

Upcycling Food Waste: Legal Framework for Circular Economies and Right to Food in India

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Abstract

India's dual crisis of rampant food waste and widespread hunger presents a moral and policy paradox, undermining the constitutional right to food and contributing to environmental degradation. With over 100 million tonnes of food wasted annually, including 68 million tonnes at the household level, the issue implicates food security, climate goals, and socio-economic equity. This article conducts a doctrinal legal analysis of India's fragmented legal and policy framework governing food waste and upcycling, encompassing constitutional principles, statutory instruments like the National Food Security Act (2013) and Food Safety and Standards Act (2006), and environmental regulations such as the Solid Waste Management Rules (2016). It integrates comparative insights from jurisdictions like the EU, Japan, and the USA, highlighting global best practices in food waste reduction. Findings reveal that despite emergent regulatory efforts—such as FSSAI's 2019 Surplus Food Regulations and municipal composting mandates—India lacks a unified, enforceable legal framework for systematic food waste upcycling. Case studies like Tamil Nadu's "No Food Waste" initiative exemplify successful public-civic partnerships. The article argues for a comprehensive national law mandating food waste measurement, redistribution obligations, and incentives for donation and recycling. By embedding food waste upcycling within rights-based, environmental, and social justice frameworks, India can transform its food system into a sustainable, circular model that ensures food reaches people—not landfills.

Keywords: Food Waste, Right to Food, Circular Economy, Food Upcycling, Indian Legal Framework, Surplus Food Donation, Environmental Law, Sustainable Development

1.1. INTRODUCTION

India faces a paradox of plenty and want: on one hand, enormous quantities of food are wasted each year; on the other, millions of Indians remain food-insecure. Estimates indicate that around 67–68 million tonnes of food are wasted in India annually – roughly 30–40% of all food produced – at a cost of over ₹92,000 crore (about USD 14 billion) per year. (Agriculture, 2024) This lost food is nutritionally sufficient to feed entire states (e.g. it could feed Bihar's population for a year) (Press Trust of India, 2021). The **right to food** is recognized as implicit in the fundamental right to life under Article 21 of the Indian Constitution, and the Indian Supreme Court has affirmed that the state's failure to prevent starvation amid plentiful food stocks violates this right. Yet, as food waste mounts, achieving food security remains elusive. At the same time, food waste burdens the environment: decomposing organic waste emits methane, a potent greenhouse gas contributing to climate change (Problem of food wastage, 2017). The United Nations Environment Programme (UNEP) reports that 8–10% of global greenhouse gas emissions are linked to unconsumed food. (Food Waste Index Report, 2021) In India, food waste generates an estimated 195 million tonnes of CO₂-equivalent emissions per year, exacerbating climate impacts such as methane

release from overflowing landfills. Against this backdrop, *upcycling* food waste – i.e., repurposing surplus or scraps into useful products (animal feed, compost, energy, or redistribution to people in need) – emerges as a strategy to support both **circular economy** goals and the human right to adequate food. A circular economy model in the food sector keeps resources in use and regenerates natural systems, treating “waste” as a feedstock for new cycles. This article provides a doctrinal legal analysis of India’s framework on food waste upcycling, examining constitutional principles, statutes, and policies, and proposes a legal roadmap to bolster circular economies and realize the right to food. It surveys current Indian laws and gaps, draws lessons from comparative jurisdictions (EU, USA, Japan), and suggests reforms – including incentives, clearer obligations, and governance innovations – to reduce food waste and ensure surplus food feeds people, not landfills. The discussion is organized into clearly numbered sections, using an interdisciplinary approach that integrates environmental law, human rights, and policy perspectives for a comprehensive understanding of the issue.

A dumpsite overflowing with mixed waste in Mumbai, India. Food and organic refuse form a large portion of municipal solid waste, highlighting the need for circular waste management solutions.

1.2. THE RIGHT TO FOOD IN INDIA: CONSTITUTIONAL AND LEGAL FOUNDATIONS

India’s legal framework implicitly recognizes the **right to food** as a fundamental aspect of the right to life and human dignity. While the Constitution of India does not explicitly enumerate a right to food, the Supreme Court has read this right into Article 21 (Protection of Life and Personal Liberty) through expansive interpretation. (*People’s Union for Civil Liberties v. Union of India*, W.P. (Civ.) No. 196/2001, 2001) Article 21 guarantees the right to live with human dignity, which the Court has held includes the right to adequate nutrition, clothing, and shelter. Additionally, Article 47 of the Constitution (a Directive Principle of State Policy) directs the State to raise the level of nutrition and the standard of living of its people and to improve public health, emphasizing the State’s duty to secure its citizens from hunger and malnutrition. (*The Constitution of India*, Article 47, 1950) Although directive principles are not justiciable in court, they guide governance and have informed statutory enactments and policies on food security.

1.2.1. Judicial Recognition of the Right to Food

In a series of Public Interest Litigations (PILs) since the early 2000s, the Supreme Court cemented the right to food as part of Article 21. A landmark case is **People’s Union for Civil Liberties v. Union of India (PUCL)**, W.P. (C) No. 196/2001 (Supreme Court of India), which was filed in the context of starvation deaths in Rajasthan even as government granaries overflowed with excess food grains. In interim orders in the PUCL case, the Supreme Court famously stated that Article 21 is violated when people starve and food stocks rot – thereby recognizing a right to food and directing governments to implement food distribution schemes (e.g. the Public Distribution System and Mid-Day Meal Scheme) as entitlements. (*PUCL v. Union of India*, W.P.(C) No. 196/2001, 2001) The Court’s orders highlighted that the State’s inaction amidst plenty imperilled the right to life, noting the “paradox of food grains rotting in granaries while people died of hunger”. This judicial intervention galvanized the **Right to Food Campaign** and led to improved rollout of feeding programs. Another pertinent decision is *Kishen Pattnayak v. State of Orissa* (1989), where the Supreme Court treated preventing hunger and starvation as part of the State’s obligations under the right to life (though the case was disposed with directions rather than a full judgment). Through such cases, Indian jurisprudence has effectively **read the right to food into constitutional law**, laying a foundation for legislative action.

1.2.2. Legislative Framework: National Food Security Act

In 2013, India enacted the **National Food Security Act, 2013** (NFSA) to give statutory shape to the right to food. The NFSA is premised on Article 21 and Article 47, and it aims to “provide for food and nutritional security...by ensuring access to adequate quantity of quality food at affordable prices”. (The National Food Security Act, 2013 (Act No. 20 of 2013)) The Act creates justiciable entitlements to highly subsidized food grains for approximately two-thirds of India’s population, through the Targeted Public Distribution System. It also codifies schemes like the Mid-Day Meal for school children and Integrated Child Development Services (ICDS) for infants and mothers. By recognizing **food as a legal entitlement**, the NFSA attempts to move away from a welfare paradigm to a rights-based approach. Notably, Section 12 of the Act calls for measures to prevent and reduce food waste in government programs (e.g., optimizing grain storage and transportation to minimize losses). However, the NFSA does not directly address private-sector food waste or upcycling; its focus is on distribution of staples to intended beneficiaries. The Act’s implementation has been marred by issues of leakage, exclusion errors, and periodic reports of grain spoilage in government warehouses due to poor storage (Report No. 7 of 2013: Performance Audit of Storage Management in Food Corporation of India, 2013). Indeed, between 2013 and 2016, over 46,000 tonnes of food grains in the central Food Corporation of India’s warehouses became unfit for consumption (and another 143 tonnes were pilfered), enough to feed hundreds of thousands of people. These losses underscore that even a robust legal entitlement framework must be complemented by strong measures to prevent food waste in supply chains and storage.

