

The UN Secretary-General's Advisory Board on Zero Waste

Zero-Waste Andolan: A People's Led Movement for Ecological Restoration and Circular Economy in Darjeeling's Fragile Ecosystem (India)



Case Study

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Executive Summary

Tieedi's Zero-Waste Andolan is a grassroots community-driven movement that addresses Darjeeling's growing waste management crisis through decentralized, sustainable solutions. The region, which attracts millions of tourists annually, faces challenges from unchecked tourism and inadequate waste infrastructure, generating 30 to 45 metric tons of waste daily. Improper disposal practices, combined with the lack of local recycling facilities, have degraded the environment, impacting air, water, and soil quality.

The Zero-Waste Andolan promotes long-term behaviour change through education and community engagement. It focuses on decentralized waste management by integrating segregation, composting, and recycling, while raising awareness at household, school, and community levels, creating a replicable model of sustainable waste management. The initiative has achieved zero-waste status in over 100 homes and shops, three villages, and local institutions.

Through its Material Recovery Facility (MRF), Tieedi processes 53 categories of waste, diverting 2.5 tons of waste monthly from landfills and incineration, and has removed over 550 tons of waste from rivers and roadsides. This effort has decreased greenhouse gas emissions and improved resource efficiency in line with circular economy principles.

In addition, Tieedi's regenerative tourism program engages both local and global visitors in volunteering and experiential learning. This movement supports dignified livelihoods for waste pickers and creates opportunities for artisans and farmers through upcycling, value-added agro-produce, and cash-for-waste programs. The Zero-Waste Andolan's sustainability, scalability, and innovative approaches have been recognized by the West Bengal Government, National Geographic, and international film festivals.

Introduction

Darjeeling, a biodiversity hotspot in the Eastern Himalayas and a major tourism hub, is facing a waste management crisis compounded by unchecked tourism and climate change. With 30 to 45 metric tons of waste generated daily, the lack of effective waste infrastructure results in dumping and burning, which severely impact the environment. Waste must be transported over 50 kilometres to Siliguri for treatment, as there are no local recycling facilities.

The region's vulnerability to climate change further exacerbates these issues. According to the IPCC's Working Group 1 Assessment Report 6, Darjeeling's average annual temperature is projected to increase by 5.4°C — double the global average — placing the region at greater risk of rapid warming than many other regions. Waste mismanagement remains a significant contributor to environmental degradation, with dumping and burning becoming common practices that pollute the air, water, and soil. The lack of awareness among households, businesses, and tourists about the need to segregate biodegradable and non-biodegradable waste further worsens the problem.

Tieedi launched Zero-Waste Andolan, a grassroots initiative aimed at addressing the waste crisis

through community-driven, decentralized waste management solutions. The project is based in Sonada, near Darjeeling, where Tieedi's permaculture farm acts as the base for operations, with outreach extending to Darjeeling and Kurseong.

The Zero-Waste Andolan promotes the fundamental principles of zero waste — waste prevention, segregation, composting, and recycling — while focusing on community action, policy reform, and extended producer responsibility. Through education and behaviour change, the initiative aims to foster long-term solutions for pure air, fresh water, and rich soil in the region.

The main objectives include:

- Preventing untreated waste from entering the environment and water bodies.
- Diverting waste from landfill.
- Promoting waste segregation and scientific waste processing at household, institutional, and community levels.
- Raising stakeholder awareness about sustainable waste practices.
- Supporting dignified livelihoods for waste pickers and promoting sustainable tourism to reduce the region's carbon footprint.

General Description

► **Where** - Darjeeling, West Bengal, India

► **Specific location**

Sonada, Darjeeling and Kalimpong

► **When**

Start date (2016) and project ongoing.

► **What is the main zero waste issue**

Waste mismanagement in Darjeeling is mainly driven by a lack of infrastructure and awareness around proper waste disposal.

- Lack of awareness and unwillingness to segregate waste at the source lead to continuous cycles of overconsumption and waste mismanagement. Most households and businesses do not practice proper segregation.

- There is no last-mile infrastructure for waste collection and processing in Darjeeling, which places excessive pressure on overburdened landfills, rivers, and forests. Waste is often improperly dumped or burned, causing pollution and environmental degradation.
- Unchecked tourism adds to the problem, as unsustainable tourist practices leave behind a massive carbon footprint and generate large amounts of improperly disposed waste.
- Waste pickers face severe health challenges due to unsafe, unregulated working conditions in the informal waste sector.

