

[First draft]

Food waste in Sri Lanka: an analysis of the applicable urban regulatory framework

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Acronyms and Abbreviations

CEA	Central Environmental Authority
EPL	Environnemental Protection License
EIA	Environmental Impact Assessment
FAO	Food and Agricultural Organization
HACCP	Hazard Analysis Critical Control Point principles
LAs	Local Authorities
MSW	Municipal Solid Waste
NAP	National Agriculture Policy
NCCAP	National Climate Change Adaptation strategy
NEA	National Environmental Act
NPSWM	National Policy for Solid Waste Management
NSSWM	National Strategy for Solid Waste Management
PC	Provincial Council
RRR	Resource Recovery and Reuse
SWM	Solid Waste Management
UDA	Urban Development Authority
WMU	Waste Management Unit

1 Background

The scope of this paper is to explore and analyze the policy and regulatory environment directly or indirectly relevant to the food waste reduction and management in the retail, hospitality (restaurants, hotels) and food service (schools, hospitals) supply chains, and household food waste in Sri Lanka. Best practices and lessons from the regulatory framework of selected regions and / or countries has been elaborated able to contextualize them to the scenario of Sri Lanka

Food losses and waste (FLW) are generated throughout the food supply chains (FSCs). Food losses start from cultivation and go downstream up to processing and packaging. Food waste is generated from wholesale, retail markets and final consumption by private households and the foodservice sector.

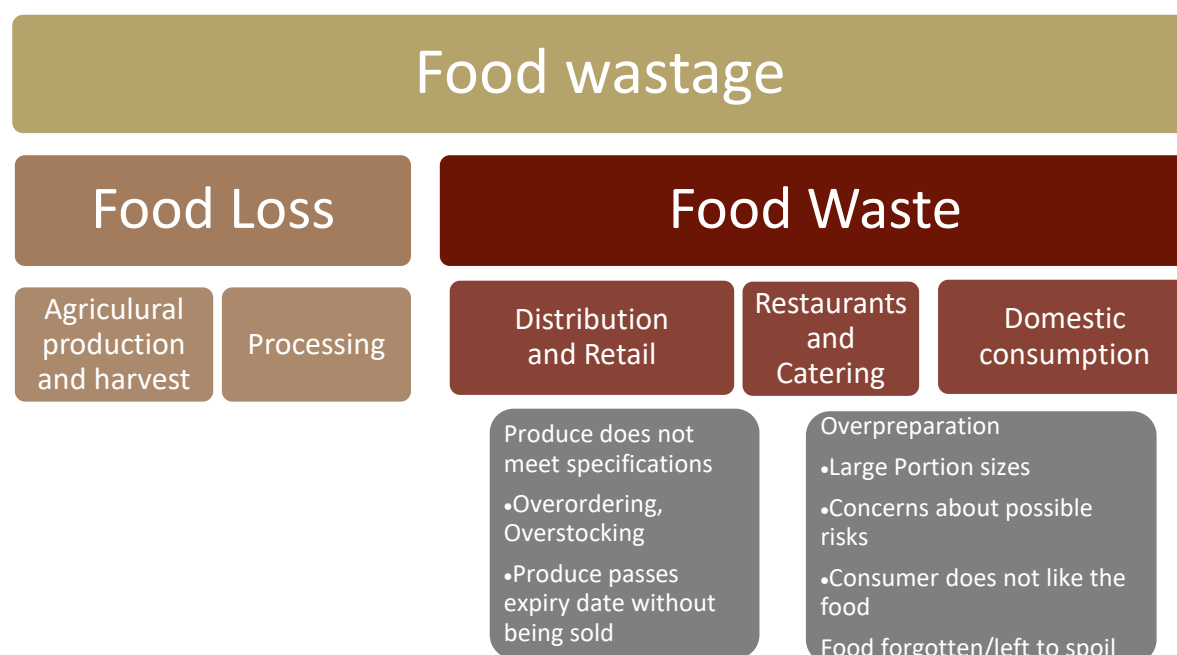


Figure 1: Classification of food wastage into food loss and food waste

According to one estimate, about 1.3 billion tons of edible food produced in the world is lost and wasted, which is nearly one-third of the all food produced for human consumption (Scottish Government, 2019) despite the need to increase food availability by 60%, by 2050 (FAO, 2013a). The estimated food waste is enough to feed three billion people. Food waste is not only a waste of valuable food but also a waste of reversible and irreversible resources (land, water, energy, and other inputs) causing negative environmental and socioeconomic footprints while creating many environmental externalities. Food waste reduction economically benefits the consumers by lowering the household food bill and at the restaurants and caterer’s levels by reducing the costs of food supplies as wells as waste disposal cost, otherwise, that would reflect in the customer’s food bill. The estimated economic cost of global food wastage excluding fish and seafood was USD 750 billion (FAO, 2013a) indicating the significance of the