1.2.3. Statutory and Regulatory Provisions Addressing Food Waste

Apart from the NFSA, several laws touch on aspects of food waste and safety. The **Food Safety and Standards Act, 2006** (FSSA) and regulations under it empower the Food Safety and Standards Authority of India (FSSAI) to ensure the safety of food, including donated or redistributed food. In 2019, FSSAI exercised its powers to notify the *Food Safety and Standards (Recovery and Distribution of Surplus Food) Regulations, 2019*, a groundbreaking step to promote safe food donation and upcycling of edible surplus. These regulations – effective July 2020 – provide a framework for donation of surplus food by food businesses and individuals, defining “surplus food” as leftover, unused safe food not served to customers. They mandate that any surplus food distribution organization (e.g. food banks, charities) must obtain an FSSAI registration and comply with food safety norms when collecting, storing, and redistributing food (Food Safety and Standards (Recovery and Distribution of Surplus Food) Regulations, 2019, 2019). Notably, the 2019 Surplus Food Regulations include a form of “**Good Samaritan**” protection, stating that donors and recipient organizations acting in good faith in compliance with the regulations shall not be liable if the donated food, upon proper handling, inadvertently causes harm. This liability shield aims to remove a key legal disincentive to donation – the fear of being sued for food poisoning – similar to laws in countries like the USA (Bill Emerson Good Samaritan Food Donation Act, 42 U.S.C. §1791). The regulations also impose responsibilities to ensure donated food is clearly labeled “Not for Sale,” handled hygienically, and distributed within its shelf-life. By formally regulating food recovery, India created a **legal enabling environment for upcycling edible food** to those in need. However, these rules are still new and enforcement remains nascent; awareness among food businesses of this option is limited. (India’s food donation law: A boon for hunger relief, 2020)

Beyond FSSAI’s domain, environmental laws indirectly relate to food waste. The **Environment (Protection) Act, 1986** provides the umbrella under which Waste Management Rules have been issued.

The **Solid Waste Management (SWM) Rules, 2016**, notified under the EP Act, require all local authorities and certain bulk waste generators (such as hotels, restaurants, wedding halls and markets) to **segregate biodegradable (wet) waste at source** and ensure its processing (composting or bio-methanation) rather than disposal in landfills. These rules represent a shift towards circular handling of organic waste, mandating that “wet waste” be used to produce compost or energy. Some cities have local by-laws under these rules – for example, municipal regulations in Bengaluru and Pune requiring large food waste generators to install on-site composters. However, compliance is uneven; lack of monitoring and incentives means much food waste still ends up mixed with trash. Other relevant statutes include the **Consumer Protection Act, 2019**, which covers adulteration and unsafe food (to the extent that donated food must still be safe for consumers), and the **Essential Commodities Act, 1955**, under which the government at times issues orders to prevent wastage of essential food items (for instance, by imposing stock limits to curb hoarding-induced spoilage).

1.3. FOOD WASTE IN INDIA: SCALE, CAUSES, AND IMPACTS

1.3.1. Extent of Food Waste in India – Data and Trends

India is often cited as one of the world’s largest generators of food waste in absolute terms, due to its large population and complex food supply chains. A 2021 UN Environment Programme report estimated that Indian households alone waste about **50 kg of food per person each year**, amounting to **68.76 million tonnes** of annual household food waste. This places India second only to China (91.6 million tonnes) in total household food waste, and far above the United States (~19.4 million tonnes). The graph below illustrates a comparison of annual household food waste (2019 data) for the top three countries:

It is important to note that these household waste figures do not even include losses at pre-consumer stages (farm, storage, transport, retail). When losses across the supply chain are accounted, India’s total food loss and waste is significantly higher. A comprehensive 2015 government study (ICAR-CIPHET) found **post-harvest losses** ranging from 3% to nearly 16% in major staples and horticultural produce, amounting to about **67 million tonnes annually** – a remarkably similar order of magnitude as the consumer waste estimate, suggesting that **overall food waste+loss in India likely exceeds 100 million tonnes/year**. According to the Indian Council of Agricultural Research, these losses were valued at **₹926.5 billion (USD ~\$15 billion) in 2014**, about 0.6% of GDP. The causes of waste span the entire food system: on farms and in distribution, inadequate storage and refrigeration, spillage during transport, lack of processing facilities, and market inefficiencies lead to “**food loss**”; at the retail and consumer end, oversupply, confusion over date labels, cultural norms (e.g. lavish weddings), and individual behaviors lead to “**food waste**”. Studies indicate that fruits and vegetables and cereals are the most wasted commodities by volume in India, owing to their high perishability and production levels. For instance, in peak seasons gluts of tomatoes or onions often rot due to bottlenecks in cold storage and processing. At the consumption level, urbanization and changing lifestyles contribute to waste: household waste audits in Indian cities have found edible food regularly discarded in the garbage. In Delhi, for example, surveys showed that 84% of excess cooked food is simply thrown away rather than reused or donated. Overall, per capita food waste (household) in India (~50 kg/year) remains lower than many developed countries (e.g. ~79 kg in USA), reflecting frugal habits among many Indians. Yet the sheer scale of India’s population and production means even a lower per capita waste translates into massive aggregate waste – with serious implications for food security and the environment.