► **Which is the main strategy applied and what tools were used**

The Zero-Waste Andolan applies a decentralized waste management strategy centred on community action, education, policy advocacy, and extended producer responsibility (EPR). Key strategies include:

- Waste Segregation: Households, businesses, and institutions are trained to segregate waste at the source through door-to-door campaigns and workshops, ensuring that both biodegradable and non-biodegradable waste are properly processed.
- Waste Innovation Center (WIC): To tackle the infrastructure challenge, the WIC, a local Material Recovery Facility (MRF) processes 53 categories of waste, diverting materials from landfills. By engaging artisans for upcycling, partnering with local and national recyclers, and investing in R&D, WIC ensures

that waste is scientifically processed and reintegrated into the circular economy.

- Contextual Innovations: Tools like Khamba and Mull Batta enable household composting. A specially developed compost catalyst accelerates decomposition in cold climates, addressing Darjeeling's unique conditions.
- Long-Term Behaviour Change: Using the Everyday Environmentalism curriculum, Tieedi engages youth, locals, and visitors to embed sustainable waste management practices as a part of daily life.
- Livelihood Opportunities: The initiative transforms the perception of waste and making jobs in this field aspirational for youth, addressing migration and offering local dignified employment.

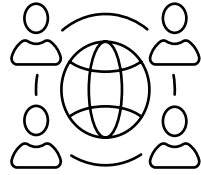
► **Partner(s)**

Schools and Colleges, Other NGO's, Recyclers and EPR Partners, Local Institutions, Community Groups, and Local Government.



Source: Tieedi

Resources Needed



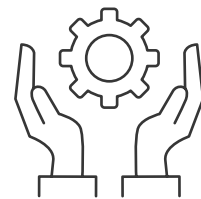
Human Resources

- Waste Crusaders – Local community and youth hired full time
- Volunteers
- Project Lead

Financial Resources

- Transportation
- Infrastructure Capital for a Material Recover Facility
- Set Up Starter Kits and Bags for Waste Management at Household, community and institution levels
- Salaries for employees

Main Challenges & Recommendations



Some of the main challenges we have encountered along the Zero-Waste Andolan implementation include:

- Administration and community apathy towards waste challenges
- Lack of recyclers and market linkages for waste categories
- High cost of operation and transport in mountain terrain

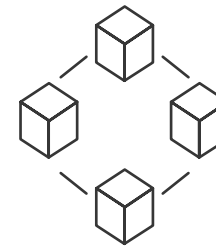
Recommendations

1. Taking a combined bottom up and top-down approach has helped create localized solutions that the government is willing to learn from and scale locally.
2. Investing initial years in education and awareness coupled with income incentives through tourism or cash for trash programs built a sense of pride towards restoring local ecology.
3. Using public advocacy and investing in R&D has been crucial in identifying and developing solutions for processing of waste categories.



4. Creating dignified and aspirational job opportunities in waste can shift the perception of working in Waste Management.
5. High Operation Cost must be accounted and budget for when planning operation in a mountainous terrain to incorporate higher transport and infrastructure costs vis a vis working in the plains.

Follow-up Measures



- Track the number of zero-waste households, shops, villages, and institutions.
- Monitor and categorize waste collected into bio-degradable and non bio-degradable.
- Evaluate educational learning outcomes at the school level.
- Establish and maintain partnerships with recyclers.

Zero Waste

The Zero-Waste Andolan integrates a range of zero-waste practices, including waste segregation at source, composting, upcycling, and recycling, all supported by innovative tools and local technologies. Key innovations and practices include:

- **Composting Innovation:** One of the main challenges in managing biodegradable waste in Darjeeling is the cold weather, which slows the composting process. To address this, we developed the 'Catalyst', a potent compost accelerator. The Catalyst is a mix of finished compost, cow dung powder, coffee powder, Mugwort (Titty Patti), Nettlewood (Sisnu), upcycled sawdust waste, ash, and indigenous microorganisms (IMOs). Uniquely, the IMOs are harvested from banana stems, making them well-suited for the region's conditions. This innovation significantly speeds up composting, ensuring biodegradable waste is efficiently processed, even in cold weather.
- **Waste Segregation at Source:** Building a daily habit of waste segregation was a crucial step, implemented through door-to-door collections, workshops, and training sessions. To manage wet waste, we introduced Khamba compost units (developed in partnership with Daily Dump) and Mull Batta, upcycled bucket composters, both of which are cost-effective and visually appealing. At the village level, we developed community composters and trained youth to manage them, ensuring the process remained decentralized and improved local soil health, even after our involvement ended. For dry waste, fixed collection dates and incentivized 'cash-for-trash' programs were implemented to reduce dumping and burning by locals. Additionally, through a CSR partnership, we established a Material Recovery Facility (MRF) that provides job security and dignity

to local waste workers, ensuring materials are processed before further recycling.