problem. For example, it was found in the UK hospitality sector that food waste contributes to 52% of the total food cost of food purchasing prices (WRAP 2013). The global carbon footprint of the food wastage generated is equivalent to 3.6 gigatons of CO₂ (excluding land-use change) (FAO, 2015). The losses cost throughout the food supply chain to freshwater resources and land resources used to produce food crops due to the food waste and food lost are 24% and 23% respectively (Kummu et al., 2012). It has been estimated that a 50% reduction of food losses and waste globally would save 1,350 km³ of water (Lundqvist and Molden, 2008). Thus, any measure taken to reduce food waste has an environment, economic, and social dimension.

The issue of food loss and waste is specifically reflected in the 2030 Agenda for Sustainable Development with the target 12.3 of the Sustainable Development Goals (SDGs). The SDG 12.3 goal calls for the halving by 2030 of per capita global food waste at the retail and consumer levels and the reduction of food losses along production and supply chains, including post-harvest losses (United Nations, 2015).

A consensus could be observed in the literature about the composition of solid waste generated in Sri Lanka that MSW has a relatively high share of organic and bio-degradable composition. Bandara (2008) found that MSW of Sri Lanka consists of 65-66% of perishable organic material. Biodegradable waste was further analyzed into short-term and long term degradable and reported to have 54.5% and 5.9% respectively. The composition of the waste varies according to the type of LAs, in general, it is assumed that nearly half of the biodegradable part of Municipal Solid Waste (MSW) is food waste (SLILG, 2008).

A study conducted in the Eravur Pradeshiya Sabha¹ area in Batticaloa district shows that every household generates an average of 2.06 kg of food waste per day contributing 79% of the total waste generated in the area (Thirumarpan et al, 2015). According to one estimate, about 22% of the total population in Sri Lanka do not have sufficient food to sustain a healthy life (WFP, 2020). Sri Lanka is ranked in 66th position in the Global hunger index with a score of 17.1 indicating moderate hunger². Therefore, reduction and reuse of food waste have a definite role in achieving SDG targets of reducing poverty (SDG 1) and food and nutrition security (SDG 2).

2 Policy and legal framework of food waste management in Sri Lanka

The institutional framework set up for the food control and waste management in Sri Lanka is under the umbrella of the Central Government, Provincial Council (PC), and Local Authority (LA). The major central government agencies that are directly related to laws and administrations waste management are the Ministry of Local Government and Provincial Councils (MoLGPC), the Ministry of Environment, and the Ministry of Urban Development while the Ministry of Health (MoH), the Ministry of Science and Technology and the Ministry of Industries and Commerce have a role in managing the food waste. There are several agencies under the ministries to perform the tasks related to waste management (Figure 2).

The policies and regulations can define a country's vision, priorities, budgetary decisions, and course of action to reach specific goals and targets. Therefore, formulation and adoption of policies, regulations, and strategies play a critical role in creating an enabling environment to adopt and implement measures leading to reduce, reuse, and recycle food waste. We can categorize two broad groups of policies and

¹Local authorities are divided into three different groups: Municipal councils, Urban councils and Divisional councils (pradeshiya sabha), the later one is the third tier local council in the country

² <https://www.globalhungerindex.org/pdf/en/2019/Sri-Lanka.pdf>

legislations dealing with food waste generation. Firstly, policies and regulations related to food production and secondly, policies, and regulations dealing with waste generation and management.

2.1 Policies and legislations related to food production

The Government of Sri Lanka has introduced and adopted large numbers of acts, regulations, and policies to guide the production and service delivery mechanisms of the food sector. The major policy instruments relating to the major agricultural products are described in Annex Table 1. Although there is a large number of policies and legislation put in place, some of the acts are not practiced due to the failure to enforce needed regulations. It has been identified that some of the policies want to be updated to meet the present-day requirements and requisite a coordinated mechanism among the variety of agencies empowered with different acts (Ministry of Agriculture, 2018).

