramatically reduce environmental footprint compared to an equivalent pair of pants produced using the air-jet weaving technique (Please refer to the results on the following page.<sup>29</sup>) This is a pivotal stride towards a more sustainable fashion industry, offering a glimmer of hope for a future with less impact.

Vega™ shortens the supply chain for operational and environmental efficiencies, ushering in a new way to think about production.

100% conventional cotton 3D woven pants made on demand

Global Warming Potential (kgCO<sub>2</sub>eq) - 53%

Primary Energy Demand (MJ) - 49%

Blue Water Consumption (L) - 39%

100% virgin polyester 3D woven pants made on demand

Global Warming Potential (kgCO<sub>2</sub>eq) - 42%

Primary Energy Demand (MJ) - 37%

Blue Water Consumption (L) - 31%

The first commercially available 3D woven products were launched during Eckhaus Latta's Spring-Summer 2024 New York Fashion Week show, where Zoe Latta praised unspun's 3D weaving for its ability to enhance the functionality of clothes through technology.<sup>30</sup> (Bazaar 2023). The company then launched a collection for Parisian brand TEGET, and most recently announced a long-term partnership with retail giant, Walmart. As a true game-changer, unspun has the power to propel the industry toward a sustainable and innovative future, pushing boundaries and establishing new benchmarks for responsible fashion practices.



L: Vega™ is estimated to be 10X faster and 5X cheaper than traditional weaving. Source: unspun  
R: unspun's 3D weaving machines. Source: unspun

# Michroma

Redefining Food Coloring: Michroma's Breakthrough in Safer And Sustainable Ingredients

Michroma is revolutionizing natural ingredient development by harnessing the power of fungi. Its flagship product, Red+, is a food colorant derived from fungi and produced through fermentation. This groundbreaking approach is paving the way for the next generation of food colorants and leading the shift away from conventional methods such as petrochemical-derived synthesis, plant extraction, and animal use.

Michroma is taking a crucial initial step toward transitioning our food system away from synthetic colorants. Recent research has revealed the alarming links between several synthetic dyes, including Red 40, and hyperactivity in children.<sup>31</sup> As evidence of the growing concern, in 2023, California became the first U.S. state to ban four food additives, including red dye 3.<sup>32</sup>

Red+ is a certified non-GMO and vegan product that boasts pH stability and temperature resistance. This innovative food colorant has the

potential to replace current uses of synthetic red food colorants in a wide range of food items, including baked goods, beverages, confectionery, meat, and alternative meat products. By offering a healthier alternative, Michroma's Red+ gives consumers a better choice.

By utilizing agro-industrial waste as feedstock in its fermentation process, Michroma effectively upcycles waste from various industries, reducing landfill waste and promoting the principles of a circular economy.

The production process of the colorant used by Michroma results in significantly lower water and land usage compared to natural colorants. This not only minimizes resource input but also alleviates strain on our ecosystem.

By sourcing its raw materials from local suppliers, Michroma effectively shortens its supply chain, reducing transportation emissions.

Michroma's Red+, a non-GMO and vegan food colorant derived from fungi and produced through fermentation.



Michroma's Red+ in macarons. Source: Michroma

Red+ offers pH stability and temperature resistance that make it ideal for coloring products across a wide array of food categories.



Top: Michroma's Red+ in candies. Source: Michroma  
Bottom: Michroma's Lab. Source: Michroma

# The Supplant Company

Addressing Food Insecurity and Climate Change:  
The Supplant Company's Transformative Solutions

The global food system is in crisis, with 10% of the world population hungry, 25% overweight or obese, and a further 25% micronutrient deficient. The UN estimates that food production must increase by 70% by 2050 to meet the demands of a growing population. Climate change and deforestation further threaten agriculture, exacerbating food insecurity and nutritional access issues. The Supplant Company's solution is poised to be a solution to this growing problem.<sup>33</sup>

In 2023, The Supplant Company further harnessed its platform to transform agricultural side-streams into another revolutionary new product: "Supplant Grain & Stalk Flour" (G&SF). This product, which is 25% lower in calories and six times higher in fiber than conventional flour, has the potential to revolutionize global wheat flour. By incorporating the stalk into the flour blend, The Supplant Company could boost global wheat production by an astounding 33% and slash land use by 25%, paving the way for a substantial increase in overall output.

The Grain & Stalk flour complements "Sugars from Fiber" (SFF), The Supplant Company's first ingredient, which is a 1:1 sugar replacement made from agricultural side-streams that has up to 75% fewer calories and an 88% lower glycemic response compared to sucrose and glucose respectively.

Given G&SF's health and environmental potential, The Supplant Company has recently unveiled a pasta made from this innovative ingredient, which has been introduced in the dining halls of the University of Cambridge, promoting healthier and more sustainable options for students.

Through its platform, The Supplant Company continues to amplify its mission of developing ingredients that prioritize both human well-being and environmental stewardship. Positioned as a key player addressing the pressing challenges of climate change, health and nutrition, and food security, The Supplant Company exemplifies the power of simultaneous action on these interconnected fronts.

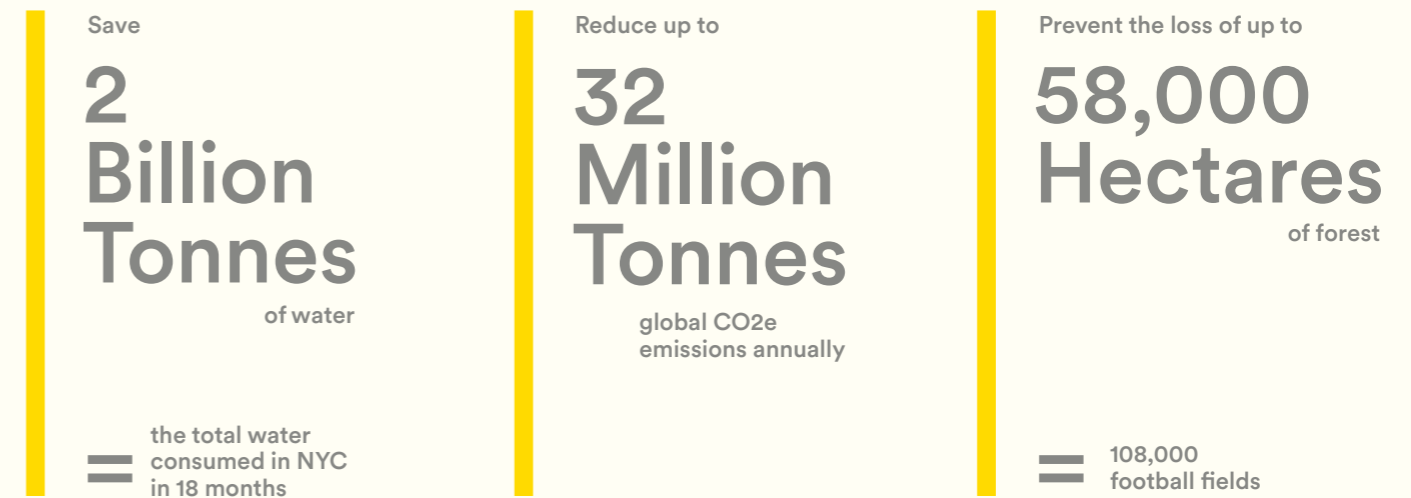


The Supplant Company Lab. Source: The Supplant Company

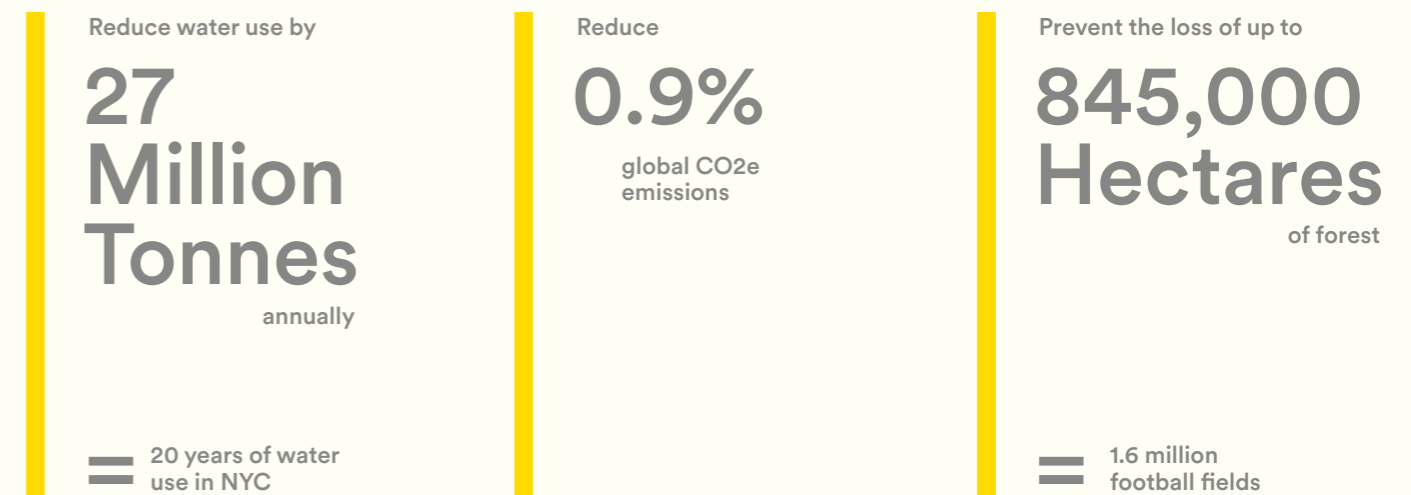


Supplant™ Grain & Stalk Flour. Source: The Supplant Company

If Sugars from Fiber replaced enough cane sugar to offset the need for deforestation (470 thousand tonnes/year), then it is estimated to<sup>34</sup>:



The current product range combined (Sugars from Fiber and Grains & Stalk Flour) has the potential to<sup>35</sup>:



Further, due to the fiber in SFF and G&SF, adoption at an individual level could lead to health benefits. If 50% of an individual's average daily sugar intake and 50% of their wheat flour intake were replaced with SFF and G&SF respectively, it could<sup>36</sup>:



# Agfunder

Empowering Innovators, Revolutionizing Food and Agriculture, Nourishing the Future

AgFunder specializes in investing in innovative AgTech and food-tech companies to transform the agrifood industry. Its investment strategy identifies early-stage and growth-stage startups with disruptive technologies and scalable business models, providing them with the necessary capital to fuel their development and expansion.

It actively seeks out startups leveraging advancements in precision agriculture, robotics, artificial intelligence, biotechnology, and digital platforms. By investing in these cutting-edge technologies, AgFunder aims to drive efficiency, sustainability, and productivity in agriculture while addressing key challenges such as food security, environmental impact, and supply chain optimization.

Two of its portfolio companies stand out as exemplars of innovation with the potential to disrupt the industry. These companies are addressing crucial food-related sustainability challenges, highlighting AgFunder's significant contributions to shaping a more sustainable future.



Asparagopsis seaweed can reduce methane emissions by up to 90%. Source: CH4 Global

## CH4 Global

CH4 Global is a company that focuses on reducing methane emissions from cattle with its innovative feed called Methane Tamer™ Beef Feedlot. Global methane emissions are a significant problem, with 16% of the emissions being contributed by ruminant animals. In the agriculture sector, a staggering 73% of methane comes from livestock, with beef and dairy cattle responsible for 65%.<sup>37</sup> CH4 Global's natural supplement made from Asparagopsis seaweed has been proven to reduce methane emissions by up to 90%.<sup>38</sup>

reduce methane emissions by up to

**90%**

This year, CH4 Global is expected to launch the world's first commercial-scale Asparagopsis facility, further advancing their efforts to mitigate emissions.

## Atomo Coffee

Atomo Coffee is disrupting the coffee industry by developing coffee without needing coffee beans. It is revolutionizing coffee production through a unique "reverse engineering" process involving upcycled ingredients with a molecular structure similar to coffee. Through this innovative approach, it can create a coffee-like beverage that captures traditional coffee's aroma, flavor, and characteristics. By harnessing the power of these upcycled ingredients, Atomo offers a sustainable and environmentally conscious alternative to conventional coffee production methods. Every pound of beanless coffee produces 83% less carbon emissions and requires 70% less farmland.<sup>39</sup>

Every pound of beanless coffee:

**83%** less carbon emission

**70%** less farmland used



Atomo Coffee's beanless coffee produces 83% less carbon emissions and requires 70% less farmland. Source: Atomo Coffee

# Fall Line Capital

Empowering Sustainable Agriculture:  
Fall Line Capital's Expertise Driving AgTech and Food Tech Innovations

Fall Line Capital's expertise in accelerating innovative AgTech and food tech solutions perfectly complements our impact thesis. It enables the advancement of solutions that promote agricultural efficiency, sustainability, and transformative change within the agrifood industry. Its focused approach exemplifies a steadfast commitment to harnessing technology as a key driver of growth and impact in the agricultural landscape.

The fund has invested in various agrifood technologies, including microbial cover crops, smart irrigation valves, CO2 removals, plant-based alternatives, cell-cultured seafood, robotic weeding, next-gen crop protection, and animal oral vaccines.

The fund also supports its portfolio companies in developing a scientific approach to impact measurement and alignment with Sustainable Development Goals (SDGs). By helping its portfolio to employ recognized methodologies such as life cycle assessment and emphasizing the quantification and reporting of metrics, it showcases a strong commitment to impact management.

The tracked metrics range from synthetic nitrogen fertilizer avoided, greenhouse gas emissions avoided and removed, improvement in water use efficiency, tonnes of crop protection products replaced and metric tonnes of herbicide replaced.

Fall Line Capital also track metrics related both to improved animal welfare and worker health and safety.

With this approach, Fall Line Capital ensures that its investees embody its forward-thinking and impactful nature.



Fall Line Capital's expertise in venture capital, science, food, and agriculture makes it a unique partner for early-stage technology companies in these markets. Source: Fall Line Capital



Micropep's Lab. Source: Micropep

## Pluton Biosciences

Pluton Biosciences leverages the power of microbes to create cost effective, innovative solutions that address agriculture's sustainability challenges. Its flagship product, Microbial Cover Crop™, offers significant potential to expand and streamline farmers' adoption of cover crops. By increasing soil coverage, farmers can achieve multiple productivity and climate benefits, including decreased soil erosion, reduction of synthetic nitrogen fertilizer, avoidance of greenhouse gas emissions, and carbon sequestration in soils.