- **Everyday Environmentalism Curriculum:** Initially designed as a day-long workshop, this curriculum has evolved into a robust learning program that educates locals, youth, and visitors on sustainable waste practices. This helps ensure future generations are aware of both the challenges and solutions related to waste management, fostering long-term behaviour change.
- **Building Market Linkages and Extended Producer Responsibility (EPR):** Through advocacy efforts, we secured partnerships with corporations like Tetra Pak to extend producer responsibility. We also established collaborations to manage cigarette waste and sanitary pads, ensuring that all products, regardless of size, are responsibly recycled or repurposed.

Governance model

Tieedi is registered as a Section 8 Non-Profit, governed by the laws applicable to such organizations in India. In addition, the initiative has set up a community-led Paryaran Surakhsha Samiti (Environmental Protection Committee) to oversee local activities and monitor compliance within the Zero-Waste Zones. This committee ensures that both locals and tourists follow proper waste management practices.

As the initiative has progressed, a user collection fee was introduced to maintain accountability, sustainability, and transparency in operations. This fee ensures the continued operation of the zero-waste community and reinforces the commitment to sustainable waste management practices.

Process and Solutions

The Zero-Waste Andolan has evolved through multiple phases, initially focusing on ecosystem restoration and then scaling to develop replicable Zero-Waste models in Himalayan Regions and beyond.

Phase 1: Save 8 Mile Khola Project and Regenerative Tourism

- This phase focused on reviving the 8 Mile River, one of Darjeeling's last living rivers, which had been severely polluted with 20 years of accumulated waste. Through community-driven efforts, over 300 tons of waste were removed from the river through clean-up campaigns, educational initiatives, and door-to-door awareness programs. In addition, tourists were invited to experience tourism through a Zero-Waste lens, immersing them in local experiences and accommodating them in dorms and cottages designed with natural materials and following permaculture principles.

Phase 2: Launching Green Mile Project and Promoting a Zero-Waste Lifestyle Among Locals and Tourists

- Building on the lessons learned from the Save 8 Mile Khola project regarding the need for long-term sustainable behaviour change initiatives, Tieedi launched the Green Mile Project. This project established Zero-Waste Villages and developed waste management infrastructure like the Waste Innovation Center (WIC), ensuring proper segregation, recycling, and upcycling. This phase also involved testing and refining the Everyday Environmentalism Curriculum, which educates community members and youth on sustainable practices. Furthermore, collaboration with artisans to upcycle products and identify recycling market linkages

for various waste categories was also in focus. Testing and the launch of a Zero-Waste store to promote waste-free living among locals and tourists. The tourism initiative expanded as well, creating locally and environmentally focused experiential tourism opportunities.

Phase 3: Replication of Zero-Waste Framework and Testing Waste Processing Innovations for Waste Categories

- Currently, the focus is on replicating the Zero-Waste Framework across additional villages while testing and innovating waste processing solutions for categories where market linkages do not yet exist. Moreover, promotion of advocacy to Extend Producer responsibility to ensure corporations are held accountable and explore more sustainable alternatives at the production level itself, creating a top down shift. Most recently a Liquid Waste Management Systems for greywater and blackwater at both household and community levels is being tested.
- **Blackwater Solutions:** Tieedi is experimenting with underground cement tanks and above-ground Sintex tanks as low-cost, efficient methods to treat blackwater. These solutions convert waste into manure and ensure that only treated water is released into rivers and streams.
- **Greywater Solutions:** In Tieedi's community kitchen, an integrated filtration system using charcoal, human hair, sand, and gravel is being tested to treat greywater. The use of bio-enzymes, natural soaps, and calcium carbonate further reduces the impact on the local water system.

Results and Impact

Through the Zero-Waste Andolan, our impact is measured using quantitative and qualitative indicators:

1. Waste Management

- 551 tons of waste diverted from landfills and burning; 2.5 tons/month treated
- 53 categories of waste collected and processed via our Material Recovery Facility
- Transformed a 1.5-acre dumping ground into a permaculture forest garden
- 3 villages, 3 schools, 2 monasteries, 2 restaurants, and over 100 homes, shops, and eateries have achieved zero-waste status
- Offset river waste by managing two rivulets and blackwater management for 15 households via humanure tanks
- 600 trees planted to restore biodiversity

2. Experiential Education and Livelihoods

- 1,800+ children trained through our “Everyday Environmentalism” curriculum
- Skilling farmers in natural farming practices