Sri Lanka's food security policy is covered under the National Agriculture Policy (NAP) of 2007 and the National Nutrition Policy of Sri Lanka of 2010. NAP introduced by the Ministry of Agriculture is aiming to achieve food and nutrition security of the country, increase employment opportunities and income, and the standard living of the farmers through adopting technically feasible, socially acceptable, economically viable, and environmentally sustainable agricultural production technologies and marketing. National Nutrition Policy provides a platform for inter-sectoral coordination to accelerate efforts to achieve optimum nutrition for the people. The policy also provides overall guidance for the development of national strategic plans of action for nutrition activities. Besides, there are several other policies in place to guide the government interventions on food production that includes National Plantation Industry Policy Framework (2006), National Livestock Policy (2006), National Fisheries and Aquaculture Policy (2018), National Policy and Strategy on Cleaner Production for the Agriculture Sector (2012), and National Agricultural Research Policy and Strategy 2018-2027 (2018). All these policies are mainly focusing on production drive, but no direct attention provided to reduce wastage of produced food.

In this context, the government has been preparing overarching Agricultural policy (draft) with a vision of creating a "Globally competitive agriculture sector for national prosperity". The objective of the said policy is *"To enhance the competitiveness of agriculture and agri-businesses through innovative and sustainable technologies, and constructive partnerships, in a conducive institutional and regulatory environment, to enhance contribution to economic growth and rising living standards of people engaged in agriculture, while ensuring sustainable use of natural resources and contributing to national food security"*. One of the thematic areas mentioned in the overarching policy statement is that "Adaptation to climate change; minimize loss and damage via increased climate resilience; climate-smart agriculture". However, the major policy thrusts discussed in this theme are limited to mainstreaming climate change through appropriate policies and regulations and enhancing farmer's resilience through building capacities and adopting suitable coping strategies. There are no direct measures proposed to minimize food waste. The draft policy should provide due consideration to incorporate the policy measures essential to curb food waste.

Another relevant thrust area mentioned in the policy to achieve food security is via adopting agriculture strategies to enhance availability, affordability, accessibility, and stability of food. This section of the policy thrust highlights the following issues warranting attention that has a connection with food loss and waste.

- Post-harvest losses, especially in perishable products.

- Food safety with appropriate responses through the full value chain.
- Storage, processing and other options for value-addition to cater to demand shaped by changing lifestyles and also the timing of production and demand.
- Introduce and implement appropriate technologies to improve the quality and safety of food.