1.3.2. Causes of Food Waste

The drivers of food waste in India are multifaceted, cutting across technological, behavioral, and policy domains. Key causes include:

- **Post-Harvest Infrastructure Gaps:** A chronic lack of adequate **cold storage and refrigerated transport** leads to high spoilage of fruits, vegetables, dairy, and meat. India has an estimated cold storage capacity of ~37 million tonnes, but needs an additional 60 million tonnes to cover current production. As a result, around 20–40% of produce (depending on the crop) never reaches consumers in saleable form. This infrastructure deficit is especially pronounced for perishables – for example, only ~10% of horticultural output is transported in cold chain, causing huge losses in transit (Aayog, 2019).
- **Supply Chain Inefficiencies:** The predominance of informal, fragmented supply chains means multiple handling points where food can be damaged or lost. In grains, inefficient logistical management by procurement agencies has led to situations where grains are stored in the open under tarps (“Cover and Plinth” method), rendering them vulnerable to rain and pests. As noted earlier, tens of thousands of tonnes of rice and wheat have rotted in government stocks. In private distribution, inconsistent electricity supply for cold rooms, and lack of packaging or processing facilities near farms, contribute to losses.
- **Retail and Consumer Behavior:** At the retail end, **oversupply and aesthetic standards** drive waste. Supermarkets (where they exist in India’s metros) often reject “ugly” produce that doesn’t meet appearance norms, and restaurants or catering businesses may overproduce food to avoid shortages, with the surplus binned at day’s end. Cultural practices, such as the serving of excessive variety and quantity of dishes in Indian weddings and banquets, also cause significant waste – studies suggest 10–20% of food at big events goes untouched. In Indian weddings, it is common to see large quantities of cooked food leftover; while some is collected by NGOs, much is discarded. Consumer attitudes like viewing leftover food as stale or a social stigma in donating excess also play a role (though this is changing with awareness).
- **Policy and Legal Gaps:** Until recently, India lacked clear legal directives to minimize food waste or to facilitate redistribution. Without **formal incentives or mandates**, businesses had little motivation to invest in waste reduction. In fact, as one Mumbai environmental activist observed, municipal budgets often grow with more waste – creating a perverse disincentive to reduce waste at source. Furthermore, the absence (until 2019) of a Good Samaritan law meant restaurants and donors feared liability if someone fell ill from donated food, so they preferred disposal. Only with FSSAI’s 2019 surplus food regulations has this begun to be addressed.
- **Public Awareness and Cultural Norms:** On the consumer side, awareness about the social and environmental costs of food waste has been relatively low. Traditionally, many Indian households did practice frugality (using leftovers, feeding animals, composting kitchen scraps). But urban middle-class lifestyles and the availability of food have led to more wasteful habits. A survey noted only ~4% of Indians were aware of the climate impact of food waste. Additionally, in some cultures wasting food is seen as a sign of abundance or hospitality (e.g. serving excess to guests). Overcoming these mindsets requires education and cultural change.

1.3.3. Impacts of Food Waste

The consequences of food waste in India are severe and wide-ranging. First, there is the moral and

economic **impact on food security and nutrition** – the wasted food, if saved or redistributed, could significantly reduce hunger. India continues to rank high on the Global Hunger Index (94th of 107 in 2020), with over 190 million undernourished people. The opportunity cost of food waste is thus enormous, representing meals denied to those in need. Second, the **environmental impact** is profound. Wasted food implies wasted water, land, and energy used in its production. FAO estimates that globally, food waste accounts for a loss of 250 cubic kilometers of water and nearly 1.4 billion hectares of land each year; in India's context, the water and fertilizer inputs that go into producing food that is never eaten exacerbate water scarcity and soil pollution (Food wastage footprint: Impacts on natural resources – Summary report, 2013). Moreover, when food waste is dumped in landfills (often mixed with other refuse), it decomposes anaerobically to produce methane, which is ~25 times more potent than CO₂ in warming the planet. Indian cities are struggling with methane fires and structural instability at giant landfill sites like Ghazipur (Delhi) and Deonar (Mumbai), where organic waste is a major contributor. Studies indicate that better food waste management in India could mitigate tens of millions of tonnes of CO₂-equivalent emissions annually. Finally, there is an **economic cost** to stakeholders across the chain – farmers lose income when crops rot, consumers pay higher prices when supply is artificially undercut by waste, and governments spend money on waste disposal that could be saved by reduction at source. In sum, reducing and upcycling food waste would yield multiple co-benefits: alleviating hunger, saving resources, reducing greenhouse emissions, and creating new economic activity (e.g., jobs in food recovery and recycling industries). These impacts underscore the urgency of a supportive legal framework to address food waste. (Preventing nutrient loss and waste across the food system: Policy actions for high-quality diets, 2019)

1.3.4. Existing Indian Legal Framework on Food Waste Upcycling

As discussed in Section 2.3, India's legal measures specific to food waste upcycling are still emerging. The FSSAI Surplus Food Regulations, 2019 are a central piece, as they legitimize and structure the **redistribution of surplus edible food**. Under these regulations, food donors (restaurants, cafeterias, grocery stores, etc.) are encouraged to hand over unused safe food to *Surplus Food Distribution Organizations* (SFDOs) like food banks and community kitchens. The SFDOs must ensure the food is kept within safe temperature ranges, labeled with source and date, and distributed promptly to prevent spoilage. The regulations also call for training of personnel in such organizations on food safety. To facilitate nationwide implementation, FSSAI launched initiatives such as the "Indian Food Sharing Alliance" (IFSA) – a network connecting donors with certified NGOs (Food loss and waste in India: The knowns and unknowns, 2021). State food safety departments have been involved; for example, Tamil Nadu's Food Safety Department, under FSSAI's guidance, formed a state-level committee including hoteliers and caterers to support food recovery efforts. These efforts show the law moving beyond mere permission to active promotion of upcycling edible food to feed the hungry.

On the **municipal solid waste** side, the SWM Rules 2016 (and related local bye-laws) form the legal backbone for upcycling inedible food waste (e.g. peels, spoiled food) into compost or energy. Many city municipal corporations have introduced rules requiring large waste generators (often defined as bulk establishments generating over 100 kg of waste per day) to process their wet waste on-site. For instance, Pune Municipal Corporation, following NGT directives, requires wedding halls and hotels to install compost units. Some progressive local bodies offer incentives for compliance – such as discounts on waste collection fees if wet waste is composted – but by and large enforcement relies on general fines for non-segregation. The National Green Tribunal (NGT) has played a role in pushing implementation; in *Westend*

Green Farms Society v. UOI (NGT Principal Bench, Order dated 08.07.2019), the NGT directed Delhi authorities to curb food wastage in social events and promote distribution of leftovers to the needy (alongside composting for non-edible waste). While not a court of record like the Supreme Court, NGT's orders have spurred local regulation. Additionally, the Ministry of Consumer Affairs has occasionally invoked the Consumer Protection Act and Essential Commodities Act to address specific instances of food wastage – for example, by directing that hotels should inform consumers about portion sizes to prevent over-ordering (a 2017 initiative). However, these efforts are sporadic.

In the realm of **international commitments**, India is a signatory to the UN Sustainable Development Goals (SDGs), including **SDG 12.3** which calls to halve per capita global food waste at the retail and consumer level by 2030 and reduce food losses along production and supply chains. Though India has not yet set a national target in line with SDG 12.3, the government's policy think-tank NITI Aayog has acknowledged food loss and waste as a concern in strategy documents (Aayog, 2019). Moreover, as a State Party to the **International Covenant on Economic, Social and Cultural Rights (ICESCR)**, India is internationally obliged to take steps to ensure the right to adequate food (ICESCR, art. 11) – which implicitly includes minimizing waste of food resources. General Comment 12 of the UN Committee on ESCR (1999) on the right to food emphasizes that states should improve methods of food storage and distribution to make food accessible, an obligation relevant to food waste reduction. While not directly enforceable in Indian courts, these international norms influence the interpretation of domestic law (the Supreme Court has often relied on ICESCR to bolster socio-economic rights). In summary, India's current legal framework provides **pieces of the puzzle** – a constitutional underpinning for right to food, sectoral regulations enabling donation and composting, and supportive judicial and policy statements – but it lacks an integrated, comprehensive law or policy dedicated to food waste reduction and upcycling. The next section analyzes how other jurisdictions have approached this issue, to glean comparative insights for India.