## Micropep

Micropep is at the forefront of the next revolution in farming, utilizing scientific innovation to work in harmony with nature. Unlike existing techniques that permanently modify plant genomes, Micropep pioneered the use of micropeptides, offering a more adaptable and dynamic approach to controlling crop pests and weeds. By leveraging this biotechnology, Micropep aims to enhance farming practices by increasing crop quality, improving yields, and ensuring overall safety. Its pioneering efforts in micropeptide-based innovations provide practical solutions for farmers and contribute to the advancement of sustainable agriculture. Using its technology in farms means it can replace existing conventional chemical-based crop protection products with species-specific molecules of biological origin, thereby decreasing knock-on environmental effects

By prioritizing innovation and rigorous impact measurement, Fall Line Capital aligns with The Mills Fabrica's goal of achieving tangible and measurable positive environmental and social impact in the agrifood industry.

# Good Fashion Fund

A Unique Impact Investment Model that Amplifies the Impact Potential of Manufacturers in the Textile Industry

The Good Fashion Fund (GFF) acts as a catalyst for sustainable textile manufacturing through long-term USD loans and comprehensive environmental and social (E&S) support. Primarily targeting India and Bangladesh, its investment focuses on driving impact in critical areas like wet processing, wastewater management, and recycling.

Developed upon the Fair Trade Textile Standard program, GFF has developed its own E&S Framework called the “Five Goods” framework, to uphold industry-leading standards and practices. It demands its investees a minimum 50% reduction in one of Materials, Energy, and Water (“Goods”) within its “Five Goods” framework.

GFF’s portfolio companies are already making a positive impact on the industry through technologies like energy-efficient spinning equipment, best-in-class washing equipment, and zero-liquid discharge technology.



Good Fashion Fund supports sustainable textile manufacturing primarily in India and Bangladesh. Source: Good Fashion Fund

## Pratibha Syntex Limited, India

Pratibha Syntex has also benefited from GFF’s investment by installing new spinning equipment, solar panels, a continuous tumble dryer, and an improved effluent treatment system. The tumble dryer alone has led to a 73% energy saving, while the spinning equipment enhances efficiency, reducing waste and energy consumption. With over 30% of its energy now sourced from renewables, it plans to reach 50%. The effluent treatment plant improvements have enabled water recycling, eliminated chemical sludge, and reduced energy consumption. Moreover, its commitment extends to treating neighboring wastewater.<sup>40</sup>

Over  
**30%**  
of its energy is now sourced from renewables

Tumble dryer has led to  
**73%**  
energy savings compared to conventional machinery

## Progress Apparel Limited, Bangladesh

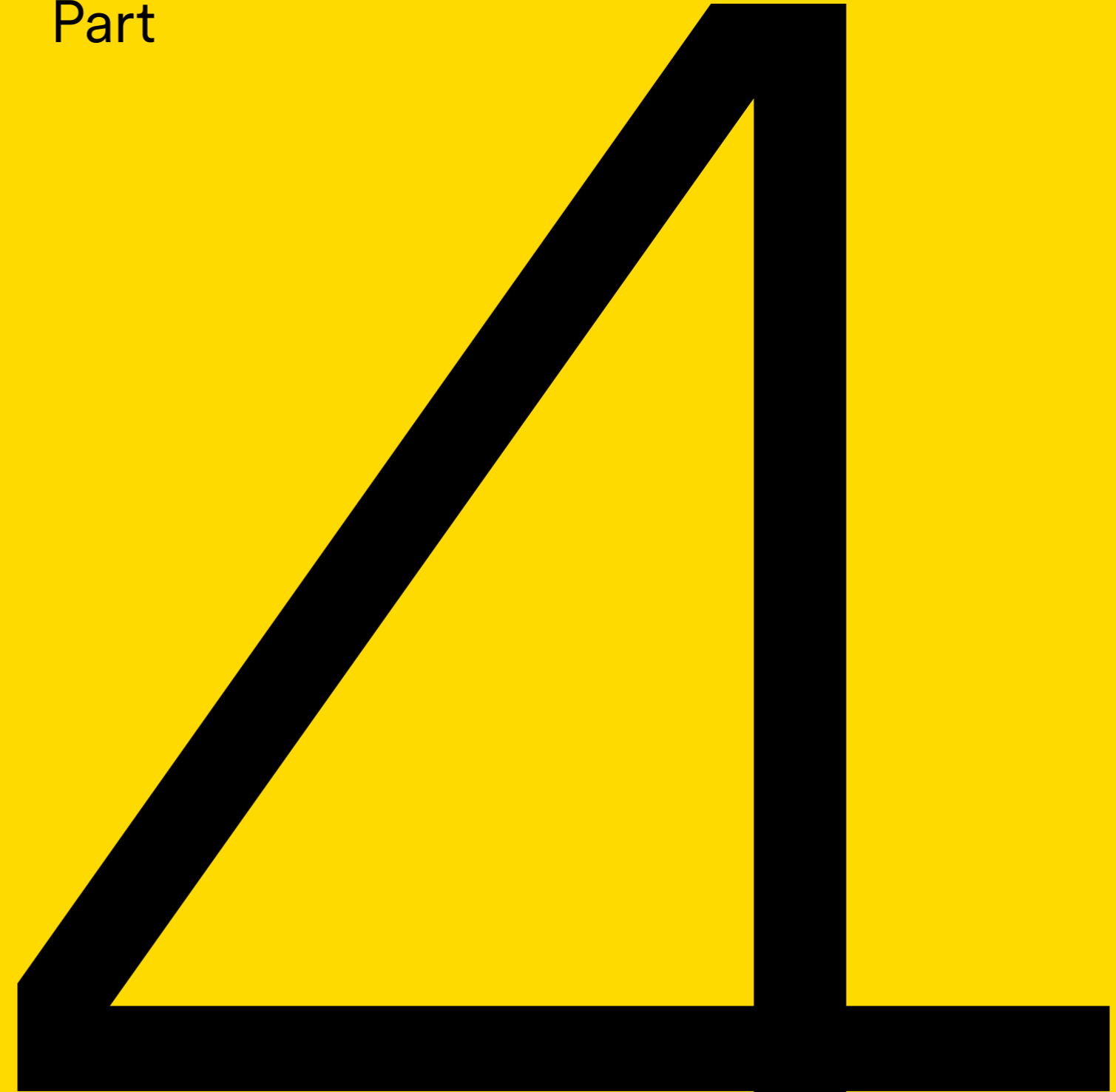
At Progress Apparel, GFF’s funding supported the installation of a modern, state-of-the-art in-house washing plant and an ancillary effluent treatment plant. This upgrade, replacing outsourced washing operations, is expected to cut water consumption by at least 50%, reduce chemical usage, and improve wastewater recovery. Additionally, Progress Apparel has committed to an environmental and social action plan, enhancing working conditions, health, and safety, improving human resource management, and reducing excessive overtime.<sup>41</sup>

Water consumption is expected to reduce by at least  
**50%**

**Improvements in salaries, worker benefits, and reduction in excessive overtime**



# Part



Incubation Program:  
 Providing Bespoke  
 Support for Nurturing  
 Startups into Their Next  
 Growth Frontier



15

Innovators supported

108

Fabrica Happenings provided to our incubatees

**Comprehensive support for innovators**

Since our inception, we have incubated 15 innovators from the techstyle and agrifood industries, including companies such as Provenance, Modern Synthesis, Ixon, and unspun. Our incubation program is designed to be made-to-measure, tailoring it to each startup’s specific stage of growth and needs.

Our incubatees also have access to our co-working spaces and a variety of Fabrica Happenings across Hong Kong and London. We connect our incubatees with industry experts, brands, manufacturers, and investor networks. We also offer showcase opportunities through our impact retail store, Fabrica X, which provides marketing and consumer exposure to our startup and its products. Additionally, trade shows and exhibition showcases can and have been extended to our incubatees where applicable.

Curated expert sessions, such as workshops and seminars, are offered to our incubatees and portfolio companies. These sessions equip startup founders with the necessary knowledge and skills to navigate the intricacies of running and growing a business. Examples of these sessions include

“Leadership in a Novel Crisis” led by Nan Fung Group, “Effective Storytelling on Sustainability” by Pangaia, “Contract Negotiations with Brands,” “Tips to Scale Successful B2B2C Brands,” and many more.

We have invited student competition winners who exhibit high growth and impact potential to join our incubation program, where they can receive more support to help them reach their next growth stage.

**Catching up with Ixon and Modern Synthesis**

Ixon and Modern Synthesis are two startups that stood out for their impactful business models, earning them the title of competition winner and subsequent support through our incubation program. As we mark our fifth anniversary, we caught up with the co-founders, Felix Cheung of Ixon and Jen Keane of Modern Synthesis. Our conversations allowed us to trace their journey from competition success to becoming incubatees and dive into their latest updates and plans for their companies.

# Conversation with Felix Cheung, Co-founder of IXON

**TMF** Tell us briefly about Ixon’s innovative technology and how it has the potential to disrupt the industry.

**FC** Ixon has developed an innovative food processing technology called advanced sous-vide aseptic packaging (ASAP) that has the potential to revolutionize the industry. ASAP allows for the precise cooking of meat and seafood, which can then be packaged in aseptic conditions, extending its shelf life at room temperature for up to two years. This breakthrough technology enables the transportation of restaurant-quality ready-made meals worldwide without the need for a cold chain, making food more sustainable and accessible than ever before.

**TMF** How has winning the Techstyle For Social Good 2020 competition and joining The Mills Fabrica’s incubation program accelerated Ixon’s goal of revolutionizing the industry with your innovative packaging approach?

**FC** The partnership with The Mills Fabrica has been instrumental in supporting IXON’s mission to commercialize its ASAP technology. Through their platform, we were able to organize tasting events for chefs, investors, and media, which helped generate awareness and interest in our innovation. Additionally, The Mills Fabrica facilitated valuable introductions to investors and corporate partners, expanding our network and opening doors to new opportunities. We are truly grateful for The Mills Fabrica’s endorsement, as it has significantly contributed to our global recognition and growth.



Private food tasting event with IXON and its revolutionary “advanced sous-vide aseptic packaging” (ASAP) technology

**TMF** Ixon has recently expanded its operations to Alberta, Canada. Could you tell us more about this exciting expansion plan and discuss its significance for Ixon's future?

**FC** In December 2022, we signed a memorandum of understanding (MOU) with the Canadian Consulate of Hong Kong and Macao to bring ASAP technology to Alberta, renowned for its beef and meat production. This expansion into Alberta presents a significant opportunity for Ixon. By introducing our technology to the region, we aim to enhance the sustainability and export-friendliness of Alberta's meat products. This strategic move aligns with our vision to revolutionize the industry and further establish Ixon as a global leader in innovative packaging solutions.

**TMF** Ixon's future looks exciting and promising. What else is in store for ASAP technology, and what impact can it have on the industry at large?

**FC** We are currently collaborating with corporate partners in Japan, South Korea, and Thailand to introduce next-generation ambient ready meals to the market. Notably, our innovative products, including Wagyu steak, pork dumplings, barbecue chicken wings, and fried rice, are specifically designed to be stored at room temperature. Through our advanced technology, we have achieved a breakthrough in food preservation, ensuring that these high-quality meals maintain their taste, texture, and safety without the need for refrigeration. This revolutionary approach provides consumers with convenient, ready-to-eat options that can be stored and consumed anywhere, anytime.

“The partnership with The Mills Fabrica has been instrumental in supporting IXON's mission to commercialize its ASAP technology. Through their platform, we were able to organize tasting events for chefs, investors, and media, which helped generate awareness and interest in our innovation... it has significantly contributed to our global recognition and growth.”

## Conversation with Jen Keane, Co-founder of Modern Synthesis

**TMF** Please tell us briefly about the work you do at Modern Synthesis and the disruptive potential of your technology.

**JK** Modern Synthesis' patent-pending biotechnology process works with bacteria to produce nanocellulose-based materials which offer performance without plastics and aesthetics without animal inputs. This offers a compelling solution for designers, who too often must choose between product sustainability and desirability. Designed for applications within fashion and beyond, Modern Synthesis' 100% biobased materials not only displace animal leathers or plastic-based materials but also generate entirely new textile possibilities for designers.

**TMF** How has winning The Mills Fabrica x Central Saint Martin Prize in 2018 with your project “This is grown” and joining our incubation program impacted your journey as a material science innovator, entrepreneur, and advocate for a more sustainable industry?

**JK** Winning The Mills Fabrica x Central Saint Martin Prize generated significant momentum for my career by generating significant press exposure and a Creative Resident position with Bolt Threads.

Joining the incubation program enabled me to:

- Travel to Hong Kong and take advantage of The Mills Fabrica's extensive facilities, which helped to mature our technology in its early stages.
- Leverage the Mill's extensive networks of brands and ecosystem enablers, which opened doors for some of our first partnerships.
- Attend brand-building events at The Mills Fabrica in London, which generated key connections and increased awareness of Modern Synthesis across the fashion industry.

**TMF** Reflecting on your journey from being a student with an idea to your current role as an entrepreneur and innovator, to what extent have creativity and curiosity influenced your path toward becoming an innovator?

**JK** All innovation begins with curiosity. The initial idea for the shoe material and early iterations of our technology grew out of a deep curiosity about these microorganisms, how they evolved, and the performance and properties of the materials they produce in nature. I think there is a lot we can still learn from nature when designing our future systems of production. Every step of my entrepreneurial journey so far has equally been shaped by a curiosity for human nature, the way we make decisions about the products we use every day, how we collaborate, and the economic systems we've devised to drive progress. I'm grateful to The Mills Fabrica for supporting my creative growth, and they have been highly influential in helping us get to where we are today.

**TMF** We have seen the industry becoming increasingly interested in alternative biomaterials. Since 2018, could you please share the journey of developing your material and how it has evolved to meet the growing demand for sustainable solutions?