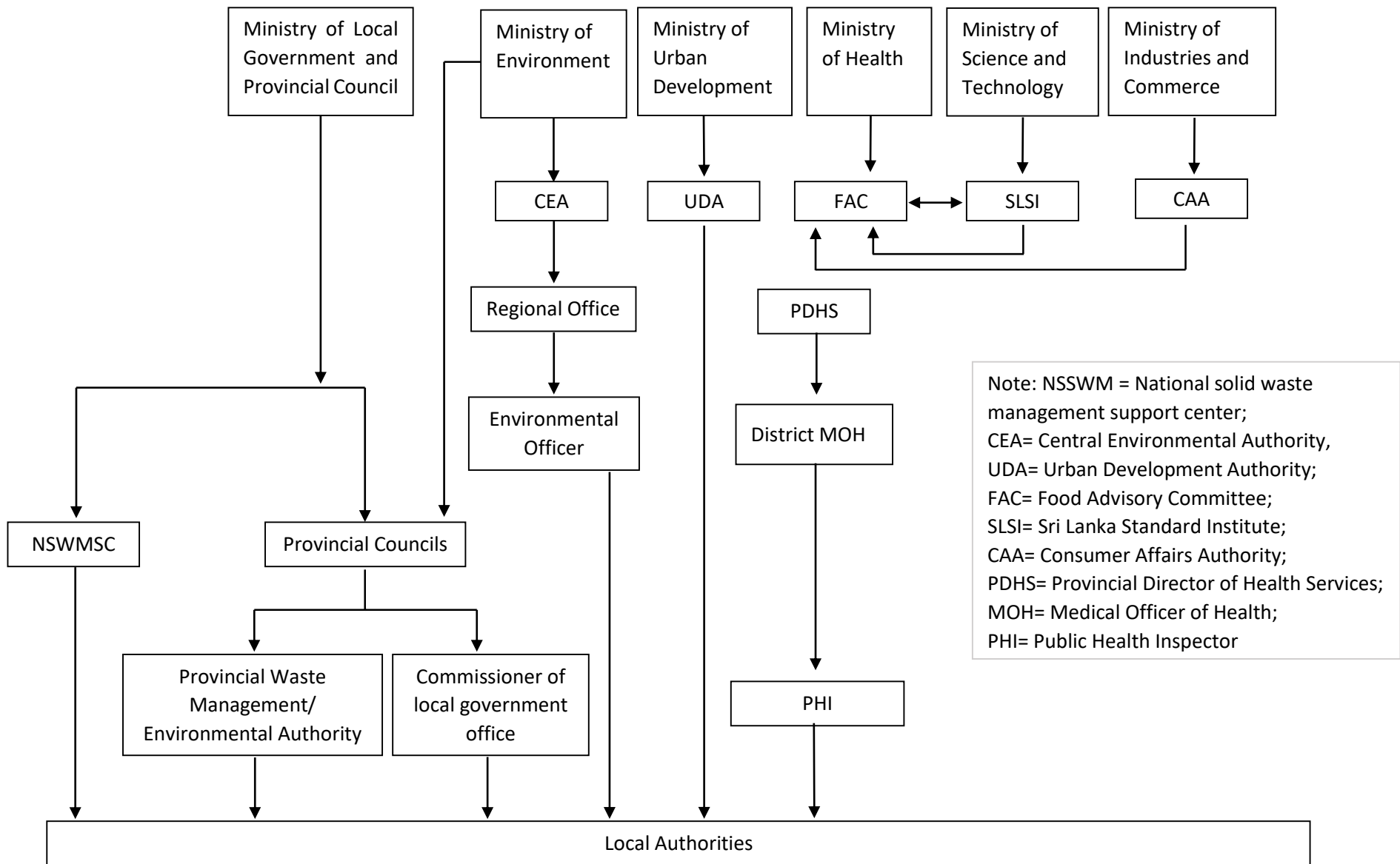


Figure 2: Connectivity of Regulatory agencies of the central government and provincial administration on waste generation and management in Sri Lanka

Being a developing island nation subject to tropical climate patterns, Sri Lanka is highly vulnerable to climate change impacts. Climate change and food production systems are interrelated. Food waste is associated with natural resources depletion and climate change, including the emission of harmful gases from landfilling. Climate change Secretariat under the Ministry of Environment has been actively involved in the global efforts to minimize the greenhouse gas emissions within the framework of sustainable development and principles enshrined in the United Nations Framework Convention on Climate Change (UNFCCC) and its Kyoto Protocol (KP). The Secretariat has prepared numbers policy and strategic documents in line with the commitments made under these agreements. Some of the key documents prepared and the reflection of these policies and framework towards food waste reduction and management are discussed below

2.1.1 National Climate Change Adaptation strategy- 2010-2016

One of the key strategic thrust areas listed in the document is to minimize climate change impacts on food security together with irrigation, agriculture, fisheries, nutrition, etc. The thrust area has identified several actions including ensuring the ability to meet food production and nutrition demand and increase awareness and mobilize communities for climate change adaptation. The document has listed a number of adaptation measures to minimize the effects of climate change, but food waste reduction is not considered directly or indirectly as a pathway to reduce the climate change impacts on food security.

2.1.2 National Climate Change Adaptation strategy (NCCAP)- 2016-2025

National Climate change adaptation plan (NCCAP) is a selection of practical interventions identified by relevant stakeholders to overcome anticipated threats due to impacts of climate change. It is the country's road map to guide the national efforts for confronting challenges posed by global climate change and its impacts. The road map has given priority to overcome the threats posed on Food security (Agriculture, Livestock, and Fisheries).

To address the expected challenges to food security due to climate change, the NCCAP has listed following as priority actions:

- a) Develop tolerant varieties (paddy, OFC, horticulture) and breeds (livestock and poultry) to heat stress, drought and floods and resistant to diseases and pest attacks
- b) Develop and promote water-efficient farming methods
- c) Adjust cropping calendars according to climate forecasts
- d) Develop systems for timely issuing and communicating of climate information to farmers
- e) Develop research institute capacity for conducting research on tolerant varieties/breeds and climate-resilient farming methods.