1.4. POLICY LINKAGES: FOOD WASTE, SUSTAINABILITY, AND SOCIAL JUSTICE IN INDIA

Food waste is not merely a sectoral problem; it sits at the intersection of various policy domains – nutrition, agriculture, urban development, climate change, social welfare, and corporate regulation. Tackling it effectively in India will require a holistic approach that leverages existing government initiatives and addresses broader issues of equity and sustainability. This section discusses how food waste upcycling relates to key Indian policies and rights: the National Food Security framework, the Swachh Bharat (Clean India) Mission, climate change commitments, economic and social justice for vulnerable populations, corporate social responsibility mandates, and the promotion of technological innovations. Situating the food waste agenda within these larger contexts can amplify its importance and open avenues for integrated solutions.

1.4.1. National Food Security and Hunger Alleviation Policies

India's flagship programs to combat hunger – as embodied in the **National Food Security Act, 2013** and schemes like the Public Distribution System (PDS), Mid-Day Meal (MDM), and Integrated Child Development Services (ICDS) – are inherently connected to food waste concerns. These programs strive to bridge the gap between food availability and access; however, inefficiencies and wastage within them can undermine goals. For instance, if grains allocated under PDS are not properly stored or transported,

they may spoil before reaching beneficiaries, effectively *wasting* what was meant to feed the poor. A 2017 CAG audit found significant quantities of wheat in Punjab FCI godowns became unfit for consumption due to prolonged storage and pest damage, highlighting systemic waste within food welfare schemes (Report No. 7 of 2013: Performance Audit of Storage Management in Food Corporation of India, 2013). Such losses in government programs not only waste taxpayer money but also represent missed opportunities to alleviate hunger. Therefore, strengthening **supply chain management** in food schemes – using improved silos, inventory rotation (“first-in, first-out”), and real-time monitoring of stock quality – is a policy priority that dovetails with the right to food. Additionally, upcycling can support food security efforts: for example, linking PDS outlets or ration shops with food banks could allow unsold grains or nearing-expiry stock to be redirected to NGOs for immediate use, rather than risk spoilage (Khera, 2011). The government’s “**Poshan Abhiyan**” (**National Nutrition Mission**), which aims to reduce malnutrition, could also integrate messages about minimizing household food waste and using surplus to feed families or community members facing food insecurity. The principle is to treat every grain as precious (echoing Mahatma Gandhi’s ethos) – aligning cultural values of not wasting food with policy implementation. By formally recognizing food waste reduction as part of the food security strategy, India can ensure that increasing agricultural production translates into better nourishment, not bigger waste piles.

1.4.2. Swachh Bharat Mission and Urban Sustainability

The **Swachh Bharat Mission (Clean India Mission)**, launched in 2014, primarily focused on sanitation and eliminating open defecation, but its urban component (Swachh Bharat Mission – Urban) also targets solid waste management. Under Swachh Bharat (extended as SBM 2.0 through 2025), cities are encouraged to achieve 100% waste collection, segregation, and scientific processing. Managing **food and organic waste** is central to this, as such waste makes up over half of India’s municipal solid waste by weight. The Mission has spurred some innovations: many cities have started household segregation drives, composting programs, and even **bio-methanation plants** that generate cooking gas or electricity from organic waste (e.g., Indore’s bio-CNG plant). Upcycling food waste aligns perfectly with Swachh Bharat’s objectives of reducing garbage sent to landfills and creating cleaner cities. For example, the **Indore model** – Indore has been India’s top-ranked clean city for several years – involves door-to-door segregated waste collection, composting of nearly all organic waste, and sale of compost to farmers, embodying a circular approach. The legal framework via SWM Rules is already in place; what’s needed is more rigorous enforcement and expansion of infrastructure. The Swachh Bharat Mission could explicitly incorporate “**food waste upcycling**” indicators in its annual city cleanliness rankings (Swachh Survekshan), rewarding cities that demonstrate high rates of surplus food redistribution or compost/biogas generation. This would motivate local governments to partner with NGOs and private players on food waste. Moreover, **linking SBM with the climate agenda** – for instance, giving carbon credits or climate finance for methane avoided by composting – can provide additional impetus. The **Smart Cities Mission** and urban planning policies can also encourage infrastructure for circular food economies, such as mandating space for composting pits or community kitchens in new market complexes. Integration of food waste considerations into urban policies ensures that as India’s cities grow, they do so sustainably, treating waste as a resource.

1.4.3. Climate Change and Environmental Impact

India’s commitments under the Paris Agreement, as expressed in its Nationally Determined Contribution

(NDC), emphasize sustainable lifestyles and climate justice. While the first NDC (2015) did not explicitly mention food waste, there is growing recognition that cutting food loss and waste can contribute significantly to emissions reduction. As noted, rotting food emits methane; conversely, preventing waste means less unnecessary production (thus saving emissions from agriculture). A study by the World Resources Institute suggests that achieving a 50% reduction in food waste could reduce India's annual GHG emissions by ~195 million tonnes CO₂eq. This is a sizable mitigation opportunity – roughly equivalent to the emissions of the entire country of Thailand. By including food waste strategies in its future NDC updates (as part of the enhancement of climate actions by 2030), India can both leverage international support and signal high-level commitment. Domestically, climate-related programs like the **National Mission for Sustainable Agriculture (NMSA)** could incorporate measures to reduce post-harvest losses (through improved storage, farm-gate processing) as an adaptation-cum-mitigation strategy. The government's push on **bio-energy**, such as the National Biofuel Policy, already encourages converting agricultural residues to energy; this can be expanded to urban food waste-to-energy projects. The **Climate Smart Cities** initiative could fund pilot projects where city compost or biogas plants are explicitly linked to climate action plans. Also, under the global Methane Pledge (which India is considering), tackling landfill methane by diverting organics would be key. **Legally**, environmental impact assessment (EIA) norms for large food processing zones or big infrastructure could require a food waste management plan as part of environmental clearance, ensuring new developments integrate circular practices from the start. Aligning food waste reduction with climate change narrative provides an added rationale and urgency, appealing not only to ethics and economics but also to India's global environmental leadership role.

