

Nature-loss drivers addressed:

Land and sea use change	Resource exploitation	Climate change	Pollution	Invasive alien species
-------------------------	-----------------------	----------------	-----------	------------------------

Phool Cleans Up With Upcycled Incense and Bio-leather

Part of the '[Opportunity Blossoms](#)' series on real economy investments in nature

Water pollution as a major cause of biodiversity loss in terrestrial and freshwater ecosystems. In India, approximately 800 million metric tons of flowers are offered in temples and mosques each year, with much of the resulting pesticide-laden waste entering the country's water bodies, exacerbating pollution, disease and water stress. The Ganges, which traverses the northeast of the country, has borne the brunt of these impacts, becoming the world's most polluted river and undergoing marked biodiversity loss.

Identifying a circular-economy opportunity, Phool has commercialized this floral waste through innovative upcycling practices. Operating in Kanpur, a city on the banks of the Ganges, the company collects discarded flowers from temples and transforms them into a range of products. These include incense sticks, organic compost and biomaterials such as compostable packaging and mycelium-based bio-leather.

As of October 2024, Phool has raised at least \$11.7 million and bagged a partnership with PVH Corp., parent of Tommy Hilfiger and Calvin Klein, to launch a product line using its bio-leather.

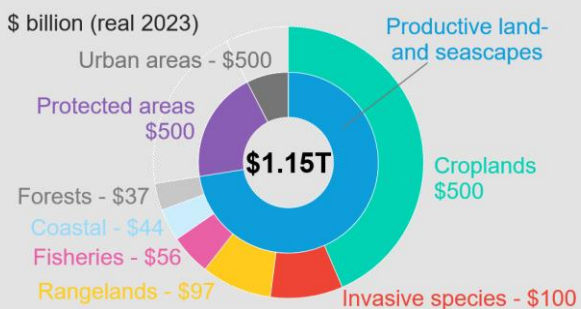
The nature-friendly product

Phool, which means 'flower' in Hindi, was founded in 2017 by two engineers aiming to reduce the amount of floral waste dumped into India's rivers. It partners with local temples to collect flowers used in religious ceremonies, which are then segregated, cleaned and dried, before being processed into the firm's primary offerings: charcoal-free incense sticks and organic agricultural compost. Biofilms – thin layers of microorganisms – and enzymes remediate the harmful pesticide components before cleaning.

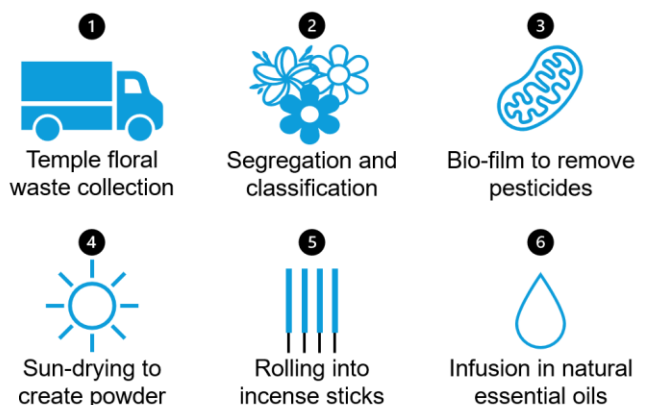
With backing from the Indian Institute of Technology since the ideation stage, Phool has undertaken research and development to discover novel ways to repurpose floral waste. The team discovered that under humid conditions, the waste acts as an effective feed culture, prompting growth of fungal mycelium networks and resulting in the creation of thick fibrous sheets. Experimentation with various microbial strains, temperatures and humidity levels led to the development of a bio-based compostable packaging foam, followed by a 'bio-leather', in 2021.

Mitigating nature loss

Biodiversity finance has to rise to an annual \$1.15 trillion by 2030. Phool's upcycling of temple floral waste is an example of a company mitigating resource exploitation and pollution.



Upcycling floral waste into incense sticks



Source: Phool, BloombergNEF.

Nature-loss drivers addressed:

Land and sea use change

Resource exploitation

Climate change

Pollution

Invasive alien species

The process of creating the bio-leather begins with boiling floral waste to extract cellulose and lignin, then feeding the liquid to microbes in flasks. Once the solution reaches a slurry-like consistency, it is transferred to trays to rest and grow into long sheets. These sheets are dried, tanned using tree-bark powder and embossed to create an animal-leather-like look and feel. Properties including insulation, tensile strength and elasticity can be tweaked based on the desired end-product requirements. Unlike other plant-based leathers, Phool’s production process does not require the use of polymer binders, making it fully compostable in around 90 days once buried in soil.

Phool has developed several products using bio-leather, including bags, wallets and shoes, although primarily markets it as an input to other companies.

Nature benefit of flower waste recovery

India’s rivers are some of the most biodiverse ecosystems in the world, with approximately 50% of all aquatic plants found in the subcontinent. The river Ganges alone is home to over 2,000 plant and animal species, including the endangered Gharial and Ganges River Dolphin. The freshwater ecosystems also hold social and economic significance.