Unfortunately, the action plan has failed to prioritize or identify the importance of addressing the issue of food waste to reduce the climate-induced threat on food security.

2.1.3 Second National Communication on climate change

The impact of climate change was considered in the report under four Sectors-Agriculture, Water Resources, Human Health, and Coastal Sector. Section 1.11 of the report describes the present situation concerning the generation and disposal of solid waste, industrial effluent, and air pollution. The report also highlighted the per capita waste generated per day is 0.60 kg in Urban Councils areas and 0.40 kg in Pradeshiya Sabha areas and only 10-40% of the MSW generated is collected by the LAs.

Key adaptation options proposed for agriculture sector are the development of new varieties, changes to cropping calendar, the introduction of new irrigation technologies, adoption of soil and water conservation measures.

2.1.4 National climate change policy of Sri Lanka

The national climate change policy of Sri Lanka was developed to provide guidance and directions for all the stakeholders to address the adverse impacts of climate change efficiently and effectively. Sustainable consumption and production are said to be one of the guiding principles of the policy. Adoption of integrated waste management systems while providing priority for the prevention of waste generation with appropriate technologies has been listed as one of the mitigation measures.

The policy has also identified the importance of promoting sustainable consumption and production. It considers the dissemination of environment-friendly lifestyles and practices in the path of sustainable development, where food waste reduction at the consumer levels has a role to play.

2.2 Policies and legislations related to waste generation and management

There are several acts, ordinances, policies, adaptation plans, and by-laws available to address the issue of overall waste reduction and management. Policies and regulations are not directly addressing food waste reduction and management and food waste is not identified as a separate waste stream in (bio) waste characterization and quantifications.

The analysis is focused on overall waste management. The major acts, ordinances, and policies that have a direct and indirect link with waste generation and management are described in Table 1.

Table 1: Major policies, and legislations linked with waste generation and management

Ministry	Policy & Regulation	Description
Acts and ordinances		
Ministry of Local Government and Provincial Council	Urban Council Ordinance No 61 of 1939	Sections 118, 119 and 120 of the Act addresses waste management responsibilities of Urban Councils
	Municipal Council Ordinance No 16 of 1947	Sections 129,130 and 131 of the Act addresses waste management responsibilities of Municipal Councils
	Nuisance Ordinance No 62 of 1939 and No 57 of 1946	Section 2(3) and 2(12) of the ordinance empowered LAs to prevent and prohibit acts of public nuisance and punish violators for such actions
	Pradeshiya Sabha Act No 15 of 1987	Section 93 and 94 of the Act Specify waste management responsibilities of Pradeshiya Sabhas
	Provincial Councils Act No. 42 of 1987 and amended Act No. 56 of 1988	Provide provisions for the LAs for waste management
Ministry of Defense	Police Ordinance No. 16 of 1865	Section 63(g)- prohibits throwing of any dirt, filth, rubbish, or any stones or building materials in the street, road, canal, or other thoroughfares. If anyone failed, can be taken into custody without a warrant and are liable to a fine or imprisonment
Ministry of Health	Food Act No. 26 of 1980	The Act provides regulations on the following; <ul style="list-style-type: none"> • No. 560/13 (Hygiene) • No. 615/11 (Preservatives) • No. 1646/19 (Formaldehyde in Fish) • No. 1660/30 (Packaging materials and articles) • No. 1694/5 (Shelf-Life)
	Prevention of Mosquitoes Breeding Act No.11 of 2007	Section 2-Prohibit the creating conditions favorable to the breeding of mosquitoes including haphazard dumping of waste.