1.4.4. Economic and Social Justice Dimensions

Upcycling food waste is intrinsically tied to questions of **equity and justice**. The victims of food waste are often the poor and marginalized – farmers who don't get value for their crops, or slum dwellers going hungry while good food is thrown away. Conversely, the beneficiaries of effective food waste reduction can be those very groups: when surplus food is redistributed, it directly aids food-insecure populations; when waste is reduced, food prices can stabilize benefiting poor consumers; and when new industries (compost, biogas, upcycled products) develop, they create jobs including for informal waste pickers and rural communities. The **Right to Food Campaign** has long argued that not only is it a violation of rights for people to starve amid abundance, but also that the State has a duty to ensure that excess food reaches those who need it (either as a matter of welfare or by enabling charitable efforts). In this light, policies like community kitchens, shelter homes, and food banks are instruments of social justice. Kerala's recent **"Hunger-Free City" initiative** (2019) – setting up state-run free food centers (janakeeya hotels) using donated surplus food – is an example of leveraging waste for social good. Legally, state governments could build on the NFSA to incorporate obligations to minimize waste in ration shops and ensure that any stocks nearing expiry in government warehouses are proactively released to relief organizations. Furthermore, upcycling can support **farmers' livelihoods**: for example, producing animal feed from food processing by-products (like fruit peels or spent grain) creates additional income streams for agribusiness and cheaper feed for livestock farmers. The government's emphasis on doubling farmers' incomes can include support for farmer cooperatives to establish small-scale processing units that make pickles, purees or dried products from surplus produce (thus preventing gluts from crashing prices and leading to waste). Such support could be financial (grants under Rashtriya Krishi Vikas Yojana or through Agri-Infra Fund) and technical (training via Krishi Vigyan Kendras in food preservation techniques). Additionally, India's

Urban Employment Guarantee schemes (like MGNREGA's urban pilots) could pay workers to collect and process household wet waste, thus marrying employment goals with waste reduction. Finally, justice also means **inclusive processes** – the voices of informal waste collectors (ragpickers), who are key agents in recycling, should be included in policy-making. The Solid Waste Rules recognize wastepickers and encourage their integration into formal systems, which could extend to food waste collection for composting or donation. Overall, upcycling food waste advances **social justice** by redistributing resources from the wasteful to the needy and by creating greener economic opportunities for disadvantaged groups.

1.4.5. Corporate Responsibility and CSR

The private sector's role is crucial in reducing food waste, given that food production and retail are largely in private hands. In India, large food businesses are increasingly aware of sustainable practices, partly driven by global ESG (Environmental, Social, Governance) trends and consumer pressure. Indian law also nudges companies towards social engagement via the **Corporate Social Responsibility (CSR) mandate** under the Companies Act, 2013. Section 135 of the Act requires companies above certain financial thresholds to spend at least 2% of profits on CSR activities. Schedule VII of the Act explicitly lists “eradicating hunger, poverty and malnutrition” and “ensuring environmental sustainability” as approved CSR themes. This provides a ready framework for companies to channel CSR funds into food waste reduction and right-to-food efforts. (General Circular 05/2018: Clarification on CSR activities under Schedule VII, 2018) Indeed, several Indian corporations have partnered with NGOs for food donation programs – e.g., the **India Food Banking Network** has corporate partners helping establish food banks in multiple cities. Some restaurant chains and hotels have begun “zero waste” kitchens and donate unsold meals daily. To enhance this, the government can issue **CSR policy guidance** highlighting food waste/upcycling as a priority area, potentially with examples of high-impact projects (like funding refrigeration logistics for food banks or technology for shelf-life extension). Additionally, stock exchanges and SEBI's Business Responsibility and Sustainability Reporting (BRSR) framework could include a specific metric on food loss/waste for companies in the food sector, prompting them to disclose and act on it. **Extended Producer Responsibility (EPR)** is another concept: currently used in plastic waste, EPR could be conceptually extended whereby large food manufacturers have some responsibility for the waste their products generate (e.g., unsold inventory or food packaging waste). While direct EPR for food is uncharted, companies like supermarkets could be required to have agreements with charities for unsold food as a license condition – similar to France's law (Notification G.S.R. 776(E) – CSR Activities (Schedule VII), 2018). Moreover, corporates can bring innovation: many start-ups are emerging in India focusing on upcycled food products (like making cookies from spent grain, or biofuel from used cooking oil). A supportive regulatory environment (fast-tracking approvals for novel foods made from waste by-products, for instance) can encourage this entrepreneurship. In summary, aligning corporate incentives through CSR and sustainability frameworks will harness private resources and ingenuity towards the national effort of food waste reduction (General Circular 05/2018: Clarification on CSR activities under Schedule VII, 2018).

1.4.6. Technology and Digital Innovation

Modern technology offers powerful tools to tackle food waste – from Artificial Intelligence (AI) that optimizes supply chains to mobile apps that connect donors with recipients in real time. India, with its booming tech sector and high mobile penetration, is well-placed to implement tech-driven solutions,

provided laws and policies adapt to enable them. One example is the rise of **food recovery apps/platforms**: organizations like *Feeding India* (by Zomato) and *Robin Hood Army* use app-based volunteer networks to redistribute leftover food from restaurants and events to underprivileged communities. The government can assist these efforts by integrating them into official channels – for instance, urban local bodies could tie-up with such apps so that when waste collection units find large quantities of edible food, they alert the app network instead of sending it to landfill. On the agriculture side, **IoT (Internet of Things) sensors** and blockchain are being used to monitor grain silo conditions (temperature, humidity) to proactively prevent spoilage. Supporting these with clear legal standards (e.g., a standard for silo monitoring systems) and perhaps insurance incentives (insurers giving better terms if such tech is installed) can accelerate adoption. Start-ups like *CropIn* and *Intello Labs* in India use AI for crop and supply forecasting to reduce overproduction and improve timing to market, thereby cutting waste at farm level. The legal angle might involve **data sharing policies** – encouraging government market data to be open so that innovators can build predictive models to prevent gluts. Another frontier is **bio-technology**: research institutions in India are developing enzymes and techniques to convert food waste to valuable products (like biodegradable plastics from starch waste, or bio-ethanol from rotten fruit). Law can boost this via grants (under the Biotech Industry Research Assistance Council, BIRAC) and by streamlining regulatory approvals for pilot projects (e.g., consent under pollution laws for experimental waste conversion facilities). Finally, the rise of **e-commerce and food delivery** has led to new forms of waste (like canceled orders, etc.), but also new data that can be harnessed – policies could mandate big food delivery companies to report their wastage and invest in solutions like dynamic pricing to clear unsold inventory at end of day (some online grocers already discount near-expiry items). The government's Digital India mission and startup initiatives should explicitly identify food waste reduction as a domain for innovation, potentially announcing hackathons or challenges for creating solutions (some have already happened, e.g., the UNDP's Innovation Challenge 2020 on food waste in India). In sum, technology, when embraced in legal and policy frameworks, can be a game-changer by increasing efficiency and connecting excess to need in real time.