Untreated sewage, agricultural run-off and industrial waste enter the river daily. Another major source of pollution is waste, including flowers, from cremations and religious offerings, with 8 million tons of floral waste dumped into the Ganges annually. Phool founder Ankit Agarwal views the diversion of floral waste as the “lowest-hanging fruit” to alleviate the region’s water pollution and water stress problems.

Through upcycling flowers, Phool stops harmful chemicals used in pesticides, such as lead and arsenic, from leaching into the river. As of 2023, it had upcycled over 35,000 tons of floral waste and diverted 3,500 kilograms of chemical residues from rivers. Its biomaterial offerings also provide an alternative to plastic packaging and conventional animal leather, which is linked to deforestation and pollution. Studies have found concerning levels of pesticide-

linked heavy metal contamination throughout the Ganges. Notably, in Kanpur, elevated levels of heavy metals associated with the city’s leather industry have been recorded.

Heavy metal contaminants in Ganges sediment at Kanpur and permissible limits (milligrams per liter)

Heavy metal	WHO limit	Concentration at Kanpur site	Percentage relative to limit
Arsenic	0.05	0.25	500%
Cadmium	0.005	2.5-6.0	50,000-120,000%
Lead	0.05	2.5	5,000%
Mercury	0.001	85-254	8,500,000-25,400,000%

Source: Paul (2017). Note: WHO is the World Health Organization. All four elements are present in pesticides; arsenic, cadmium and lead are effluents from tanneries.

Financial performance

Phool has raised at least \$11.7 million since its inception in 2017, according to PitchBook data. This includes \$2.5 million in seed rounds from several notable investors, such as IAN Fund, Tata’s Social Alpha (FISE) and IIT-Kanpur. Its most recent round – an \$8 million Series A in 2022 – was led by an investment from Sixth Sense Ventures.

The company told BNEF it is on track to double its annual revenue to \$15 million in 2024, with most sales shipped directly to customers through its website, and also expects this growth rate to continue to 2026. It is expanding geographically and now sources discarded flowers from six temple cities, allowing it to build its consumer-facing business and carve further into India’s \$3.2 billion home fragrance market.

Phool’s sustainability-focused product portfolio has garnered attention from young Indians online, building a strong social media presence and enabling repeat customer rates of over 60%. Reviews point to satisfaction with product quality and the non-toxic credentials of its offerings.

Nature-loss drivers addressed:

Land and sea use change

Resource exploitation

Climate change

Pollution

Invasive alien species

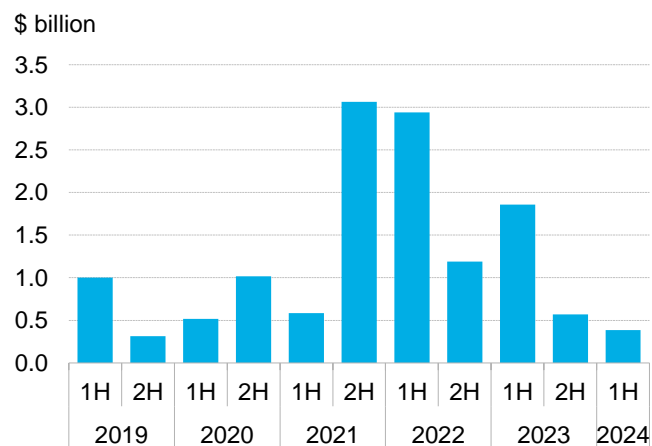
While sales and revenue information are not yet available for the firm’s bio-leather, the material has drawn commercial interest. By operating in Kanpur, India’s leather capital, and with the country playing a key role in the global textile supply chain, Phool is ideally positioned to tap the \$73 billion vegan leather industry. This has enabled it to secure partnerships with international clothing companies, including PVH Corp. (which owns brands including Tommy Hilfiger and Calvin Klein), and Phool says further interest has been expressed by a British carmaker and a US fashion retailer to bring the material into new markets.

Meanwhile, the bio-leather development led to Phool being named a finalist in the 2022 Earthshot Prize, whose committee noted that the material is a notable innovation helping to alleviate the global waste challenge. A December 2022 BBC article further boosted the public profile of the product.

Broader circular economy opportunities

Circular economy business models address resource scarcity and waste while creating economic opportunities. The global circular economy market was estimated to be worth €148 billion (\$161 billion) in 2020 and is forecast to hit €263 billion by 2030. BNEF estimates venture capital and private equity funding raised by circular economy-related startups totaled around \$385 million in the first half of 2024.

Venture capital and private equity funding for circular economy startups



Source: BloombergNEF.

The table below profiles three companies with business models that address the problem of waste while creating useful products.