		Section 4- Failure to comply with requirements imposed is a punishable offense.
Ministry of Environment	National Environmental Act No. 47 of 1980, amended Act No 56 of 1988 and amended Act No. 53 of 2000	The Act provides provisions to establish the CEA Section 12 and 26 of the act addresses Waste management Special regulation, No 1627/19 (2009)-No dumping waste along the roadsides other than the places designated for such purposes
Ministry of Road Development and Highways	National Thoroughfares Act No 40 of 2008	Waste management addresses at Section 64 (a), (b), (c) and section 65
Policies, strategies, plans, and programs		
Ministry of Environment	National Policy of Solid Waste Management	Waste management addresses at; Provide integrated socially responsible solution for Solid Waste Management providing more attention to resource recovery from waste
	National Solid Waste Management Strategy in Sri Lanka	Promotes waste minimization, maximum resource recovery, and sanitary landfills. This provides more attention to resource recovery from waste.
	“Pilisaru” National Solid Waste Management Program of 2008	National level solid waste management program introducing waste treatment facilities at local authority levels
	Environmental Protection License Scheme	Regulatory tool under the Gazette Notification No. 1533/16 dated 25.01.2008 that control the establishment of RRR business
Guidelines		
Ministry of Health	Healthcare Waste Management Guideline of 2001	Provide recommendation to manage hospital generated clinical waste with minimum harm to the environment
Ministry of Local Government and Provincial Councils	Solid Waste Management Guideline for Local Authorities of 2003	To guide LAs on the SWM practices
Ministry of Environment	Technical Guidelines on Municipal Solid Waste Management in Sri Lanka of 2005	To support the SWM and siting of engineered landfills
	Technical Guidelines on Solid Waste Management in Sri Lanka of 2007	To support the constructions of engineered landfill

	Guidelines for the Management of Scheduled Waste in Sri Lanka of 2009	Management of scheduled waste
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2.2.1 National policies

Ministry of Environment has formulated two national-level policies and some regulatory instruments targeting waste minimization and proper final waste disposal.

a. National Strategy for Solid Waste Management -2000

National Strategy for Solid Waste Management (NSSWM) in Sri Lanka aims to reduce waste by encouraging producers and consumers to change their practices and reduce the quantities of waste they generate.

The NSSWM promotes strategies for waste minimization, maximum resource recovery, and the establishment of sanitary landfills. However, the waste minimization address in the strategy is very generic with the sole focus on promoting the separation of waste at source into biodegradable, recyclable and non-degradable components that would reduce the waste going to the landfill sites but less thoughtfulness given to the reduction of waste generation, especially no direct attention given to food waste generation.

While the strategy advocating individual LAs towards the stated aims, the strategy has provided for central level actions, such as developing the market conditions for the sale of recyclable waste and for the products made from recyclable materials to support the LAs efforts.

b. National Policy on Solid Waste Management in Sri Lanka -2007

In 2007, National Policy for Solid Waste Management (NPSWM) was formulated to replace the National Strategy for Solid Waste Management of 2000, which targets waste minimization, reuse of waste, recycling, and appropriate final disposal of waste. The policy was prepared to ensure integrated, economically feasible, and environmentally sound and socially responsible Solid Waste Management practices for the country at the national, provincial, and LA level.

The policy suggests the decentralized responsibility of waste generation, waste management, and services related to solid waste while providing the opportunity to bring all the responsible and interested parties together to come up with sustainable solutions for the solid waste problem in Sri Lanka. Since the NPSWM is the highest level policy on SWM to date, directives of the policy have an impact on Resource Recovery and Ruse (RRR) businesses in Sri Lanka.

The policy instructs all the RRR businesses should be functioned within the provisions made by the NPSWM. The policy directly suggests finding possible RRR business opportunities to minimize the amount of waste for disposal, ensure the health and well-being of the people, and preserve the ecosystems. Therefore, the National Solid Waste Policy in Sri Lanka has identified and permitted all stakeholders to reduce waste disposal through RRR opportunities. The policy clearly states that “sustainable waste

collection systems should be established to make recycling economically viable.” Sorting waste at the source was recognized as a strategy to make recycling economically viable.

c. Environmental Protection License Schème (EPLS)

Obtaining the Environmental Protection License (EPL) to undergo RRR business become mandatory under the National Environmental Act (NEA) No: 47 of 1980 amended by Acts No. 56 of 1988 and No. 53 of 2000. Section 23 A of the NEA states that “*no person shall carry out any prescribed activity except under the authority of an EPL and following such standards and other criteria as may be prescribed under the Act*”. EPLS is playing a key role in establishing environment friendly and legally structured RRR business culture in Sri Lanka. Industries and activities which required an EPL are listed in Gazette Notification No. 1533/16 of 2008. According to the standard criteria of EPLs, there is hardly any possible way to undergo the RRR business of medium to large scale without getting EPL.

d. Technical Guidelines on Solid Waste Management

The CEA has prepared several technical guidelines to support waste treatment at the national level. These guidelines on solid waste management are also designed to provide general guidance to the investors, local authorities (LAs), and any other entity that initiates or operates any SWM activity to make them environmentally sound and adhering to legal compulsions (CEA, U.D.). There are three general guidelines available to guide to prioritize the waste in the preparation of RRR business.