1.5. CASE STUDY: UPCYCLING FOOD WASTE AT THE LOCAL LEVEL – “NO FOOD WASTE” INITIATIVE

To illustrate how the aforementioned legal and policy elements converge on the ground, this section presents a brief case study of an Indian local initiative that has gained recognition for upcycling food waste to serve the hungry: the **“No Food Waste” movement in Coimbatore, Tamil Nadu**. This initiative, started in 2014 by a group of young social entrepreneurs, demonstrates how grassroots action, supported by government cooperation and legal enablers, can create a circular system where surplus food from the community is efficiently collected and redistributed rather than discarded. It also highlights practical challenges in implementation and how they were navigated.

Background: “No Food Waste” began when three college graduates noticed large amounts of food being thrown away at events and hotels in Coimbatore, while people on the streets went hungry. Motivated by a simple question from a schoolchild – “How can food not be wasted?” – they set out to bridge this gap. They started by publicizing a helpline number that people could call to donate surplus food. Their first call was to collect leftovers from a housewarming ceremony; with donated banana leaves for packaging and a borrowed vehicle, they delivered meals to 52 needy individuals that day. From this modest start, the initiative grew into an organized network. They developed a mobile app and a volunteer system to respond

quickly to donation calls, and formed chapters in other cities. Today, “No Food Waste” has chapters across 26 districts in Tamil Nadu, Andhra Pradesh, and Telangana, reportedly redistributing **7–8 lakh (700,000–800,000) plates of food per month** that would otherwise go to waste. This case exemplifies community-led operationalization of the **Good Samaritan principle** – rescuing surplus food to realize the right to food for the underprivileged.

Legal and Institutional Support: In its early days, the initiative operated in a legal grey area – food safety laws did not explicitly cover donations, and the volunteers were unsure about needing any license. They approached FSSAI to clarify the regulations. In response, FSSAI not only assured them support but, as noted earlier, went on to create the 2019 Surplus Food Distribution regulations partially inspired by such efforts. Tamil Nadu’s state government also took note. The state Food Safety Department collaborated with “No Food Waste” to train volunteers in hygienic handling and packing of food. A **state-level Food Recovery Committee** was established, including representatives of wedding hall owners, hoteliers, and caterers, to institutionalize the practice of notifying surplus and easing its collection. This committee, backed by the legal framework of FSSAI’s guidelines, helped standardize the process and disseminate awareness: for example, large wedding halls in Coimbatore now routinely inform food recovery teams after functions. Local police and municipal authorities also cooperated by granting permissions for after-hours distribution drives and allotting spaces for food collection centers. The Coimbatore City Municipal Corporation provided a facility for a food collection and distribution “**Hub**”, and Rotary Clubs donated vehicles, addressing logistic challenges. In essence, the convergence of community initiative with government endorsement created a viable **public-private partnership** model.

1.5.1. Impact and Challenges

The impact has been both social and environmental. Socially, the initiative feeds thousands of people daily – not just the homeless, but also low-income hospital patients and urban poor who rely on these supplementary meals. It has uncovered “hidden hunger,” as illustrated by an incident where a well-dressed man at a beach requested food packets for his family who were stranded in the city for medical treatment. This underlines that hunger can affect diverse people, and food recovery can be a vital safety net. Environmentally, by rescuing food before it becomes waste, the initiative has likely averted tons of organic waste from ending up in landfills or drains (though exact quantification is ongoing). “No Food Waste” estimates that their work may have contributed to a **10% reduction in food waste** in the cities they operate, given the volume they handle. They have also innovated by developing **food waste auditing tools** to help donor organizations track what items tend to be wasted, aiming to reduce waste at source. Despite success, challenges remain: scaling up to cover entire cities requires sustained funding (transport fuel, containers, cold storage for perishable donations). They have navigated regulatory hurdles like ensuring all drivers and volunteers carry ID and food handler certification (to satisfy authorities that food is transported safely and not resold illegally). Moreover, during the COVID-19 pandemic lockdowns, operations were hindered – but that period also spurred local governments to formally involve such groups in relief efforts (e.g., passes were issued to allow volunteers to move during curfew for food distribution). The case study shows that **on-ground coordination** between legal mandates and execution is key. Laws like the FSSAI regulations provided legitimacy and guidelines, but it took local policy measures (like Tamil Nadu’s committee) and active civil society to make it happen. Going forward, scaling such models to all districts in India, and linking them in a national network, could dramatically reduce hunger and waste in tandem. Government schemes could even fund these as part of social welfare (for instance, using some

of the grain from NFSA allotment that is in excess of local needs). The “No Food Waste” example underscores how a **localized circular economy model in the food sector** – taking surplus from weddings, hotels, etc., and cycling it to those in need – can be achieved within existing legal frameworks, especially when those frameworks are responsive and supportive. It also highlights typical implementation challenges such as ensuring food safety and volunteer reliability, which laws must account for (through standards and training requirements).

1.6. CHALLENGES TO IMPLEMENTATION OF FOOD WASTE LAWS IN INDIA

Implementing a robust legal framework for upcycling food waste in India faces several practical challenges. A law or policy is only as effective as its execution on the ground, and multiple factors in India’s governance and society can impede or slow progress. Understanding these challenges is important to formulate strategies to overcome them. Key implementation challenges include:

- **Institutional Fragmentation and Coordination Issues:** Responsibility for aspects of food waste is spread across different ministries and levels of government. Agriculture departments handle post-harvest losses, urban local bodies manage municipal waste, food safety authorities oversee donation safety, and welfare departments run food security schemes. This can lead to siloed efforts and lack of clear accountability. For instance, a city municipal corporation might not coordinate with the food supply department when excess grains could be diverted to needy, resulting in missed opportunities. Ensuring effective **inter-agency coordination** – possibly through a nodal agency or task force on food waste – is a challenge. Without a unified chain of command, policies may not be uniformly implemented. (Assessment of quantitative harvest and post-harvest losses of major crops and commodities in India, 2015)
- **Awareness, Attitudes, and Cultural Norms:** Legal rules alone cannot alter ingrained behaviors. Many citizens and even officials may not be aware of new regulations or the importance of food waste reduction. In some cases, there is cultural resistance; for example, in hospitality sectors, abundance is seen as a sign of generosity, so kitchens over-prepare intentionally. Convincing people to adopt the “waste not” ethic requires sustained public education. The challenge is to overcome apathy (“I paid for it, why bother about waste”) and misconceptions (e.g., that donated food is unsafe or that taking leftovers is low-status). Without broad buy-in, even well-crafted laws might be ignored.
- **Capacity and Infrastructure Gaps:** Many local bodies lack the **infrastructure** to implement waste processing mandates – e.g., not enough composting centers or bio-digesters to handle segregated food waste, or insufficient refrigerated vans to transport donations long distances. In rural areas, farm-level storage and processing units are still inadequate. Bridging this gap needs investment and innovation, and if not addressed, laws like the requirement for bulk composting could lead to non-compliance simply due to lack of facilities. Additionally, **human resource capacity** is an issue: enforcing agencies (food safety officers, municipal inspectors) are often understaffed and may not prioritize food waste rules amidst other duties. Training them to understand and champion these rules is a hurdle.
- **Corruption and Leakage:** Unfortunately, corruption can undermine even the best-intentioned programs. In PDS, for example, diversion of food grains to the black market has been a persistent problem – which means some food ends up wasted or not reaching the hungry. Similarly, in waste management contracts, corruption might lead to the under-reporting of waste collected (to

misappropriate funds) or illegal dumping despite rules. If new food waste laws introduce penalties or fees (say for waste generation), there is risk of bribery to avoid fines. Robust transparency and grievance redressal mechanisms are needed, which is a challenge to put in place uniformly. The presence of vested interests – e.g., contractors who profit from landfilling waste might lobby against composting initiatives – is also a political economy challenge.