Inclusion considerations

Laali Guras, an initiative within Zero-Waste Andolan focuses on sustainable menstruation. The project educates young women about eco-friendly menstrual products to reduce plastic waste from single-use sanitary items. Participants in Laali Guras engage in awareness workshops, addressing social taboos around menstruation and promoting sustainable waste management. Further,

- Employed 6 full-time waste crusaders and income-generating opportunities for artisans, farmers, and community members through upcycling and cash-for-waste programs
- 3. Recognition
 - Awards, endorsements and features from West Bengal Government, National Geographic, News18, and Sabera
 - Featured in Local and Global Film Festivals

these women test solutions like period panties, menstrual cups and cloth pads, becoming role models in the community for leading a shift towards sustainable menstruation. By fostering leadership among these young women we address both social and environmental issues.

Future steps, upscaling and sustainability

The Zero-Waste Andolan plans to enhance its reach and effectiveness in sustainable waste management. In the immediate future the plan includes:

1. Establishing Robust Market Linkages: Setting up partnerships with local and national recyclers to ensure that all collected materials are processed sustainably. Using a mix of investment in R&D, advocacy and strategic partnerships, the Andolan will create a reliable network for recycling for various waste categories. This includes negotiating long-term contracts with recyclers and exploring innovative recycling technologies that can handle diverse material streams. By establishing these linkages, we aim to close the loop in our waste management process, ensuring that materials are not only diverted from landfills but also reintegrated into the economy as valuable resources.

2. Expand Reach of Zero-Waste Framework and Capacity to Process Monthly Waste: Increase our waste processing capacity from 2.5 tons to 5 tons per month, thereby extending our services to more communities and households to adopt the Zero-Waste Framework directly. In addition, work with organizations, panchayats, and other institutions to replicate the framework in their contexts. To expand the existing processing capacity, an investment in acquiring advanced machinery for specific categories of waste like paper and plastics.

For the sustainability of the project, we engage in identifying CSR's, and building economic resilience within the initiative itself through user fees, tourism and other consulting projects.



Source: Tieddi

Lessons Learned and Recommendations

- 1. Community Engagement is Crucial:** Initial apathy and resistance from local communities posed significant hurdles.
 - Building trust and rapport with community members is essential. Successful engagement was achieved through continuous dialogue, involving locals in decision-making processes, and demonstrating tangible benefits of zero-waste practices.
 - Build alliances with local leaders, NGOs, and community groups to enhance credibility and facilitate grassroots mobilization. Use participatory approaches to ensure community ownership and sustainability.
- 2. Infrastructure Limitations:** The lack of adequate waste processing facilities hindered efficient waste management.
 - Establishing localized infrastructure, such as Material Recovery Facilities (MRFs), proved effective in addressing this gap and serving as a model example. However, scaling these facilities requires careful planning and investment.
 - Invest in decentralized infrastructure initially and partnering with recyclers by setting up community based MRFs and Micro-MRFs.
- 3. Behavioural Change Takes Time:** Shifting long-standing waste disposal habits required sustained effort. Educational programs like the “Everyday Environmentalism” curriculum were instrumental in fostering long-term behavioural change. Consistent reinforcement through work-shops and community events helped solidify new habits.
 - Integration of behaviour change strategies into all stages of project planning and execution are necessary to ensure they are culturally relevant and engaging.
- 4. Economic Incentives Drive Participation:** Motivating individuals to participate in pay for waste segregation and recycling efforts was initially difficult. Economic incentives, such as cash-for-trash programs and creating local livelihood opportunities, significantly increased participation rates.
 - Design incentive structures that align with local economic conditions and provide clear, immediate benefits to participants.
- 5. Policy Support Enhances Impact:** Limited initial support from local government agencies slowed progress. Advocacy and collaboration with governmental bodies lead to policy changes that supported zero-waste goals. Demonstrating successful outcomes helped garner official backing.
 - Engage policymakers early in the process and provide them with data-driven and anecdotal evidence of the initiative’s benefits to secure their support.
 - Document and share best practices, challenges, and successes with other organizations and communities. Host workshops, webinars, and conferences to disseminate knowledge and foster collaboration.

Conclusion

The Zero-Waste Andolan in Darjeeling exemplifies the transformative power of grassroots, community-driven efforts in tackling significant environmental challenges. By employing innovative waste management strategies, forging strategic partnerships, and prioritizing education, this initiative has made a positive stride towards waste management practices in the region. With over 550 tons of waste diverted from landfills and multiple villages and institutions achieving zero-waste status, the tangible impact of these efforts is evident.

By embracing circular economy principles and fostering long-term behavioural change, the Zero-Waste Andolan not only addresses immediate waste management concerns but also contributes to broader ecological restoration and climate resilience.