Notable circular economy startups

Company	Description	Funding
Evnu	A US-based textile innovation company that chemically recycles textile waste into new fibers. Its technology can replace 90% of virgin fabrics.	\$31 million raised, with \$330 million in purchase commitments and partnerships with notable brands.
UBQ	Israel-headquartered UBQ’s technology converts unsorted household waste into a plastic substitute. It opened an industrial-scale facility in the Netherlands in 2024.	It has raised \$240 million. Its most recent Series D round totaled \$70 million in 2023.
Apeel	Californian startup creating plant-based edible coating for fruits and vegetables that enables them to remain fresh twice as long.	\$635 million raised, including \$250 million in Series E in 2021, pushing its valuation to over \$2 billion.

Analyst take

According to the Ellen MacArthur Foundation, “waste is the result of design choices” and thus the outcome of production inefficiencies. Circular economy companies such as Phool break away from the incumbent take-make-waste linear economic system, providing a solution to reduce nature impacts, as well as generate economic returns. Phool’s business model takes otherwise harmful waste from ceremonies and upcycles it into a range of commercial products. Its strong revenue growth, innovation and engaged client base position it well for future value creation, while also upskilling over 300 women from marginalized communities who manufacture its products.

Bloomberg’s nature and biodiversity solutions

This case was authored by Bloomberg’s ESG Data Team.

Clients can access Bloomberg’s Nature Solutions by entering {ESG Nature <GO>}.

Case study on Terminal Nature and Biodiversity analysis (terminal).

Nature-loss drivers addressed:

Land and sea
use change

Resource
exploitation

Climate
change

Pollution

Invasive alien
species

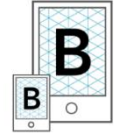
About us

Contact details

Client enquiries:

- Bloomberg Terminal: press <Help> key twice
- Email: support.bnef@bloomberg.net

Get the app



On IOS + Android
about.bnef.com/mobile

Surabhi Nagar	Senior ESG Data Analyst, Bloomberg	snagar13@bloomberg.net
Alistair Purdie	Analyst, Nature and Biodiversity	apurdie2@bloomberg.net
Hugh Bromley	Manager, Food, Agriculture and Nature	hbromley1@bloomberg.net

Copyright

© Bloomberg Finance L.P. 2024. This publication is the copyright of Bloomberg Finance L.P. in connection with BloombergNEF. No portion of this document may be photocopied, reproduced, scanned into an electronic system or transmitted, forwarded or distributed in any way without prior consent of BloombergNEF.

Disclaimer

The BloombergNEF ("BNEF"), service/information is derived from selected public sources. Bloomberg Finance L.P. and its affiliates, in providing the service/information, believe that the information it uses comes from reliable sources, but do not guarantee the accuracy or completeness of this information, which is subject to change without notice, and nothing in this document shall be construed as such a guarantee. The statements in this service/document reflect the current judgment of the authors of the relevant articles or features, and do not necessarily reflect the opinion of Bloomberg Finance L.P., Bloomberg L.P. or any of their affiliates ("Bloomberg"). Bloomberg disclaims any liability arising from use of this document, its contents and/or this service. Nothing herein shall constitute or be construed as an offering of financial instruments or as investment advice or recommendations by Bloomberg of an investment or other strategy (e.g., whether or not to "buy", "sell", or "hold" an investment). The information available through this service is not based on consideration of a subscriber's individual circumstances and should not be considered as information sufficient upon which to base an investment decision. You should determine on your own whether you agree with the content. This service should not be construed as tax or accounting advice or as a service designed to facilitate any subscriber's compliance with its tax, accounting or other legal obligations. Employees involved in this service may hold positions in the companies mentioned in the services/information.

The data included in these materials are for illustrative purposes only. The BLOOMBERG TERMINAL service and Bloomberg data products (the "Services") are owned and distributed by Bloomberg Finance L.P. ("BFLP") except (i) in Argentina, Australia and certain jurisdictions in the Pacific islands, Bermuda, China, India, Japan, Korea and New Zealand, where Bloomberg L.P. and its subsidiaries ("BLP") distribute these products, and (ii) in Singapore and the jurisdictions serviced by Bloomberg's Singapore office, where a subsidiary of BFLP distributes these products. BLP provides BFLP and its subsidiaries with global marketing and operational support and service. Certain features, functions, products and services are available only to sophisticated investors and only where permitted. BFLP, BLP and their affiliates do not guarantee the accuracy of prices or other information in the Services. Nothing in the Services shall constitute or be construed as an offering of financial instruments by BFLP, BLP or their affiliates, or as investment advice or recommendations by BFLP, BLP or their affiliates of an investment strategy or whether or not to "buy", "sell" or "hold" an investment. Information available via the Services should not be considered as information sufficient upon which to base an investment decision. The following are trademarks and service marks of BFLP, a Delaware limited partnership, or its subsidiaries: BLOOMBERG, BLOOMBERG ANYWHERE, BLOOMBERG MARKETS, BLOOMBERG NEWS, BLOOMBERG PROFESSIONAL, BLOOMBERG TERMINAL and BLOOMBERG.COM. Absence of any trademark or service mark from this list does not waive Bloomberg's intellectual property rights in that name, mark or logo. All rights reserved. © 2024 Bloomberg.