1. Technical Guidelines on Solid Waste Management in Sri Lanka of 2005 to support the SWM and siting of engineered landfills. Various components of Solid Waste Management such as waste collection, waste transfer, recovery of useful components of solid wastes, waste incineration, composting, biogas generation, and landfilling are covered in these guidelines giving technical guidance to do these operations with minimal impacts to the environment.

According to the guideline, “Any person wishing to operate solid waste disposal (including transfer station, materials recovery, incineration, composting, etc.) shall provide to the CEA the following information and any further information as may be requested by the CEA for approval procedure”.

- a) A topographic map showing the location and boundaries of the proposed site and land use within one Kilometer radius of the proposed site
- b) A clear layout plan with an appropriate scale showing full details of the proposed locations for different activities.
- c) The capacity of the facility, all types of machinery, and equipment to be used in the facility, operating hours, number of working days, number of workers for each activity.
- d) The details of the operation flow diagram for the proposed facility, origin, composition, and expected weight or volume of solid waste to be accepted as well as the projected waste quantity expected in future years”.

The guideline has also suggested specific requirements for different types of RRR businesses part from the general, legal, and operational requirements. In addition to the guidelines developed by the CEA, Ministry of Health, & Indigenous Medicine has prepared the “Healthcare Waste Management Guideline of 2001” and Ministry of Home Affairs, Provincial Councils and Local Government has developed “Solid Waste Management Guideline for Local Authorities of 2003.

2. Technical Guidelines on Solid Waste Management in Sri Lanka of 2007 to support the constructions of engineered landfill
3. Guidelines for the Management of Scheduled Waste in Sri Lanka of 2009 targeting the management of scheduled waste to facilitate the implementation of Regulations on hazardous waste management of 1999

e. *National Waste Management policy of 2018 (Draft)*

Ministry of Environment has drafted a National Waste Management Policy with a mission of “Development of an eco-friendly nation by promoting resource circulation”. One of the stated guiding principles of the policy is that “*Waste management systems should be zero waste oriented linking to life cycle management of products and processes as much as possible with appropriate technology*” that has a direct relationship on the reduction of food waste. The policy states that “*Strategies shall be developed by the Local Authorities to promote the prevention of generation and reduction at source followed by source separation and further segregation as appropriate to facilitate regaining the utility value of household refuse as much as possible*”. The policy seeks the LAs to ensure the active engagement of all the households, institutions, and other commercial entities for proper collection of municipal waste effectively and efficiently with a feedback mechanism. It has been recommended to identify appropriate tools and strategies able to apply the polluter pays principle and extended producer responsibility principle to maximize resource recovery and prevent scattering and haphazard disposal of waste. One of the actions proposed is the development of systematic mechanisms with tracking systems to know where what and how much waste is generated as premises for confirmation of the cause of waste generation aiming at establishing a sound and self-responsible society with life cycle thinking in resource utilization.

Regarding the food, agriculture and livestock waste it has been stated in the policy to develop a comprehensive strategy and action plan by the Ministries of Agriculture, Trade, Tourism, Local Government, Health and Education to minimize the quantity of waste to be finally disposed of, in collaboration with the relevant stakeholders. According to the policy food waste generators (food handling establishments and kitchen waste) shall be responsible to develop their management plans and implement in consultation with relevant authorities to prevent health and environmental problems and guidelines shall be developed for food and agriculture waste prioritizing waste minimization targeting all sectors with appropriate standards to prevent contamination of water bodies and lands that would cause health and environmental problems. The policy promotes the application of cleaner production techniques to minimize hazardous contents and improve resource efficiencies at all levels.

According to the policy, the importation of post-consumer waste shall be prohibited. It has been proposed to carry out a comprehensive revision of the relevance, sufficiency, efficiency, and effectiveness of the existing laws and regulations by the Ministry of Environment to support the implementation of the national policy to achieve required transformation deviating from “linear waste management approaches” (make, use, dispose of) and moving forward to “circular systems” (keep resources in use for as long as possible, extract the maximum value from them whilst in use, then recover and regenerate products and materials at the end of its service life). It has been recommended to develop short, medium, and long-term strategies and action plans by leading institutions and agencies to minimize the waste to be finally disposed of by using an appropriate waste management hierarchy throughout the life cycle.