**JK** Our material development journey has grown in parallel with the industry's overwhelming demand for alternative biomaterials. In 2018, our process sought to push the boundaries of what is possible with responsible materials. Most designers today think that sustainable materials limit creativity, as they often look quite rustic and offer lower performance than incumbent materials. In “This is Grown,” I asked myself, “What if responsible materials could actually expand, rather than contract, designers' creative universe?” To answer this, I looked to nature as inspiration - and set out to

“All innovation begins with curiosity. The initial idea for the shoe material and early iterations of our technology grew out of a deep curiosity about these microorganisms, how they evolved, and the performance and properties.”

develop a method of material manufacturing that was grown rather than assembled. After all, nature doesn't grow component parts in sheets; to cut them out and reassemble them would be both inefficient and wasteful. The early process that I designed resulted in a composite material grown into the shape of the upper of an athletic shoe.

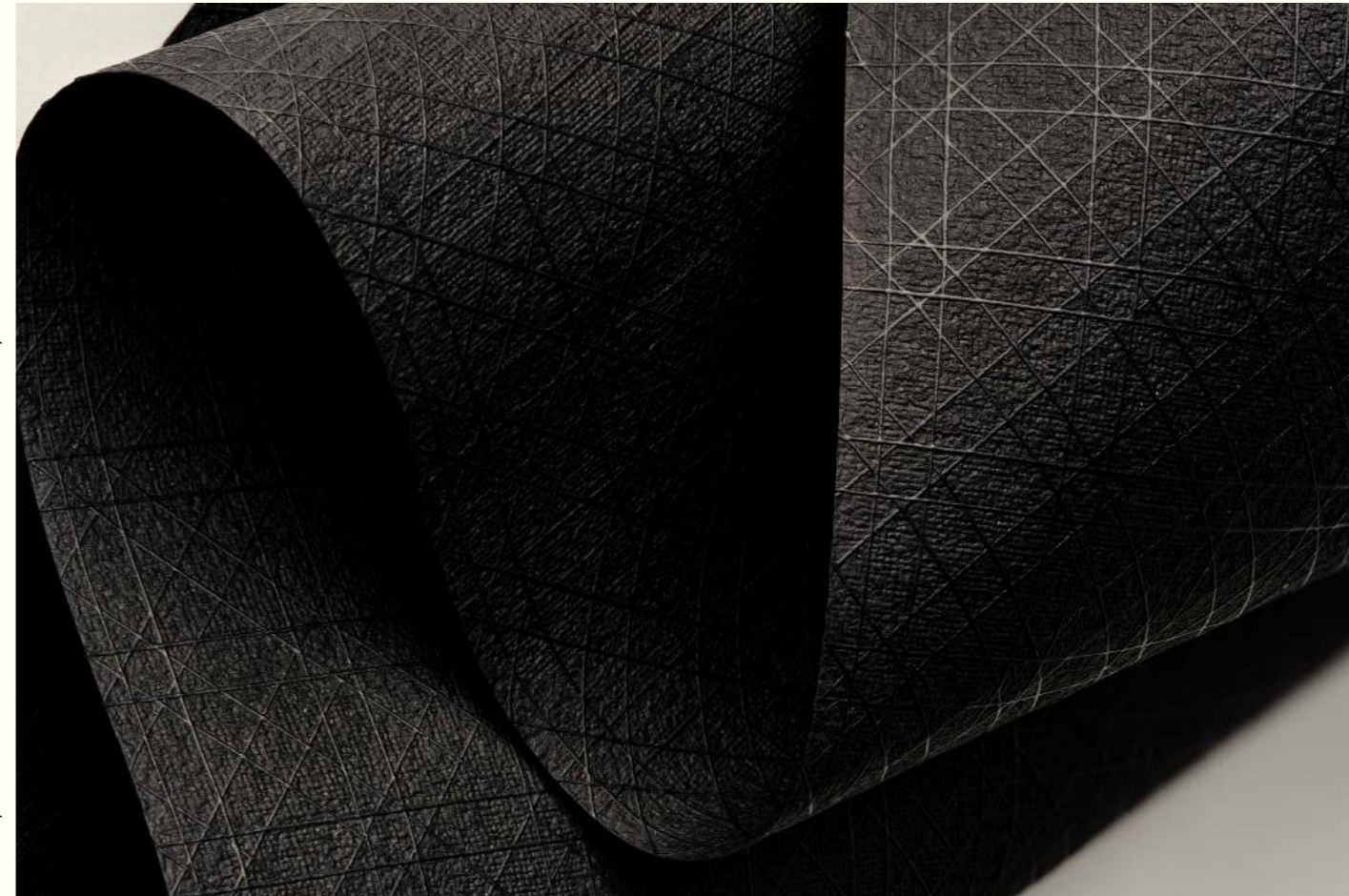
In the five years since then, our process has evolved significantly to meet the market's complex needs. We've designed our manufacturing process to meet industry requirements for performance, price, and supply chain integration at scale. We're still using grown bacterial nanocellulose as our core ingredient, but this next-generation process has enabled us to develop a wider portfolio of material possibilities to meet evolving needs.

**TMF** Having seen and felt your material just shy of a year ago, the texture, feel, and versatility of your materials show immense disruptive potential. Tell us what will be in store in the future and how you think this can disrupt the industry from an economic and environmental perspective.

**JK** Thanks for that feedback! We're encouraged by how quickly we're advancing the look, feel, and performance of our materials. While our main focus at the moment is ensuring our material hits the performance standards for product applications within the handbag application space, in the future, we plan to explore a wider range of product possibilities, including:

- Transparency and unique composite textile layering
- Color changing and sensing/responsive materials
- Materials for use within footwear and automotive applications

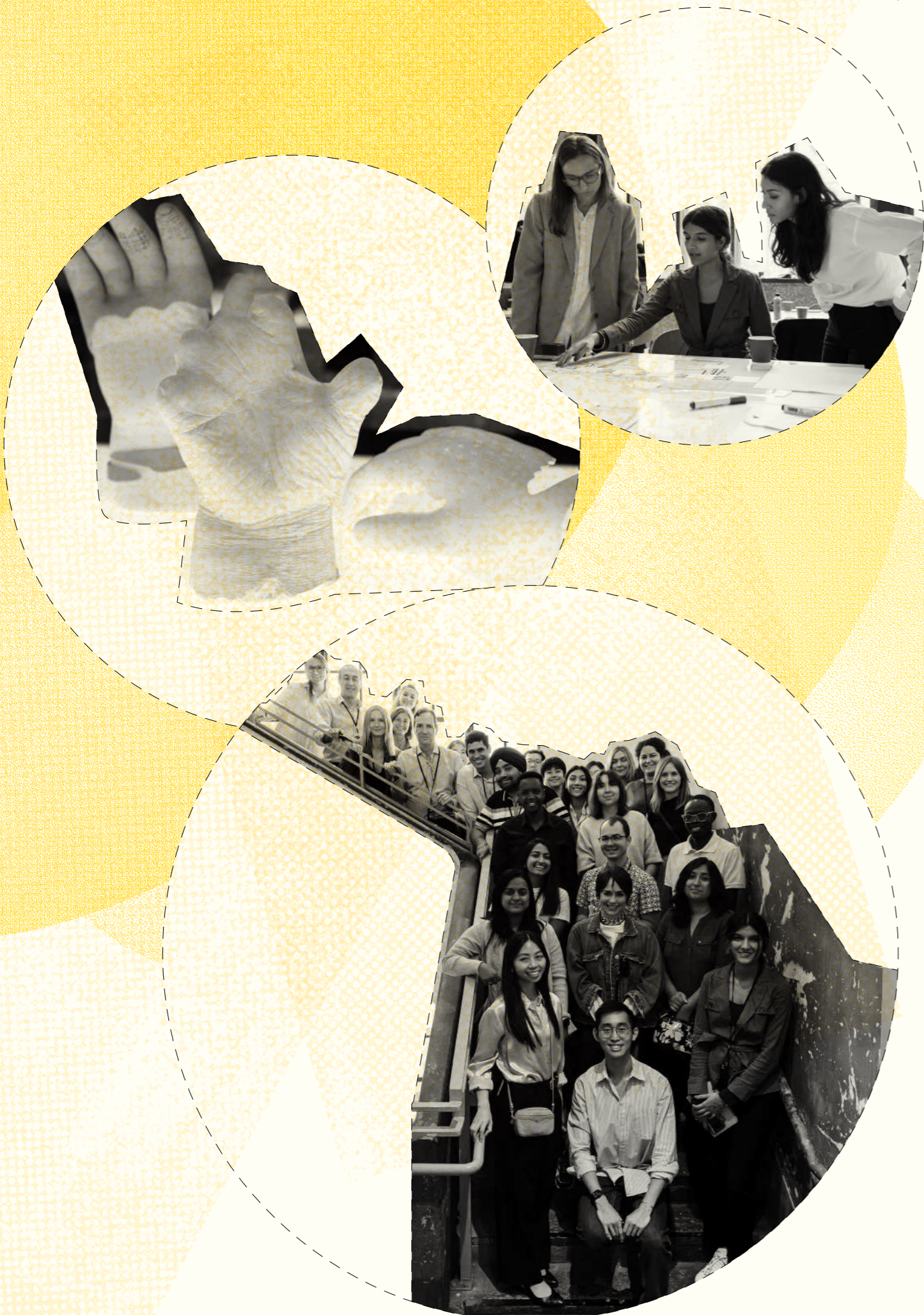
Once fully developed, these new material variants will not only offer designers and brands new aesthetic opportunities but also give them the ability to functionalize the materials they use in their iconic products.



Modern Synthesis' nanocellulose-based biomaterial. Source: Modern Synthesis



"This is Grown" shoe made by microbial weaving. Source: Modern Synthesis



# Part

Fabrica Partnerships  
and Happenings  
Uniting for Innovation:

Connecting  
Possibilities, Inspiring  
Collaboration,  
and Igniting Innovation  
for Planet-Positive  
Change

Our commitment to fostering innovation for sustainable development is exemplified through our partnership initiatives and curated Fabrica Happenings. Collaborations with the H&M Foundation via The Global Change Award, The Earthshot Prize, and our Innovation Scouting and Integration Program not only allow us to support a broader range of innovators but also help brands integrate innovation into their business models.

Through organizing a series of Happenings, including industry events, roundtables, fireside chats, corporate training sessions, innovation discovery day, and sustainability workshops in Hong Kong and London, we have engaged a wide range of stakeholders, raised awareness of socioenvironmental issues, and fostered collaboration between businesses and innovators.

To date, our Fabrica Happenings have made a substantial impact, hosting over 360 events, engaging over 45,000 individuals, and covering topics including alternative materials, textile innovation, circularity in fashion, and novel food production. The conversations, connections, and collaborations fostered by these events have been invaluable, furthering our mission of driving planet-positive change. Fabrica Happenings and Partnerships highlights our belief that industry collaboration is crucial for igniting entrepreneurship, fostering curiosity, and creating partnership opportunities.



Since our inception:

**360+**

Fabrica Happenings took place

**45,000+**

individuals took part in Fabrica Happenings

Number of Fabrica Happenings curated for our ecosystem partners:

**41**

for students

**67**

for the general public

**108**

for our incubatees

**110**

for portfolio companies

**135**

for co-working space members

**192**

for industry partners

**198**

for other startups

## 5.1

# Partnership Initiatives Supporting the Growth of Innovators

## The Official Nominator of The Earthshot Prize Since 2022

The Earthshot Prize, founded by Prince William in 2020, searches for solutions to the world's most pressing environmental challenges. As official nominators since 2022, we searched for nominees from our knowing community, which led to three remarkable finalists: this includes our portfolio companies Circ and Colorifix and Hong Kong-based greentech startup Ampd Energy. Our role as nominators emphasizes the significance of supporting impactful startups, granting them the recognition and exposure necessary to extend their influence and engage diverse audiences, ultimately fostering a broader impact on the global stage.



Three of our nominated startups became the finalists of The Earthshot Prize in 2022 and 2023. This includes our portfolio company Circ and Colorifix and HK-based startup Ampd Energy.

The Mills Fabrica acted as an official nominator for The Earthshot Prize in 2022 and 2023. Source: Colorifix (Top)

## Partner of H&M Foundation's Global Change Award

As partners of H&M Foundation's Global Change Award (GCA), we support winners by providing industry connections and essential skills to become investor-ready. This year, during GCA Hong Kong Week, we facilitated connections with Asian markets through investment workshops, media pitching sessions, and networking events with investors, incubators, accelerators, and brands. We also organized site visits to Esquel Group, Crystal Group, and HKRITA to help winners understand manufacturers' needs and explore material innovations in Asia. Our guidance aims to help winners effectively showcase their innovations, attract investors, and secure collaboration partners, fueling their growth and impact.

The Mills Fabrica hosted H&M Foundation's Global Change Award 2023 winners in Hong Kong



We're happy that The Mills Fabrica, one of our core partners, invited our ten GCA winners to Hong Kong – a great fashion hub for research, innovation, production, and manufacturing. The accelerator week provided the teams with insights into manufacturing and production and enabled them to tap into the investor network and learn more about the Asian market.

Christiane Dolva, Strategy Lead Planet Positive at the H&M Foundation

## 5.2 Techstyle Happenings

### London Craft Week

We have been the official innovation partner of London Craft Week for three years in a row. This partnership has brought innovators, entrepreneurs, startups, brands, retailers, and creatives to discuss and collaborate on important socio-environmental issues. We organized three main events: Planet Saving Innovations, Pioneering Innovation in Making, and Innovating Better. Together, they featured over 25 speakers and attracted over 1,000 attendees. We also showcased innovative technologies in our Impact Retail store, Fabrica X, enabling attendees to “see and feel” the innovations and their potential. Key industry players like Fabrican, Biofabricate, SaltyCo, Fibe, Colorifix, Ganni, FARFETCH, True Global, Dezeen, Modern Synthesis, Renewcell, Bananatex, The Supplant Company, and Provenance gathered and shared their expertise on topics such as circularity, alternative materials, and sustainability verification. These events promoted collaboration and knowledge-sharing among a diverse group of stakeholders, ultimately building and creating synergies for a more vibrant ecosystem.