- **Monitoring and Enforcement:** Enforcing food waste regulations poses practical difficulties. How to monitor that a restaurant is actually segregating and donating surplus rather than binning it? Inspectors cannot be everywhere. Monitoring donation quality also requires vigilance to avoid any health incidents that could erode public trust. Traditional command-and-control enforcement is tough given the vast number of food businesses and the informal sector. Innovative enforcement (like requiring large businesses to file waste reports, using tech sensors to measure waste output, or social enforcement via ratings) needs to be developed. But these systems themselves require legal sanction and capacity to implement. Ensuring compliance in millions of households is virtually impossible through direct enforcement – it relies on incentives and nudges, which are challenging to design effectively.
- **Financial Constraints:** Implementing new schemes or infrastructure for upcycling may require significant funding. Municipal budgets in India are often strained; persuading them to allocate funds for, say, a biogas plant or a food bank network competes with other pressing needs like water, roads, etc. Similarly, small businesses may resist compliance if it entails cost (e.g., buying compostable packaging for donating food, or transporting waste to processing centers). Without financial support or economic instruments (tax breaks, subsidies), compliance could lag. Thus, aligning budgeting processes and perhaps unlocking private finance (through CSR or impact investing) is a necessary but challenging task.
- **Regulatory Overlap and Simplification:** When introducing new regulations (such as donation guidelines, or mandatory waste audits for companies), care must be taken to simplify compliance procedures. If rules are too cumbersome, they can deter participation. For example, if an NGO needs multiple licenses to operate a food bank (FSSAI license, society registration, health trade license, etc.), it might discourage them. Streamlining processes – perhaps a single-window clearance for food recovery organizations – is needed, but bureaucratic reform itself is a challenge.
- **Technological and Logistical Barriers:** While technology is a boon, there can be barriers in adoption. Many smaller municipalities or organizations may lack the technical know-how to deploy AI or apps. Logistically, India's vast geography and climate variation pose challenges: moving perishable surplus food from one place to another quickly (especially in hot weather) needs cold chain which is not universally available. Reaching remote or rural hungry populations with urban surplus is another logistical issue. Building efficient networks (like the way milk is transported via cold chain) for surplus food is complex.

Addressing these challenges requires a combination of strong political will, public-private collaboration, and adaptive management in implementation. Legal provisions may need to be augmented with *detailed rules and standard operating procedures*, as well as periodic training of officials and awareness drives for stakeholders. Importantly, a **multi-stakeholder approach** – involving government, industry, civil society, and citizen groups – is crucial to identify bottlenecks early and resolve them. The Suggestions in the next section will incorporate ways to tackle some of these implementation challenges, ensuring that the legal framework is not just well-designed on paper but also effective in practice.

1.7. CONCLUSION

India's struggle with food waste reveals a stark contradiction—millions remain food-insecure while over 100 million tonnes of edible and inedible food are wasted annually. The legal and policy landscape surrounding this crisis is gradually evolving, with constitutional recognition of the right to food, statutory entitlements under the National Food Security Act, and regulatory interventions by FSSAI and urban authorities. Yet, systemic challenges such as infrastructure gaps, cultural attitudes, policy fragmentation, and weak enforcement impede the realization of a truly circular food economy. The impacts of this waste are profound—depriving the undernourished, exacerbating climate change, and draining public and private resources. Encouragingly, initiatives like “No Food Waste” in Coimbatore demonstrate how community action, government support, and responsive regulation can converge to address hunger and sustainability simultaneously.

However, legal progress remains piecemeal. Without an integrated, enforceable national strategy, food waste reduction and upcycling will remain marginal rather than mainstream. India must harness its constitutional commitments, sustainable development goals, and policy innovations to institutionalize circularity in the food system. This entails not only reducing waste but actively repurposing surplus for social benefit. Upcycling must be framed as a legal obligation as much as a moral imperative. Leveraging technology, public awareness, fiscal incentives, and robust governance structures can collectively turn India's food waste crisis into an opportunity for equity, resilience, and environmental stewardship.

1.8. SUGGESTIONS FOR A HOLISTIC LEGAL FRAMEWORK

In lieu of a conclusion, this section provides concrete **Suggestions** for strengthening India's legal and policy framework on upcycling food waste and realizing the right to food through circular economy principles. These suggestions are grounded in the analysis above, empirical data, and best practices from international experience. They are intended to be actionable measures for lawmakers, regulators, and stakeholders.

1. **Enact a Comprehensive “Food Waste Reduction and Upcycling Act”:** India should consider a dedicated law that consolidates and strengthens provisions related to food waste. This Act could set a **national target** of, for example, **50% reduction in food waste by 2030** (aligned with SDG 12.3), creating accountability for ministries to achieve it. It would mandate regular measurement and reporting of food waste at national and state levels (similar to EU requirements). The Act can formalize the **Good Samaritan protection** already introduced by FSSAI – giving it statutory force to reassure donors – and expand it to protect not just donors but intermediary facilitators (e.g., tech platforms). It should also direct the central government to formulate a **National Food Waste Reduction Strategy** and require each state to develop an action plan (akin to Japan's Food Loss Act requiring local plans). Embedding food waste into law underscores political commitment and enables budgetary allocations. For example, France's 2016 law not only banned supermarket waste but also included provisions for education; India's law could similarly ban large retailers and hotels from landfilling edible food (following a graded approach) and require them to partner with food recovery agencies (French Law No. 2016-138). (Loi n° 2016-138 du 11 février 2016 relative à la lutte contre le gaspillage alimentaire, 2016) To ensure enforcement, penalties for non-compliance (e.g., fines for wanton food wastage by big players) can be included, with the proceeds funding food distribution programs. Such a law, passed by Parliament, would elevate food waste to a national priority and bind various agencies to a common goal.