Furthermore, the initiative’s commitment to creating dignified livelihoods and promoting regenerative tourism taps into the potential of showcasing how sustainable practices can drive economic growth. As more communities embrace similar approaches, the ripple effects will significantly advance the sustainable development goals.

In summary, the Zero-Waste Andolan stands as an inspiring model for other regions facing similar challenges. Its achievements demonstrate that through collective action, innovative solutions, and unwavering dedication, it is possible to create a future of pure air, fresh water, and rich soil. For all beings.

References

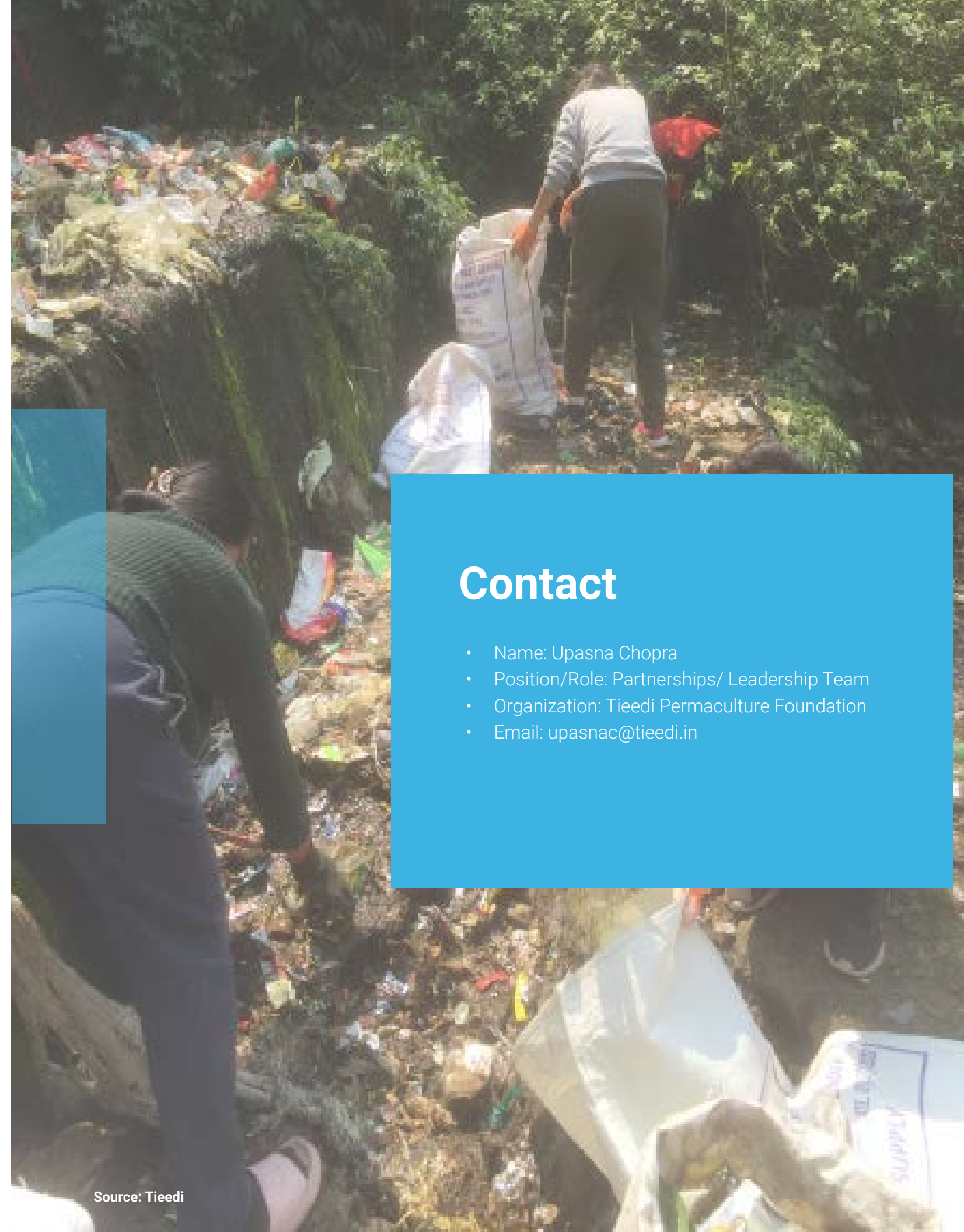
[Link to Annual Report 2023-2024](#)

Data based on internal calculations and estimates

Further Information and Media

[Link to Annual Report 2023-2024](#)

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