### Future Fabrics Expo

The Mills Fabrica partnered with Future Fabrics Expo to curate exhibitions showcasing companies promoting circularity in the textile industry. The event attracted over 850 attendees who explored innovations from leaders like Circ and Renewcell, both specializing in textile recycling. Parley for the Oceans highlighted ocean conservation efforts, while Nona Source showcased high-end deadstock fabric resale. Colorifix presented natural textile dyes, and Modern Synthesis displayed progressive biomaterials. The expo provided attendees with an immersive experience, highlighting the latest advancements and their impact on the techstyle industry.

### Denim Futures Events

We organized the Denim Futures conference, a two-day event with over 450 industry attendees to address sustainability challenges in the denim industry. The conference featured 29 expert speakers from denim brands, manufacturers, and innovators who shared insights on circularity in design, upcycling denim, next-gen fiber and fabrics, and talent development. The event had speakers from the industry’s biggest players, including WGSN, Jeanologia, Advance Denim, FibreTrace, Lenzing Group, The LYCRA Company, Hong Kong Design Institute, The Hong Kong Polytechnic University, and Kontoor Brands. The event also included 14 exhibitors showcasing their latest products designed to reduce the environmental impact of denim manufacturing. We also partnered with the Hong Kong Denim Festival. As part of this partnership, we hosted The Kingpins Pop Up Denim Fair in our Hong Kong space, an invitation-only event attended by over 200 industry attendees to raise awareness and foster collaboration in the denim industry.



## 5.3 Agrifood Happenings

### Unveiling the Agrifood Landscape with Foodlabs

The Mills Fabrica and FoodLabs collaborated to organize the event, Unveiling the Agrifood Landscape, which brought together stakeholders from the agrifood sector, including farmers, innovators, brands, chefs, and changemakers. The event featured keynotes and panel discussions with 20 industry leaders, representing organizations such as MeliBio, Mushlabs, Klim, Tupu, Toast Ale, Wildfarmed, M&S Foods, Daylesford Organic, and Apricity Restaurant.

Through the talks, attendees gained insights on topics including regenerative agriculture, upcycling food, alternative ingredients, innovation in menu offerings, and retailers’ role in sustainability. The event also provided a food-tasting experience, showcasing sustainable food products from different innovators. Attendees could sample products like Wildfarmed’s regeneratively produced flour, Citizens of Soil’s traceable olive oil, WNWN’s cocoa-free chocolate, and The Supplant Company’s chocolate. By presenting multiple innovative solutions, the event offered valuable insights and showcased the potential for integrating these innovations into the food and beverage industry.

\*Unveiling the Agrifood Landscape\* event in London, co-hosted with Foodlabs



### Food Tech Synergy: Uniting Technologies for Sustainable Impact

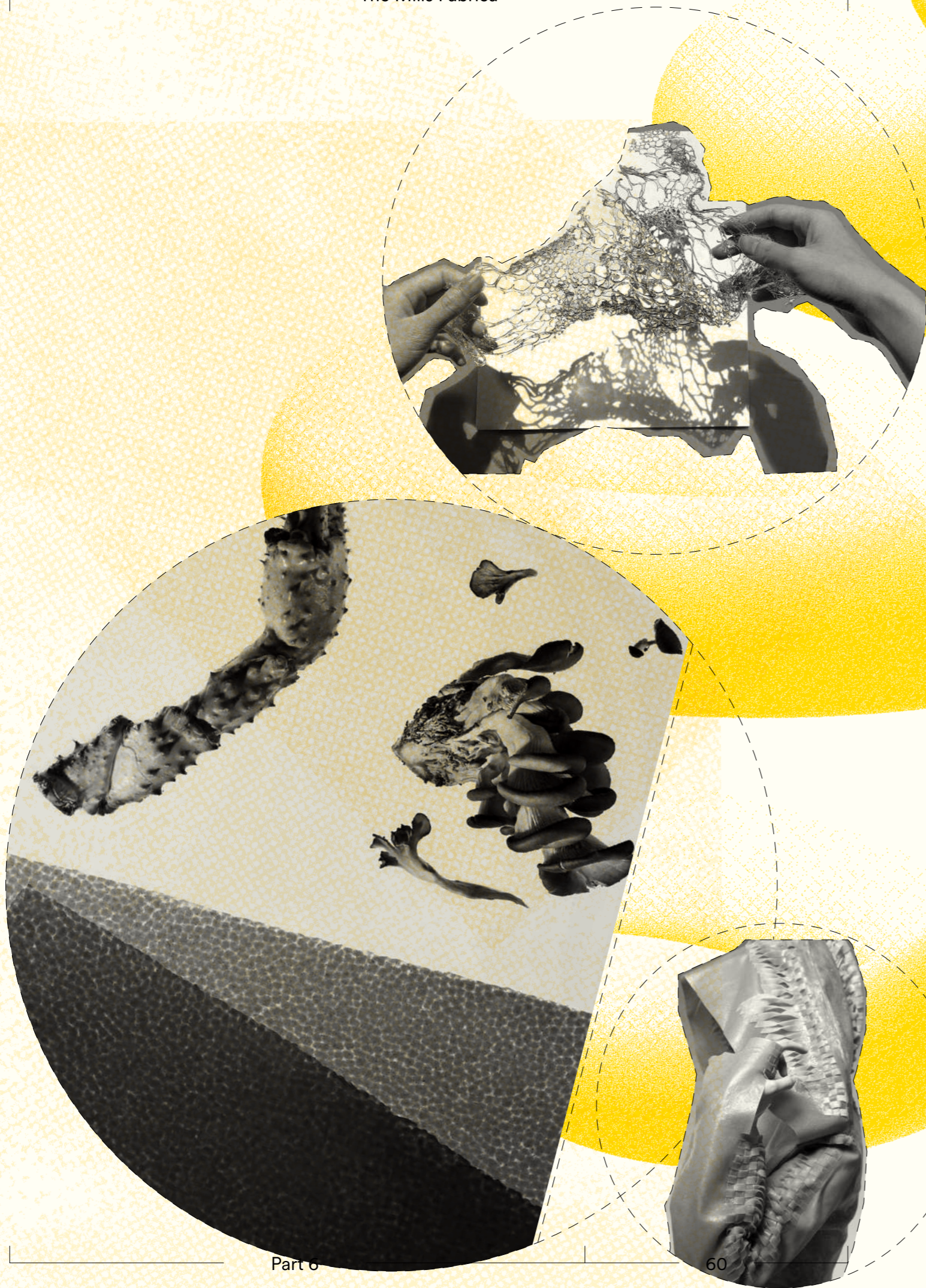
The event brought together players from the food industry. Among the attendees were Synbiobeta, a network for those passionate about biological engineering and sustainability, and Eagle Genomics, which applies network data science to enhance innovation. Startups like Hoxton Farms and The Supplant Company showcased their use of synthetic biology to produce animal fat, sugars, and flour. Meanwhile, Silo, the world’s first zero-waste restaurant, shared their commitment to zero-waste practices in the food service industry.

Focusing on the challenges and opportunities of integrating diverse systems and mindsets, the event underscored the potential for collaboration and experimentation to drive change. Restaurants emerged as key platforms for introducing environmentally friendly and healthier technologies to consumers, proving that sustainable alternatives can be as, if not more, delicious than traditional options.

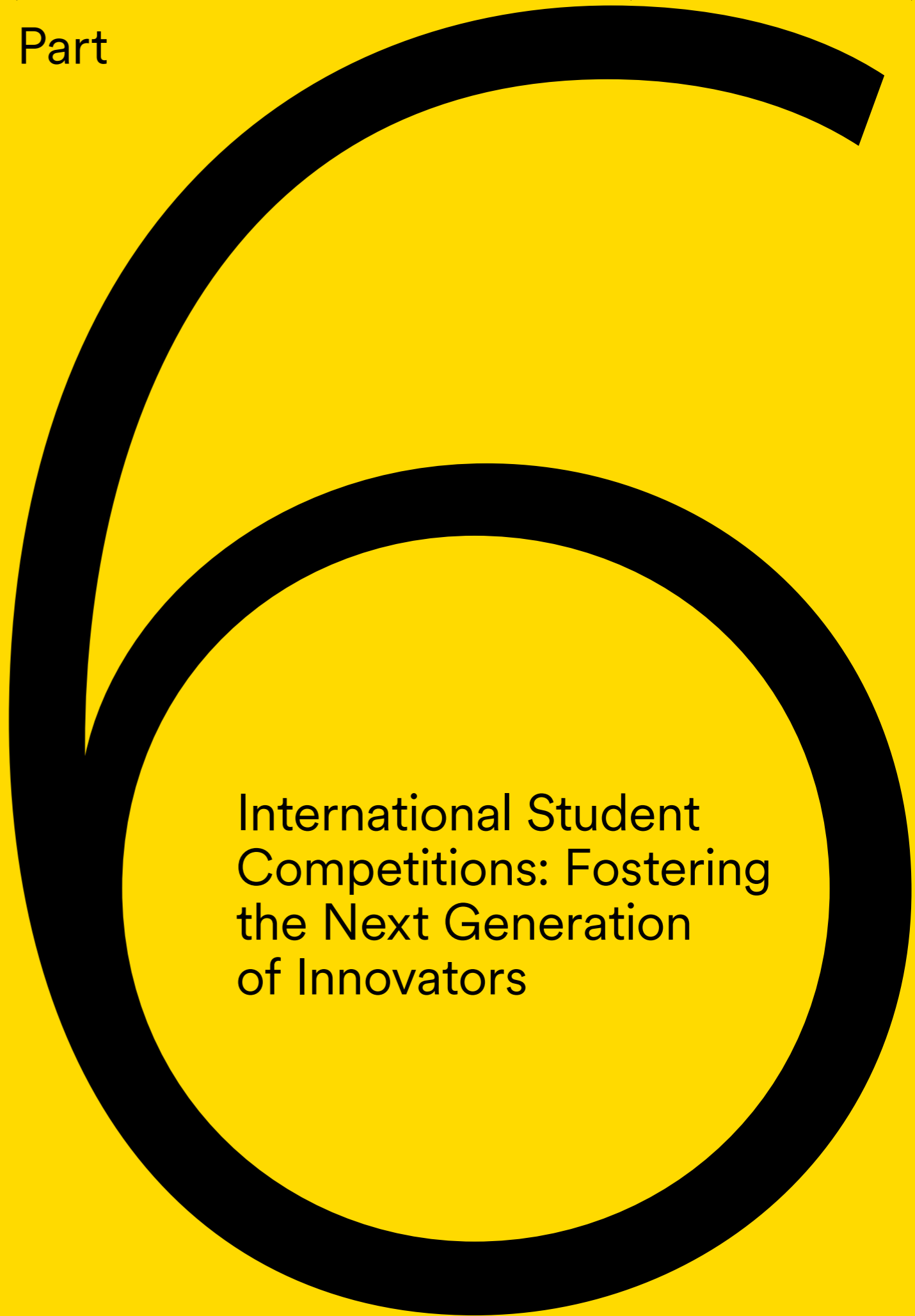
The event highlighted the importance of a collaborative and experimental approach to transforming the food industry. The speakers demonstrated that collaboration can facilitate significant progress toward a circular and sustainable food system.

\*Food Tech Synergy: Uniting Technologies for Sustainable Impact\* event at The Mills Fabrica, London





# Part



International Student  
Competitions: Fostering  
the Next Generation  
of Innovators



By giving opportunities to students, our competitions aim to unleash the creative potential and entrepreneurial spirit of students and recent graduates.

Entries from

**650+**  
Submissions

**41** Countries

**170+** Institutions

**28**  
Winners

**HKD1.9 Million**  
in prize value  
have been awarded



Our competitions foster the creativity and entrepreneurial spirit of students and recent graduates. Showcasing TMF x CSM Prize winner Xue Chen's Bio-Invasive Textile Library. Source: Xue Chen

The “idea-development” and “core innovation” phases form the very foundation for innovative and creative solutions. This encompasses the sparks of inspiration, the conception of the ideas, and the subsequent development of prototypes. These often occur inside educational institutions where students turn their research into ideas. Understanding the importance of supporting these ideas to the next stage and preventing potential ideas from being lost, The Mills Fabrica established two student competitions, The Central Saint Martins x The Mills Fabrica Prize (CSM x TMF Prize) and Techstyle For Social Good (TFSG).

The CSM x TMF Prize is designed to support Central Saint Martins students who have well-developed ideas or early prototypes.<sup>42</sup> Meanwhile, TFSG welcomes students and recent graduates with ideas ranging from proof-of-concept to early prototype stages. Both competitions aim to support innovations that can positively impact the techstyle and agrifood industries.

Winners of the competitions will receive comprehensive support to advance their prototypes. This includes a three-month residency in Hong Kong or London with hot desk membership, a cash prize, mentorship from the Fabrica team, connections to potential collaborators and customers, and access to marketing initiatives and showcasing opportunities, such as collaboration

with Fabrica X and event marketing exposure. Through strategic support, we aim to cultivate a thriving environment that nurtures these ideas into the next stage. Our incubation program and ecosystem partners provide ongoing support, fostering a collaborative network that facilitates the maturation of innovative ideas and contributes to developing game-changing solutions.