2. **Incentivize Food Donation and Recycling through Fiscal Measures:** Legal reforms should introduce **tax and financial incentives** to encourage stakeholders to prevent and upcycle waste. One recommendation is to amend the Income Tax Act to provide **enhanced deductions (say 150% of cost)** for businesses on expenses incurred in donating food (transport, storage, etc.), similar to the U.S. tax code's incentives. This would offset costs and nudge companies to prefer donation over dumping. Additionally, the Goods and Services Tax (GST) could be tweaked to exempt donated food from output tax (currently, ambiguities in GST make some companies hesitate to donate packaged foods for fear of tax liability on "deemed supply"; a clear exemption for donations would remove this barrier). The government should also use its policy to direct public sector companies and large private companies to invest CSR funds in building food recovery infrastructure – for instance, funding refrigerated trucks or grain silos for food banks can be counted as CSR towards hunger and environment (Companies Act, 2013: Schedule VII – CSR Activities (as amended), 2021) . On the recycling front, **subsidies or low-interest loans** can be offered for setting up composting units, biogas plants or feed manufacturing from food waste. The Swachh Bharat Mission could introduce a **performance grant** for cities that achieve high organic waste processing rates. International best practice shows incentives work: Italy saw food donations rise after offering tax credits on waste fees to donors (France's Law Against Food Waste: Case Study, 2018). India could allow municipalities to waive part of commercial garbage collection fees for establishments that consistently donate or compost their food waste. These economic incentives, anchored in law or policy, will make it financially beneficial to follow circular practices.
3. **Strengthen Mandatory Requirements for Large Food Waste Generators:** Building on the model of some states and Japan, India should impose **mandatory waste reduction and recycling obligations** on big food businesses. Through amendments to existing rules or new regulations under the Environment Protection Act, the government can require that entities above a certain threshold (e.g., food manufacturers, hospitality chains, supermarkets) **measure, disclose, and reduce their food waste**. For example, a rule could mandate that all hotels with >50 rooms or restaurants above a turnover limit segregate their waste and either install on-site composting/biogas units or have a tie-up with a waste processing facility – similar to the requirement in SWM Rules 2016 but more specific and enforceable with targets. Further, such businesses could be required to **donate all surplus edible food** that is safe for consumption: this could be enforced via health inspection regimes (for instance, as a condition for renewing FSSAI licenses, large food operators must show evidence of a surplus food donation program or a zero-waste kitchen protocol). Japan's Food Recycling Act obligates reporting and meeting recycling targets; India could adapt this by setting sector-wise benchmarks (e.g., supermarkets should reduce waste by x% annually). Legally binding **separation of organic waste** should also be accelerated nation-wide: although the deadline is 2023 per rules, many cities lag. The central pollution board can issue directives under the Environment Act to state boards to enforce this, combined with support. Another measure is to incorporate food waste criteria in **certifications** – for example, the FSSAI hygiene rating or any eco-labels for food businesses could include a parameter on waste management. Non-compliance with mandatory standards could attract penalties or impact licenses. Over time, norms could tighten (e.g., by 2025, no bulk generator should be sending any food waste to landfill – following California's SB1383 example). While imposing duties, the law should also ease compliance – one

idea is a **single-window registration** for surplus food distribution organizations (as suggested earlier) to bring more players into the formal fold, making it easier for big generators to find partners to offload edible surplus responsibly. (Annual report on food, agriculture and rural areas in Japan FY2017, 2018)

4. **Enhance Public Awareness and Education Campaigns on Food Waste:** To ensure laws work, a parallel nationwide **social awareness campaign** is necessary to reshape attitudes. The government should launch a program, perhaps dubbed “**Save Food, Share Food**” (building on FSSAI’s initiative) on the scale of the “Swachh Bharat” campaign, using mass media, school curricula, and community outreach to promote mindful consumption and donation. This can be institutionalized by involving multiple ministries: Education Ministry can include modules on food wastage in textbooks; Information & Broadcasting can direct public service advertisements on TV/radio about portioning and leftover reuse; Consumer Affairs can encourage supermarkets to run “buy what you need” nudges for shoppers. (Swachh Bharat Mission Guidelines – Solid Waste Management, 2016) **Food Waste Awareness Week** could be observed every year (as some countries do) to focus attention. Faith leaders and celebrities can be roped in to lend weight, much like they did for the cleanliness and polio campaigns. On a local level, municipalities could recognize households or eateries with best practices (awards like “Zero Food Waste Champion”) to create positive competition. Given that **behavior change** is crucial, techniques from behavioral economics (nudges) can be employed: e.g., smaller plate sizes in buffets by default, or apps that remind users to finish perishables in their fridge. The law can support this by, for example, requiring large buffet restaurants to **offer carry-out containers** to willing customers for leftovers (France introduced this in 2021, making it mandatory for restaurants to provide doggy bags to reduce waste) (Décret n° 2020-1455 relatif à la restauration commerciale, 2020). Schools and colleges should be mandated to have food waste reduction programs (monitoring and composting of canteen waste, etc.). Over time, just as littering became socially frowned upon through Swachh Bharat, wasting food should become anathema in polite society. This normative shift will make implementation of laws easier as citizens voluntarily comply. (Think Eat Save – Reduce Your Foodprint, 2013)
5. **Leverage Technology and Data: Create a Food Waste Innovation Hub:** The government should foster technological innovation by establishing a **Food Waste Innovation Hub** (perhaps under NITI Aayog or the Atal Innovation Mission) that brings together startups, researchers, and government agencies to pilot new solutions. Legally, this could be supported by offering **regulatory sandboxes** for food waste tech – for instance, easing licensing for experimental projects like converting market vegetable waste to animal feed using Black Soldier Fly larvae (which currently might face biosecurity regulatory hurdles). The Hub could manage a **digital platform** that acts as a national exchange for surplus food: integrating existing apps and databases (akin to a “Uber for food waste”) to match surpluses with deficits in real time across India. Government data on agricultural production, wholesale arrivals, etc., can be opened via APIs to help predict gluts and trigger preventative actions (e.g., food processing units being alerted to excess produce in one state that could be processed instead of wasted). There should be legal provisions for **data sharing** between government mandis, warehouses and this platform under data privacy safeguards. Additionally, expanding the use of **AI and IoT**: the government could mandate in public procurement that new silos or cold stores must be equipped with IoT sensors – this creates

a market that will drive costs down for private players too, eventually making such tech ubiquitous. Another suggestion is to incorporate **food waste tracking in corporate ESG reporting**: SEBI can require listed companies in food-related sectors to disclose their waste footprint and reduction efforts in annual reports, leveraging market pressure for transparency. To facilitate compliance, a standardized methodology (perhaps developed by the Bureau of Indian Standards in collaboration with the Hub) for measuring food waste should be introduced. Finally, the government can incentivize the private sector by sponsoring **prizes or challenge grants** for innovations (for example, a grand challenge for developing a low-cost solar-powered cold storage for rural areas to cut post-harvest loss). In sum, embracing technology and providing the legal space and support for it will enable scaling solutions to a country of India's size.

By implementing these suggestions – a comprehensive law with targets, smart incentives, mandatory obligations for big generators, massive awareness drives, and support for tech innovation – India can create a virtuous cycle wherein food waste is significantly reduced and whatever surplus remains is efficiently upcycled for the benefit of society and the environment. These measures, backed by empirical evidence and international examples, would not only bolster India's circular economy and sustainability goals but also advance the fundamental human right to food, ensuring that “**no one sleeps hungry and no food goes to waste**” becomes a reality rather than an aspiration.

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