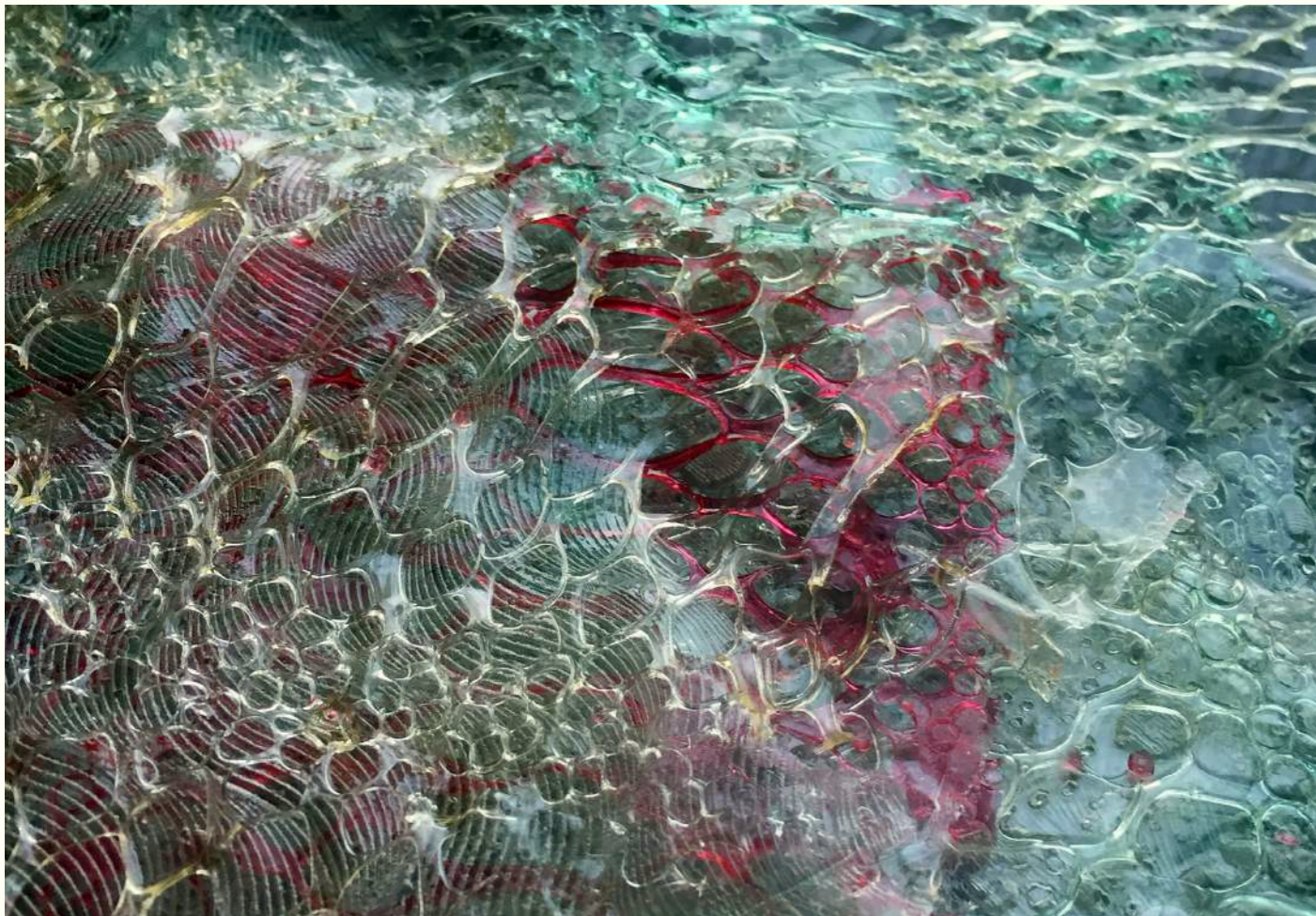
To date, we have partnered with more than 170 educational institutions worldwide to identify promising innovators who have developed or are close to developing an early prototype of a product. In the last five years, the two competitions have received over 600 applications globally, and we have awarded prizes equivalent to HKD1.9 million.

Since our inception, we have had 28 winners from both competitions, representing technological innovations spanning diverse fields. These innovations range from novel materials for fabrics to novel food packaging for the preservation of foodstuff. Notable examples include Fibe, which leverages potato waste; Tomtex, which utilizes shellfish waste; and Treekind by Biophilica. Furthermore, agrifood tech startups like Harmony are revolutionizing baby nutrition formulations, while Ixon is reimagining food packaging and storage methods.

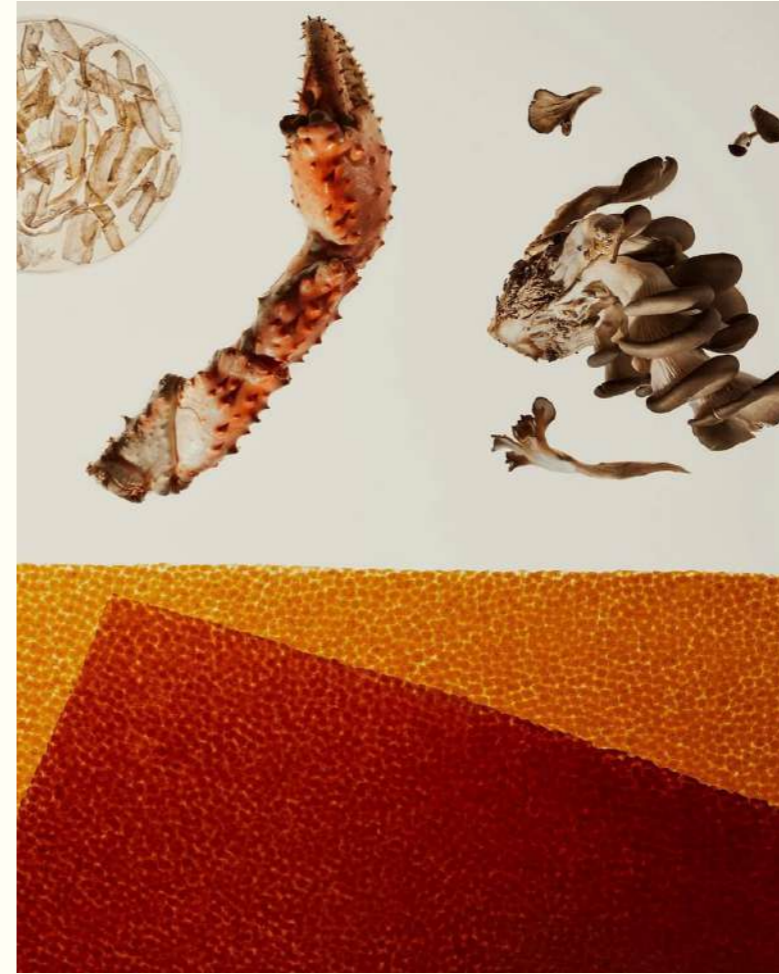
Supporting individuals at this critical stage becomes imperative as we aim to unlock the creative potential and entrepreneurial spirit of students and recent graduates through our competition.



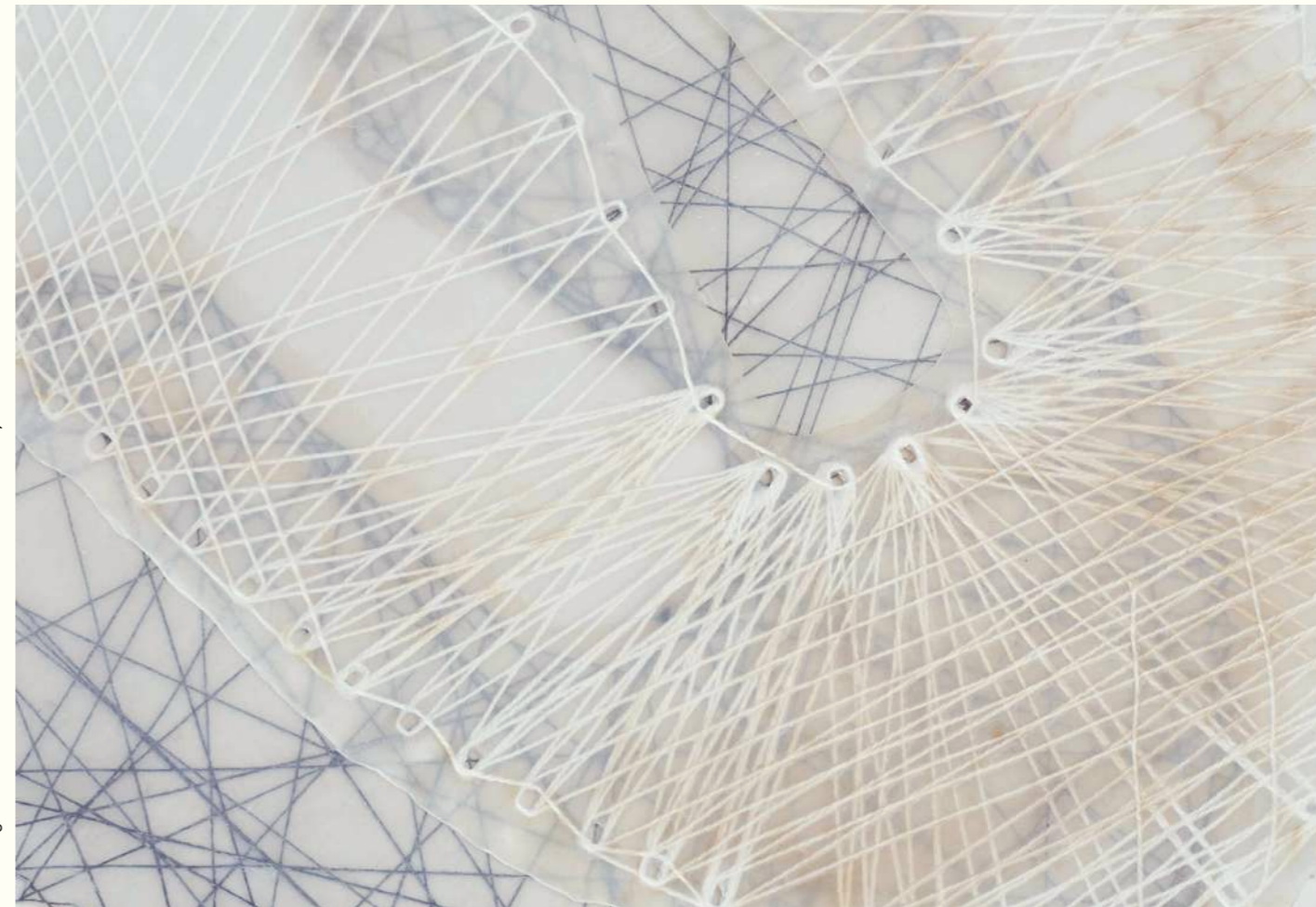
Fibe turns potato waste into fibers that significantly reduce the impact on water use, land use, and carbon emissions compared to cotton production. Source: Fibe



Scarlett Yang, CSM x TMF Techstyle and Sustainability Prizes 2020 winner, developed a textile made with algae extract and silk cocoon protein. Source: Scarlett Yang



TómTex creates innovative bio-based materials using waste products, highlighted by seashells and mushrooms. Source: TómTex



Modern Synthesis utilizes a "microbial weaving" process, harnessing microbes to grow a strong, lightweight, and biodegradable cellulose-based material. Source: Modern Synthesis



Brewer's Grains Granola. Source: The Moonbeam Co.

We are thankful for this opportunity that will undoubtedly shape the trajectory of not only my entrepreneurial journey but also our start-up. We look forward to growing our network of collaborators in this ecosystem and learning from experts and fellow entrepreneurs.

Kong, co-founder, The Moonbeam Co.

Winner Highlight

## The Moonbeam Co.: Turning Brewer Spent Grains into Tasty Granola

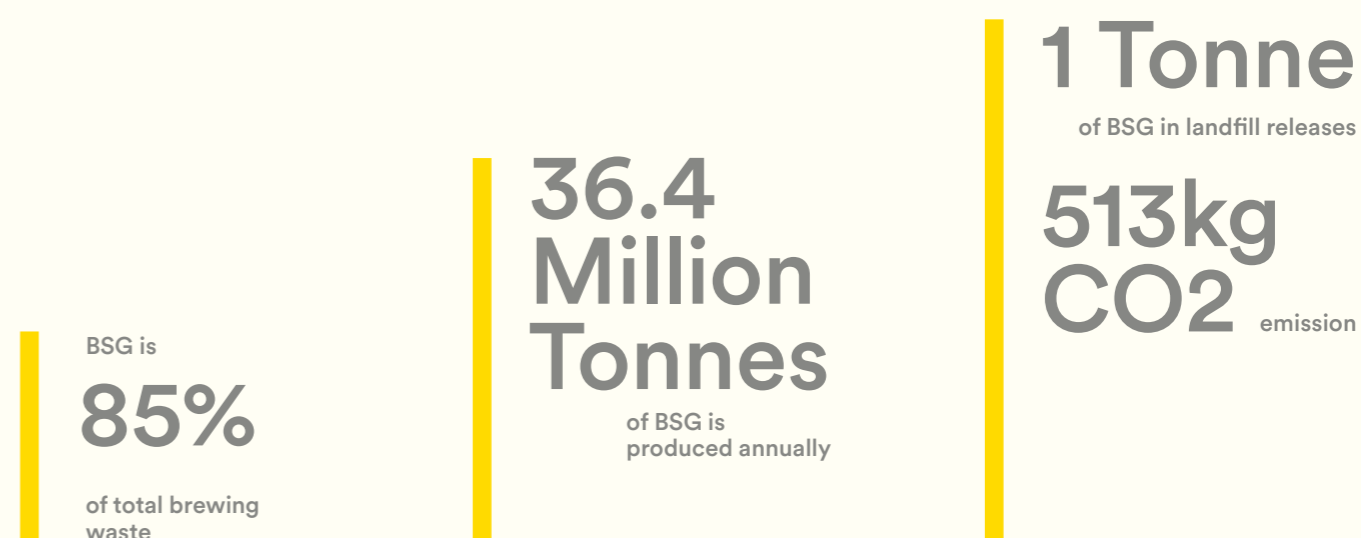
The Moonbeam Co. won the Techstyle For Social Good 2022 award. Recognizing the vast untapped potential of brewer's spent grains (BSG), it developed a technique to transform BSG into an edible form, ultimately enabling the upcycling of BSG into granola.

BSG is the most abundant by-product of beer brewing, averaging 85% of total brewing waste. Annually, an estimated 36.4 million tonnes are produced.<sup>43</sup> Given its high moisture content and susceptibility to microbial spoilage, BSG has a short shelf-life, limiting its recyclability. That is why it is usually used in low-value animal feed or sent to landfills.

One tonne of BSG in landfills releases 513kg of CO<sub>2</sub>-equivalent greenhouse gases.<sup>44</sup> This means The Moonbeam Co. can divert BSG away from the waste stream and into the food system, which reduces land-use pressure and helps avoid the buildup and release of greenhouse gases. BSG-derived ingredients have also been found to improve the nutritional profile of foods commonly consumed in the global north, which could reduce the prevalence of dietary-related disease and mortality.<sup>45</sup>

After winning the prize, the founders took up a one-and-a-half-month residency in both locations. During their residency, we introduced key industry partners, including F&B outlets, hotel groups, local beer brewers, investors, and accelerators. We also hosted a private breakfast networking and food-tasting event in London attended by more than 60 industry players, giving them valuable opportunities to get consumer feedback and connect with stakeholders in the industry. In Hong Kong, we invited The Moonbeam Co. to participate in a "weekend market" to get consumer feedback, with the public loving its products.

The Moonbeam Co. has tapped into a previously unexplored food source by successfully upcycling BSG into granola and other food products. Its innovative technology transforms what was once considered waste, destined for landfills, into delicious and nutritious edible food items. This breakthrough presents a promising opportunity to generate a significant impact and highlights the untapped potential of sustainable food production.





Part

Fabrica X  
Impact Retail Concept

# Combining Education, Experience, and Sustainable Retail Under One Roof

Fabrica X is our Impact Retail concept, with locations in Hong Kong and London. As the consumer-facing arm of The Mills Fabrica, it aims to educate consumers on key sustainability issues, understand consumer sentiment on sustainable products, and drive awareness on how to achieve a conscious lifestyle.<sup>46</sup> Fabrica X is built on three pillars:

### Education

- Presenting a compelling exhibition to increase awareness of the most pressing socioenvironmental issues the industries face.
- Showcasing the latest innovations that address the challenges.

### Experiential

- Engaging in workshops that upcycle waste materials, fostering creative experiences and reimagining how resources can be reused.

### Sustainable Retail

- Retailing low-impact products that individuals can purchase and inspire individuals to adopt a conscious lifestyle.

Since its inception, we have showcased 100+ innovators and sustainable brands and welcomed over 80,000 visitors to both locations. These visitors range from the public to brands, manufacturers, corporates, investors, education institutions, and NGOs.

→ Our differing approach to traditional retail allows us to:

### Promote Behavioral Change by Enhancing Knowledge and Awareness (fig.8)

The Impact Retail model serves as a catalyst for driving behavioral change, inspiring individuals, consumers, and intrapreneurs alike.<sup>47</sup> It encourages them to embrace a more conscious lifestyle and explore how these technologies can revolutionize the innovation process within their existing companies.

### Empower Innovators and Sustainable Brands: A Dynamic Platform Showcasing Cutting-Edge Innovations and Brands (fig. 9)

Fabrica X is a vibrant platform that offers recognition, exposure, and growth opportunities for innovators and sustainable brands. With our extensive network of corporates, we can help innovators open doors for potential collaborations. Additionally, we provide opportunities for consumers to engage with sustainable brands, boosting their exposure and sales. With locations in both Hong Kong and London, Fabrica X uniquely serves as a bridge for sustainable brands to connect across East and West.

### Impact Management System to Measure the Impact of Fabrica X

To measure the impact Fabrica X aims to achieve (figs 8 and 9), we developed a tailored impact management system to evaluate our campaigns' effects on individuals and brands. We conduct rigorous pre- and post-experience surveys with participants of Fabrica X experiences, which entail guided educational tours, innovation showcases, introduction to sustainable retail brands, and workshops. So far, we have organized experiences for three campaigns—Plastic Circularity, Biomaterials, and Denim Futures—serving over 2,400 participants.

100+

Innovative and sustainable brands collaborated with Fabrica X

80,000+

Visitors have come to our store since its inception

Fig. 8: Fabrica X's impact pathway on individuals

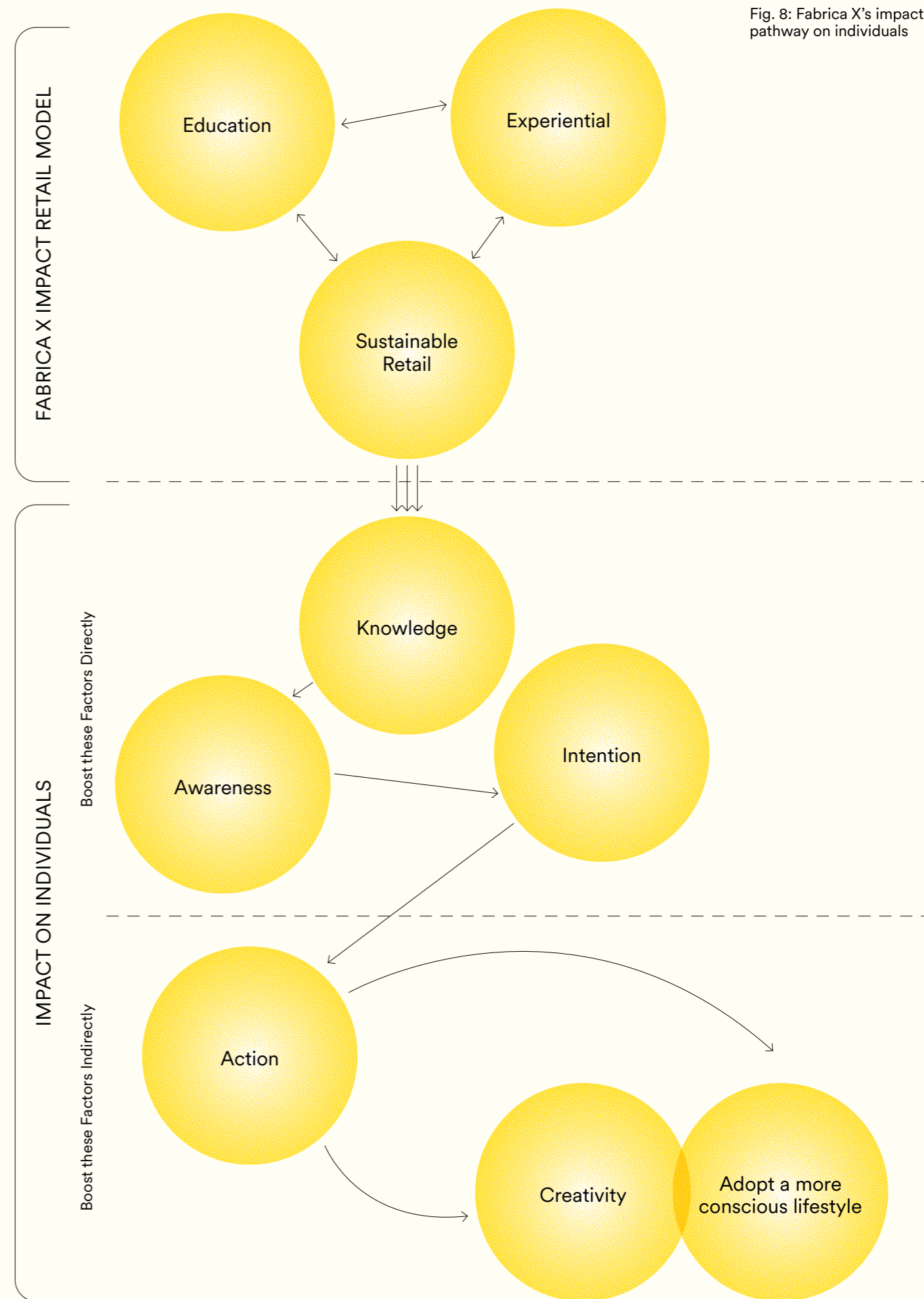
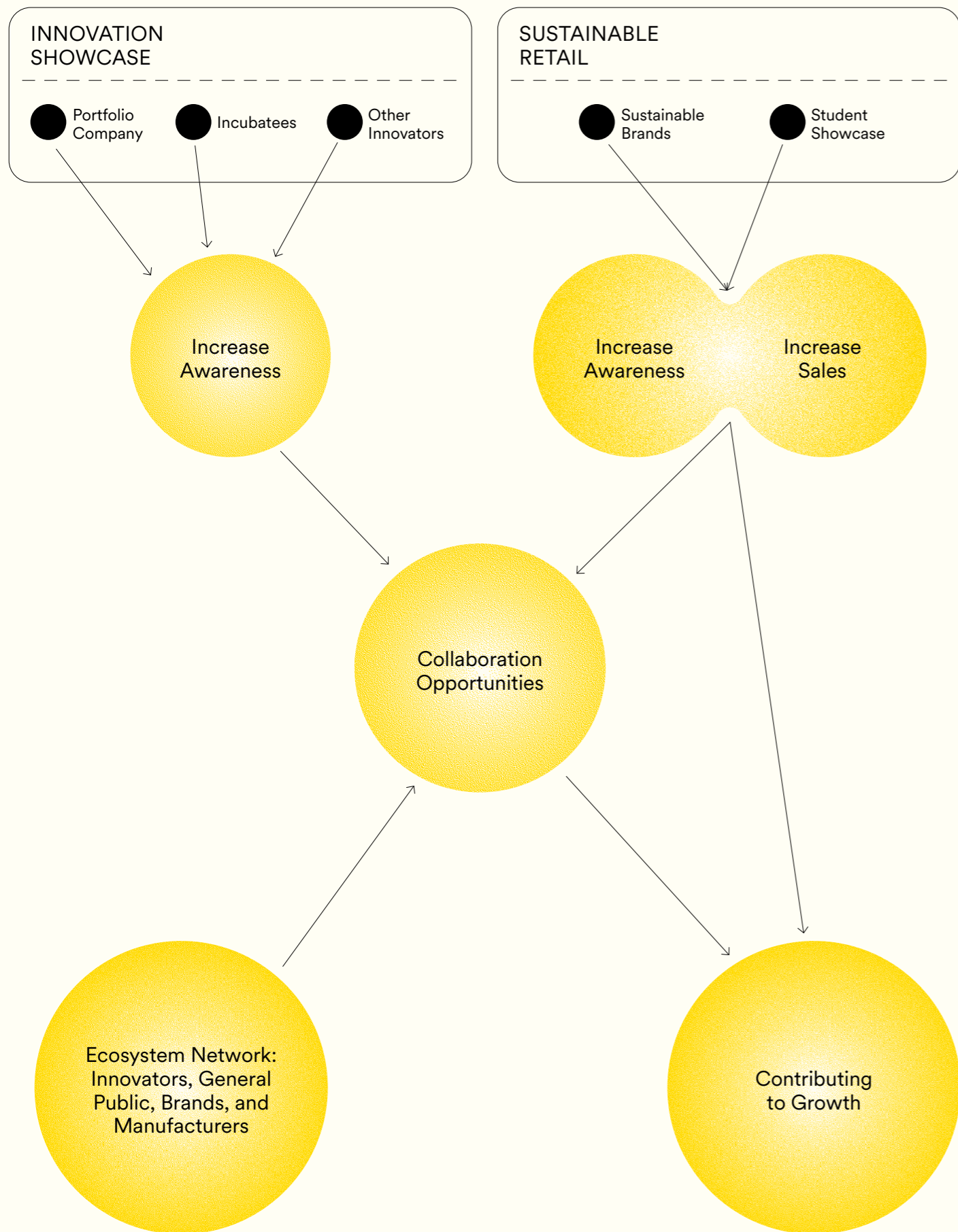


Fig. 9: Fabrica X's impact pathway on innovators



## 7.1 Thematic Campaigns Across East and West

The Biomaterials and Denim Futures campaigns took place in both our locations and showcased innovative material and denim technologies across the industry's supply chain. They highlighted the environmental impacts associated with the materials, showcased the benefits of innovative technologies, and emphasized the crucial role of consumer behaviors in driving sustainability.<sup>48</sup>

### Biomaterials Campaign

More than 13,500 individuals visited the campaign, showcasing more than 47 material innovators and sustainable brands across both locations. Private tours were organized for over 600 individuals from our ecosystem network, including brands, manufacturers, marketing brands, and investors. Sponsored by Fidelity International and supported by Lenzing and our knowledge partner, Biofabricate, we were able to curate Fabrica X experiences that welcomed more than 760 individuals in Hong Kong. We found that:

Pre-experience

52%

of participants either are *indifferent* or *unlikely* to consider the environmental impact of clothing materials before making any purchase.

Post-experience

86%

of participants are *somewhat* to *extremely* aware of the environmental benefit of biomaterials.

On the intention to change

55%

of participants intend to adopt one or more new conscious buying habits that they previously didn't practice.

On consumer intention to support sustainable brands

58%

of participants are likely to extremely likely to support sustainable brands...

...and they are willing to pay an average price premium of

16.7%

for products made from biomaterials

# Denim Futures Campaign

The Denim Futures campaign featured 42 innovative brands, including Advance Denim, AGI Denim, Circ, Crystal Group, Galy, Jeanologia, Levi's, Lenzing, Natural Coatings, Nextevo, and unspun. With the help of our knowledge partners, Fashionary and The Magic of Denim Consultancy, we informed visitors about denim innovation and tips for extending the lifespan of denim products. Since its launch, the campaign has attracted over 13,000 visitors and hosted more than 60 private tours for our ecosystem partners.

Knowledge of the environmental impact of denim production

After the experience,

**52%**

of individuals are *moderately aware* and *extremely aware* of the environmental impact of denim.

**94%**

of them *agree to strongly agree* that innovations are important in making the denim industry more environmentally friendly.

Conscious consumption habits

Awareness of denim innovation

After the experience,

**84%**

of individuals *agree to strongly agree* that they will practice checking labels for better composition before purchasing.

Before the experience, only

**10%**

of individuals were *aware or very aware* of innovations in the denim industry.

After the experience,

**62%**

of individuals learned *more and a lot more* about innovations in the denim industry.

Intention to support better denim products

After the experience,

**83%**

of individuals are *likely to very likely* to support better denim products,

and are willing to pay an average price premium of

**20.2%**

# 7.2 Regional Campaign Highlights

## Rethinking Design Approach with Nona Source in London

Deadstock, a pressing environmental issue for the industry, has always been a concern. Working with Fabrica X London, Nona Source created a showroom dedicated to showcasing and selling high-end deadstock fabrics. These fabrics were sourced from renowned fashion houses like LVMH and made available to young designers and creatives. Situated strategically near Central Saint Martins and supported by our ecosystem network of creatives, designers, and startups, this collaboration seeks to promote circularity through design, demonstrating that positive impact can be achieved through creativity.

The London showroom is one of the most creative places in the world. It is a major step forward in Nona Sources' commitment to developing circular creativity and creative reuse as well as supporting young and emerging designers, talent, and brands.

indicates Romain Brabo, co-founder of Nona Source<sup>49</sup>

# Plastic Circularity Campaign in Hong Kong

First launched in late 2022 at our Fabrica X Hong Kong store and later in two pop-up locations, the Plastic Circularity campaign attracted over 45,000 visitors.<sup>50</sup> The campaign aimed to raise awareness about ocean plastic pollution and featured 10 brands that used recycled fishing nets and post-consumer plastics to create sustainable products. It included plastic upcycling workshops and showcased innovative low-impact items, encouraging visitors to see plastic waste as a resource and not trash. By promoting this mindset, the campaign inspired enhanced recycling efforts and the adoption of products made from recycled plastics, aligning with circular economy principles.

1,292 individuals joined our Fabrica X Experience, and we were able to identify the below findings:

## Knowledge gain

**58%**

of participants gained more knowledge of ocean plastic pollution.

**73%**

of participants gained a deeper understanding of ocean plastic pollution's impact on marine ecosystems.

**75%**

of participants learned more about the dangers of plastic pollution on health.

## Promoting circular economy

**73%**

of participants have a better understanding of the usefulness of plastics.

**67%**

of participants are more willing to practice reducing, reusing, and recycling in their lives.

**88%**

of participants are more willing to buy items made from recycled materials.



Moral's bags incorporate up to 80% recycled or upcycled materials

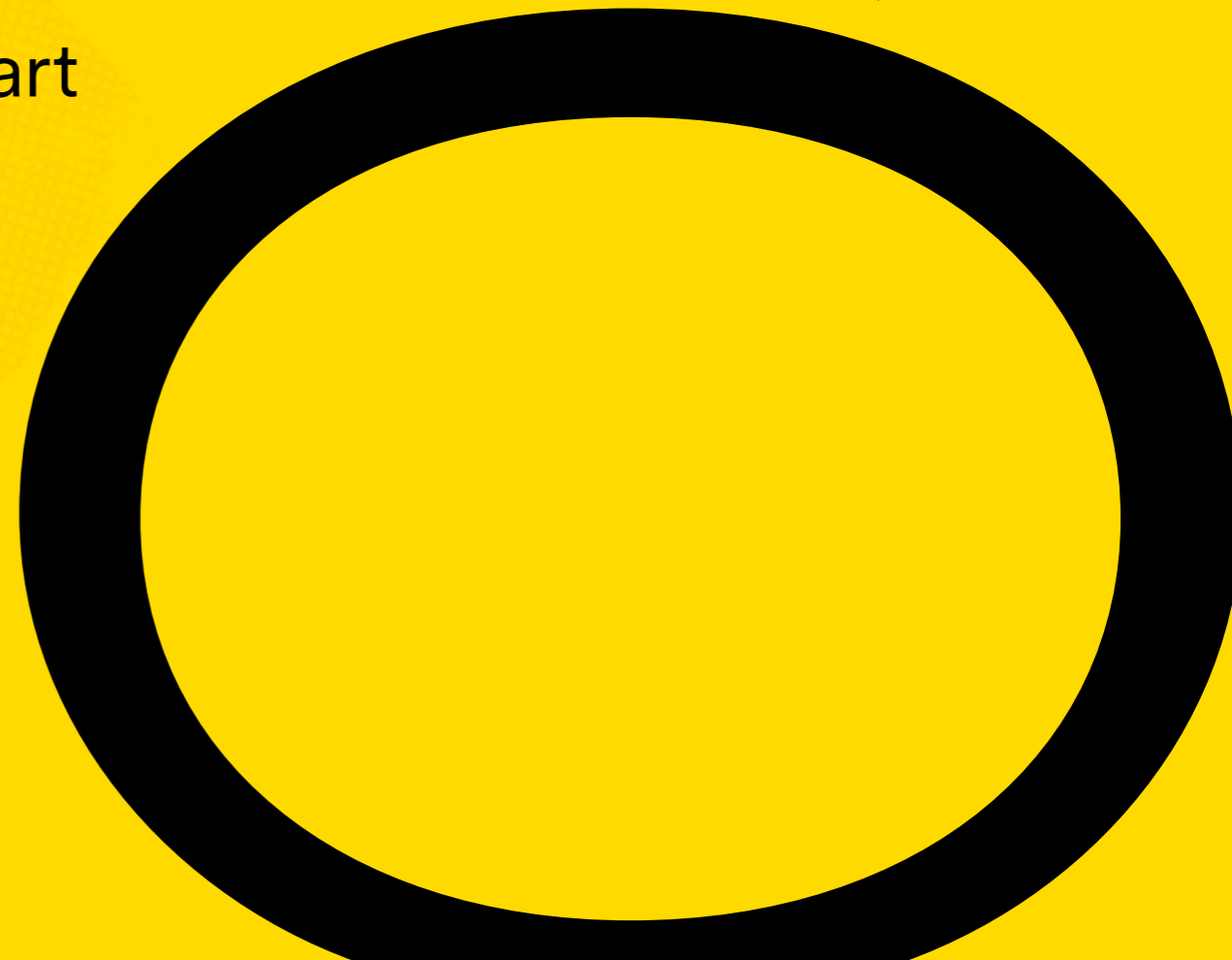


Plastic Circularity campaign at Fabrica X The Mills, Hong Kong





# Part



Fabrica Lab:  
Empowering Innovators,  
Fueling Creativity,  
Igniting Change

Fabrica Lab is our prototyping facility. Designed to assist entrepreneurs, creatives, and startups in experimenting with ideas and turning them into prototypes, the space also offers a community for feedback, support, and collaboration. Additionally, members have access to the latest textile innovation information and connections to our broader ecosystem of industry partners. Notable members include Orange Terry, Scarlett Yang, Vincent Li, Meisze Tsang, and Florian and Christine.

Supporting young, talented designers in embodying circularity principles in their designs is also critical. In 2023, Fabrica Lab created the Future-Maker Award to provide recognition, financial and non-financial support, and industry connections to talented Hong Kong-based fashion students who embed sustainable design principles in their final-year graduation shows.

Fabrica Lab curates Experiential Workshops for the public and organizations like brands and schools, using tactile experiences and creativity to help participants understand sustainable living.

## 8.1 Future-Maker Award

This award acknowledges and empowers graduating students with designs that embody strong sustainability ideals from three of Hong Kong’s educational institutions: The Hong Kong Polytechnic University (PolyU), Hong Kong Design Institute (HKDI), and the Technological and Higher Education Institute of Hong Kong (THEi). It also fuels them to use innovative techniques to create their final-year graduation projects.

In 2023, six winners received a free six-month Fabrica Lab membership, enabling them to prototype and start their creative journeys. To celebrate our 5th anniversary, we commissioned five of these winners to design an outfit that symbolizes the spirit and heritage of The Mills. Collaborating with industry partners like Jeanologia, Advance Denim, and Lenzing, their creation incorporates sustainable materials, advanced finishing techniques, and timeless designs. These outfits are showcased in Fabrica X’s Denim Futures campaign, providing young designers with significant exposure.

Working with **3** top education institutions in Hong Kong

**6** winners

**5** receive follow-on project opportunities from Fabrica X

## 8.2 Experiential Workshop



At Fabrica Lab, we value craftsmanship and hands-on experiences, fostering a cultural and physical connection to materials. By merging these values with sustainability, we have curated workshops for students and corporate partners to promote team bonding, creativity, and sustainability knowledge.

Since our inception, Fabrica Lab has hosted 150 workshops for over 2,000 participants from schools, NGOs, and corporations. One such workshop involves creating cardholders and lampshades from upcycled plastics collected in Hong Kong. This initiative raises awareness about plastic pollution while sparking creativity and curiosity among participants, inspiring both “the intention” and “the spark.” By cultivating this mindset, we empower individuals to embrace an innovative approach within their respective domains.



Space x Lab Open Day 2023 at The Mills Fabrica, Hong Kong

**150** tailored workshops hosted

**2,000+** individuals participated in our workshops

## 8.3 Conversation with Meisze Tsang, Founder of TMS.SITE

Meisze Tsang is the founder of TMS.SITE. Her brand creates high-performance workwear for Industrial Athletes working in the most demanding physical environments. She became a lab member soon after completing her degree and stayed until late 2022. We caught up with Meisze and spoke about her time working in Fabrica Lab and exciting updates with TMS.SITE:

**TMF** We've seen you grow from a fresh graduate to building your own brand. What sparked your entrepreneurship journey? How has curiosity fueled your innovation, resilience against challenges, and adaptation to changing market needs?

**MS** The mission behind starting TMS.SITE, a modernized workwear brand, is to provide a uniform/workwear solution to heavy workers in rising temperatures and tough working environments. I've formed a deep connection with construction work from an early age through my working-class upbringing.

In the '90s, when I followed my father to work sites, I witnessed the skilled labor of the workers, as well as their brutal and unforgiving working conditions. Their clothes not only failed to protect them but made difficult work even harder. Traditional workwear is often bulky and uncomfortable.

In Hong Kong, although there is a rising number of safety problems on work sites, workers' safety awareness and self-value identification are low, leading them to believe they don't deserve better gear. It's essential to change this through the workwear solutions we provide and empower workers with an image of industrial athletes. We want to send a message: a sustainable future is built by inclusivity where everyone is considered.

From ideas to products, I executed the process at the Fabrica Lab. Determining if the products work is challenging because I need to ensure [they] function in tough conditions. I also want to know what workers think. Therefore, I pitched prototypes to construction workers outside The Mills's building in Tsuen Wan. With real testing data, I can move forward with design improvements and gain insights into user experience and market challenges.

**TMF** We were fortunate to have you as a lab member on your journey to develop your brand. Can you tell us more about how working in Fabrica Lab and being in the broader The Mills Fabrica ecosystem network has, in part, contributed to both your personal growth as an entrepreneur and the brand?

**MS** I joined Fabrica Lab in late 2020, right after completing my Master's at the Royal College of Art in London. [The lab] became the birthplace of my company's product and textile developments until [Summer 2022]. During my time at The Mills Fabrica, I participated in numerous networking events and summits focused on sustainability, food tech, and textile tech. These engagements provided valuable insights into industry trends and market dynamics. With a better understanding of the market and global trends, I could strategically align my business plan to meet evolving demands and technological advancements. The networking opportunities at The Mills Fabrica allowed me to connect with various textile-related companies, expanding my professional network.

**TMF** Since winning the Lacoste Starting Up Program in 2021, your brand has created various products. Can you tell us more about some exciting milestones you hit and exciting projects brewing in your pipeline?



Hong Kong steel fixers in TMS.SITE's protective workwear. Source: TMS.SITE

**MS** Before joining the Lacoste Starting Up Program, I spent two years developing working pants in the lab, continuously testing and improving the product design. However, I lacked knowledge about bringing these products to market.

Through the Lacoste Starting Up Program, I achieved significant milestones. With the support of funding and mentors, I launched a Kickstarter campaign to introduce the work pants I had developed. The Industrial Athletes Work Pants, a series of four stylish and durable work pants designed for hot and tough environments, were successfully launched. Within the first seven hours, the Kickstarter campaign raised HKD150K, meeting our funding targets. This marked the beginning of our brand's entry into the real market.

Since 2020, we have sold our workwear products to over 2,000 heavy-duty workers worldwide. Each year, we update and refine our products based on user feedback. In 2024, we are excited to develop a new line of performance workwear made from recycled fabric. This includes innovative items like the Cool Air Fan Jackets, an enhanced version of the iconic fan jacket with multifunctionality and improved airflow, catering to active workers. Coming Summer 2024, we will provide uniform jackets for The Mills CHAT (Centre for Heritage, Arts and Textile) team.

Additionally, we have enhanced our circular design uniform cycles through partnerships with recycling innovators, [enabling] us to collect worn-out uniforms, recycle them into yarn, and extend their lifespan by creating new uniforms.

## Part

## Concluding Remarks

For five years, The Mills Fabrica has proudly fostered, accelerated, and supported innovators actively making a tangible difference for our planet. Our mission is to create and develop an innovation platform that works synergistically with the broader ecosystem to generate a pipeline of innovators. The goal is to accelerate the birth of groundbreaking solutions that address the industry's most pressing socioenvironmental problems.

Our comprehensive scope of work entails providing diverse resources and support to foster collaboration and innovation. This encompasses venture investing, an incubation program, partnership initiatives, Fabrica Happenings, Fabrica Lab, Fabrica X (Impact Retail), and vibrant co-working spaces in Hong Kong and London.

By harnessing the synergies between these resources and support, we cultivate a knowledgeable and collaborative community. This collective effort enables us to foster collaborative relationships with the broader ecosystem, generating beneficial outcomes for a wide range of stakeholders, including students, entrepreneurs, intrapreneurs, education institutions, brands, manufacturers, and the industry itself.

These outcomes foster innovative solutions and encourage individuals to adopt more conscious behaviors, driving positive change on a larger scale. The Mills Fabrica will continue our mission to build a future where innovation, sustainability, and conscious consumption intersect, in hopes of creating a resilient and thriving planet for all.

# Glossary

## A

### All-cause mortality

A measure of the total number of deaths from any cause in a specific group of people over a specific period.

### Atmospheric Aerosol Loading (Planetary Boundary)

The concentration of human-made aerosols in the atmosphere that leads to significant changes in regional and global climate patterns.

## B

### Biogeochemical Flows (Planetary Boundary)

The rate of human-induced nitrogen and phosphorus loading to terrestrial and aquatic ecosystems that exceeds the natural background rate, leading to eutrophication and other ecosystem changes. This is measured as the global environmental flows of reactive forms of nitrogen (N) and phosphorus (P).

### Biomaterial

A material wholly or partially derived from naturally occurring sources such as plants, trees, or animals.

### Biosphere Integrity (Planetary Boundary)

The global rate of species extinctions is the planetary boundary indicator for the loss of genetic biodiversity and the maintenance of the integrity of the biosphere – the entirety of life on Earth and the complex web of its relationships. The diversity and abundance of living organisms underpin long-term Earth system functioning by regulating natural

material and energy flows and by providing resilience to both abrupt and gradual change. The extinction metric for this planetary boundary is now complemented with a more readily operational measure of biodiversity intactness.

- Genetic diversity: defined as the extinction rate, E/MSY (the extinctions per million species-years). < 10 E/MSY (10–100 E/MSY) but with an aspirational goal of ca. 1 E/MSY (the background rate of extinction loss).
- Functional diversity: defined by the Biodiversity Intactness Index (BII, not yet quantified), which assesses change in population abundance as a result of human impacts, such as land or resource use, across a wide range of taxa and functional groups at a biome or ecosystem level using pre-industrial era abundance as a reference point.

### Bottom-up Impact Research

An approach that focuses on the granular, detailed analysis of individual investments or projects. It involves evaluating the specific outcomes and changes generated by each investment at the ground level.

### Brewer's spent grains (BSG)

The by-product of the brewing process, consisting of the residual malt and grain husks left after the extraction of wort. BSG is rich in fiber, protein, and other nutrients, making it a valuable resource for animal feed, biofuel production, and other applications.

## C

### Carbon Tunnel Vision

A narrow focus on reducing carbon emissions (specifically CO<sub>2</sub>) to the exclusion of other important environmental and social issues.

### Carbon Dioxide Equivalent (Planetary Boundary)

A carbon dioxide equivalent or CO<sub>2</sub> equivalent, abbreviated as CO<sub>2</sub>-eq is a metric measure used to compare the emissions from various greenhouse gases on the basis of their global-warming potential (GWP), by converting amounts of other gases to the equivalent amount of carbon dioxide with the same global warming potential.

### Climate Change (Planetary Boundary)

An atmospheric CO<sub>2</sub> concentration of 350 parts per million (ppm) and an increase in top-of-atmosphere radiative forcing of +1.0 W m<sup>-2</sup> relative to preindustrial levels.

## F

### Fabrica Happenings

The different types of events that Fabrica hosts, co-hosts, or is part of.

### Freshwater Use (Planetary Boundary)

The use of green water and blue water. Green water is represented by the percentage of ice-free land area on which root-zone soil moisture deviates from Holocene variability for any month of the year. Blue water is an estimate of the total global volume of 'blue' water consumption (that is, the use of

## N

### Novel Entities (Planetary Boundary)

New substances, new forms of existing substances, and modified life forms, including chemicals and other new types of engineered materials or organisms not previously known to the earth system as well as naturally occurring elements (for example, heavy metals mobilized by anthropological activities).

## O

### Ocean Acidification (Planetary Boundaries)

The indicator used in the planetary boundaries framework is the aragonite saturation, a specialized measure of the geochemical effect of acidification in the oceans. As ocean acidification intensifies, the effects on marine life are complex and poorly predictable but include changes in calcification (shell and coral formation), photosynthesis, metabolism, and chemical signaling affecting organism behavior and structures of ecosystems. The planetary boundaries framework sets a safe boundary for ocean acidification at a pH of 8.2, which is the pre-industrial level. The current pH of the oceans is estimated to be around 8.1.

### Open System Process

An approach where an organization or community does not rely solely on its internal resources for research and development. Instead, it interacts dynamically with its environment, incorporating external ideas, technologies, and expertise. This concept is integral to open innovation models, where the traditional boundaries between a firm and its external environment are permeable.

water from rivers, lakes, reservoirs, and renewable groundwater sources) that would alter the Holocene functions of the water cycle.

## I

### Idea Generation

The purposeful and conscious process of creating, developing, and communicating new ideas, potential solutions, concepts, or innovations, ultimately leading to The Idea.

### Impact Retail

Our retail approach that places equal values on education, experience, and sustainable retail.

### Industries

The Mills Fabrica's target industries: textile and apparel and agrifood

## K

### Knowing community

A group of individuals or entities that collectively engage in the creation, sharing, and utilization of knowledge. These communities are typically characterized by their focus on learning, their common interests or goals, and their collaborative efforts to advance understanding or innovation within a particular domain or practice.

## L

### Land-System Change (Planetary Boundary)

The conversion of more than 15% of the Earth's ice-free land surface to cropland or other uses, leading to significant loss of biodiversity and changes in ecosystem function.

## P

### Planetary Boundaries Framework

A scientific framework that identifies and quantifies the planetary limits within which humanity can safely operate. It outlines nine critical Earth system processes and sets boundaries to avoid destabilizing the Earth system.

### Polyhydroxyalkanoates (PHAs)

A class of biodegradable polymers produced by certain bacteria as a form of energy storage. PHAs are considered environmentally friendly alternatives to conventional plastics because they are biodegradable and can be produced from renewable resources.

### Pounds of polluting plastics displaced

The weight of pellets in the market replacing conventional, polluting plastics. This number will increase as Mango Materials' PHA enters the market and is sold to consumers.

### Product

An article or service.

## R

### Recover

To incinerate materials to recover energy.

### Recycle

To process materials to obtain the same (high grade) or lower (low grade) quality.

### Reduce

To increase efficiency in product manufacture or use by consuming fewer natural resources and materials.

### Refurbish

To restore an old product and bring it up to date.

**Refuse**

To make a product redundant by abandoning its function or by offering the same function with a radically different product.

**Remanufacture**

To use parts of discarded products in a new product with the same function.

**Repair**

To repair and maintain defective products to be used as their original function.

**Repurpose**

To use discarded products or their parts in a new product to serve a different function.

**Rethink**

To make product use more intensive through sharing products or by putting multi-functional products on the market.

**Re-use**

To re-use by another consumer of discarded products that are still in good condition and fulfill their original function.

**S****Stratospheric Ozone Depletion (Planetary Boundary)**

The boundary related to the ozone concentration in the stratosphere, which protects life on Earth from harmful ultraviolet (UV) radiation.

**T****Techstyle**

The convergence of technology and lifestyle, which highlights how the textile and apparel industry is integrating technologies to drive advancements in both technical and sustainability dimensions.

**The Idea**

The final iteration of an idea for a product or service, which comes from the synthesis of less mature ideas and insights.

**The Intention**

The conscious and deliberate commitment to use existing and new knowledge and experiences to identify problems and set goals to solve them.

**The Spark**

The moment when an initial concept is created and set in motion to be developed further with clear, actionable goals to pursue it into more mature ideas.

**Top-Down Impact Research**

An approach that includes the examination of the broader, macro-level effects of investments, often from a portfolio or sector perspective, and the assessment of the overall impact and strategic alignment with larger goals and frameworks.

**W****Waste Colonialism**

The practice of exporting waste from higher-income countries to lower-income countries. This is often done under the guise of recycling or disposal, but it typically results in significant environmental degradation, health risks, and exploitation of the receiving countries.

# Endnotes

- 1 Zhang, David D., et al. "Global climate change, war, and population decline in recent human history." *Proceedings of the National Academy of Sciences* 104.49 (2007): 19214-19219.
- 2 Adapted from Galanakis, Kostas. "Innovation process. Make sense using systems thinking." *Tech-novation* 26.11 (2006): 1222-1232. And Cohendet, Patrick, Guy Parmentier, and Laurent Simon. "Managing knowledge, creativity and innovation." *The Elgar companion to innovation and knowledge creation*. Edward Elgar Publishing, 2017. 197-214.
- 3 This is an open system, meaning that ideas, individuals, and startups can enter and leave at any phase. As a result, the ideas, prototypes, and products we support will collaborate with other organizations, enhancing and contributing to the entire innovation landscape. This fluid interaction fosters a dynamic ecosystem where knowledge and resources are shared, driving collective growth and innovation. Through this continuous exchange, we aim to build a more interconnected and resilient network of innovators.
- 4 A knowing community refers to a group of individuals or entities that collectively engage in the exchange and creation of knowledge, particularly in the early stages of the innovation process. These communities are characterized by their collaborative nature, where members contribute diverse expertise, insights, and experiences to address complex problems and explore new opportunities. In the context of innovation, knowing communities play a crucial role in ideation, problem-solving, and the development of novel concepts by leveraging the collective intelligence and shared understanding of their members. Harvey, Jean-François, et al. "Knowing communities in the front end of innovation." *Research-Technology Management* 58.1 (2015): 46-54.
- 5 The "goal" refers to the desired outcome or the specific problem that the innovation aims to address. It is the clear objective that guides the creative process from the initial spark of an idea through to its ultimate realization as a product, service, or method.
- 6 Intention leads to the Spark. In our work, we begin by fostering the intention to innovate or solve specific problems, aligning with planetary boundaries to address environmental issues. This pre-existing intention creates a mindset that is receptive to new ideas, increasing the likelihood of a spark during brainstorming sessions, research, or other idea-generating activities. Essentially, the intention to solve a problem or improve a situation stimulates increased awareness and observation, which subsequently leads to a spark of inspirations.
- 7 Cohendet, Patrick, Guy Parmentier, and Laurent Simon. "Managing knowledge, creativity and innovation." *The Elgar companion to innovation and knowledge creation*. Edward Elgar Publishing, 2017. 197-214.
- 8 Akrich, Madeleine, et al. "The key to success in innovation part II: The art of choosing good spokes-persons." *International journal of innovation management* 6.02 (2002): 207-225.
- 9 Figure is adapted from Potting, José, et al. "Circular economy: measuring innovation in the product chain." *Planbureau voor de Leefomgeving* 2544 (2017).
- 10 Richardson, Katherine, et al. "Earth beyond six of nine planetary boundaries." *Science advances* 9.37 (2023): eadh2458.
- 11 Adapted from Hellweg, Stefanie, et al. "Life-cycle assessment to guide solutions for the triple planetary crisis." *Nature Portfolio*, vol. 4, no. 7, 4 Jul. 2023, p. 471-486. <https://doi.org/https://doi.org/10.1038/s43017-023-00449-2>.
- 12 Carbon tunnel vision refers to the narrow focus on reducing carbon emissions to the exclusion of other important environmental and sustainability issues. While mitigating carbon emissions is crucial for combating climate change, carbon tunnel vision can lead to the neglect of other critical aspects such as biodiversity loss, water scarcity, pollution, and social impacts.
- 13 Deivanayagam, Thilagawathi Abi, and Rhiannon Elizabeth Osborne. "Breaking free from tunnel vision for climate change and health." *PLOS Global Public Health* 3.3 (2023): e0001684.
- 14 In our 2022 Impact Report, we showed that all our portfolio companies have the future potential to positively impact at least one of the planetary boundaries.
- 15 As mentioned in our 2022 Impact Report, we follow the Impact Management Project (IMP) to specifically define the intentions and outcomes of our investment, as well as incorporating standardized measurement metrics such as IRIS+, GRI, and other measurement metrics.
- 16 Changing Markets Foundation (2023), *Take-Back Trickery: an investigation into clothing take-back schemes*. <https://changingmarkets.org/report/take-back-trickery-an-investigation-into-clothing-take-back-schemes/>.
- 17 Reuters (2023), *Ghana's vintage enthusiasts give new life to Western clothing waste*. <https://www.reuters.com/lifestyle/ghanas-vintage-enthusiasts-give-new-life-western-clothing-waste-2022-12-28/>.
- 18 Vogue Business 2023, <https://www.voguebusiness.com/sustainability/zara-teams-up-with-circ-to-launch-recycled-fibre-collection>.
- 19 Circ 2023, <https://circ.earth/mara-hoffmans-gorgeous-new-dress-can-be-recycled-again-and-again-and-again/>. Data provided by Circ.
- 20 Colorifix 2023 <https://colorifix.com/colorifix-receives-oeko-tex-eco-passport-and-pioneers-the-first-biological-dye-safety-testing-setting-a-new-standard-in-the-industry/>.
- 21 <https://futurevworld.com/fashion/vollebak-sustainable-dye-colorifix-biomaterials-microorganisms-bacteria-pigment-interview/>.
- 22 Zibunas, Christian, et al. "Cost-optimal pathways towards net-zero chemicals and plastics based on a circular carbon economy." *Computers & Chemical Engineering* 162 (2022): 107798.
- 23 Geyer, Roland, Jenna R. Jambeck, and Kara Lavender Law. "Production, use, and fate of all plastics ever made." *Science advances* 3.7 (2017): e1700782.
- 24 Data provided by Mango Materials. This denotes the weight of pellets that's created by Mango Materials which replaces conventional, polluting plastics.
- 25
- 26

- 27 Internal study by unspun.
- 28 *ibid.*
- 29 unspun 2024: Phase 2 LCA study released in 2024. The savings are based on comparing a pair of 3D woven pants made on-demand from either 100% conventional cotton or 100% virgin polyester with pants produced using air-jet weaving that has a 70% sell-through rate — with 30% of unsold finished inventory as wasted where 15% is incinerated and 85% landfilling with energy recovery.
- 30 Bazaar 2023 <https://www.harpersbazaar.com/fashion/designers/a45012768/eckhaus-latta-unspun-spring-2024-runway/>.
- 31 Miller, Mark D., et al. “Potential impacts of synthetic food dyes on activity and attention in children: a review of the human and animal evidence.” *Environmental Health* 21.1 (2022): 45.
- 32 The New York Times “What to Know About the 4 Food Additives Banned by California.”
- 33 Hubert, Bernard, et al. “The future of food: scenarios for 2050.” *Crop Science* 50 (2010): S-33.
- 34 The Supplant Company’s internal research.
- 35 *ibid.*
- 36 *ibid.*
- 37 Tseten, Tenzin, et al. “Strategies to mitigate enteric methane emissions from ruminant animals.” *Journal of Microbiology and Biotechnology* 32.3 (2022): 269.
- 38 As claimed on CH4 Global website: <https://ch4global.com/>.
- 39 As cited in Atomo Coffee website: <https://www.atomocoffee.com/pages/sustainability#:~:text=Every%20pound%20of%20Atomo%20beanless,positive%20impact%20on%20the%20planet.>
- 40 Data provided by Good Fashion Fund.
- 41 Data provided by Good Fashion Fund.
- 42 The 2019 and 2020 prizes was open to students studying MA Materials Futures. From 2021 onwards, the award was open to MA Biodesign students.
- 43 Nyhan, Laura, et al. “Brewers’ Spent Grain: An Unprecedented Opportunity to Develop Sustainable Plant-Based Nutrition Ingredients Addressing Global Malnutrition Challenges.” *Journal of Agricultural and Food Chemistry* 71.28 (2023): 10543-10564.
- 44 *Ibid.*
- 45 *Ibid.*
- 46 Fabrica X Hong Kong permanently resides at The Mills in Tsuen Wan and currently runs two pop-up locations in Central Nan Fung Tower and Kai Tak AIRSIDE. Pop-up locations might vary and could change throughout the year.

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