2.2.2 National legislations on waste generation and management

a. *General setting*

The National Environmental Act (NEA) No. 47 of 1980 is the umbrella legislation for environmental protection in the country. The Central Environmental Authority (CEA) was created in August 1981 under the provisions made in the NEA. The establishment of the CEA is the first explicit effort to regularize the environmental concerns at the national level in Sri Lanka, which includes protection, management, and enhancement of the environment, regulation, maintenance, and control of the quality of the environment and prevention, abatement and control of pollution. One of the important functions of the CEA is formulating Solid Waste Management strategies in the country. As per the NEA, No. 47 of 1980, Paragraph (h) of Sub-section (2) of Section 32 (2) (h), the Minister-in-charge has issued special regulation, No. 1627/19 of 2009 providing special attention on MSW. CEA as an apex agency that gives EPL to start and operate RRR business in Sri Lanka, has the authority to either approve or reject the proposal for RRR business in line with the national level environment and waste management laws, policies and regulations.

CEA has formed a separate division named “Waste Management Unit (WMU)” to handle the functions related to waste management. WMU deals with regulatory functions about Hazardous Waste Management (Scheduled Waste Management), Solid Waste Management, and Chemical Management under the provisions of the NEA and the other related regulations. Besides, WMU also provides necessary awareness and educational assistance to the general public on waste reduction and apposite handling of solid waste.

Regulations in food safety and hygiene aspects also has implications on the quantity of food waste generation in the back end of the food chain. The Food Act, No.26 of 1980 is the main legislation governing Food Control activities in Sri Lanka. General Objectives of the Food Act is to ensure the availability of safe, wholesome, and genuinely presented food in the market for human consumption. The Food Act also control, manufacture, importation, sale, distribution, transportation, advertisement and labeling of food through the necessary regulations made by the Minister of Health in consultation with the Food Advisory Committee (FAC). The FAC comprises 19 members. They represent various stakeholders in food safety from government departments/ ministries as well as trade and consumers. The main purpose of the Act is to ensure the food available for sale is both safe and suitable for human consumption. It also prohibits any misleading conduct about the food.

According to the Municipal Council Ordinance No.20 of 1947 (Sections 129, 130 and 131), Urban Council Ordinance (Sections 118, 119, and 120) and Pradeshiya Sabha Act (Sections 93 and 94) Municipal Solid Waste Management is a responsibility of Local Authorities. According to these provisions made in the local council's Acts, it is an obligatory requirement of the LA in the area of concern for ownership and resource allocation on waste. To enable the entrusted function of managing the municipal solid waste of the LAs, the respective council has to obtain site clearance from CEA to construct Municipal Solid Waste facilities including landfills. A facility that receives over 100 tons/day needs an Environmental Impact Assessment (EIA) approval from CEA, while the sites which receive less than 100 tons/day required to obtain Environmental Clearance or Initial Environmental Examination (IEE) or EIA approval as per the Act to operate a landfill site.

Urban planning in Sri Lanka is regularized by the Urban Development act No 41 of 1978. The Urban Development Authority of Sri Lanka (UDA) was formulated under the purview of this Act in 1978. The UDA

is a multidisciplinary organization engaged in urban planning and sustainable urban development in Sri Lanka. Powers and functions of UDA described in part II of the Act of the said Urban Development Act delegates power to the UDA to develop environmental standards and develop schemes for environmental improvements within the respective urban areas. UDA is in charge of finding innovative solutions to resolve the SWM issues in urban areas to assist LAs and has a role to provide a coordinating mechanism for the various waste management related projects implemented by different ministries and agencies.

Consumer Affairs Authority Act No 09 of 2003 has legal provisions empowering the Consumer Affairs Authority (CAA) to take necessary actions to safeguard the interests of consumers while maintaining effective competition among suppliers of consumer products. CAA can handle consumer complaints and also has a role to play on consumer education and empowerment. CAA is a member of the National Food Advisory Committee (FAC).

Sri Lanka Standard Institution (SLSI) established under Sri Lanka Standards Institution Act No 06 of 1984 is responsible for disseminating information on standards, technical regulation and standards related activities to the community at the national level. It promotes the volunteer adoption of SLSI standards intending to assure the safety and quality of foods, provide third party certification to both consumer and producer and to enhance the industry recognition of the food operator. However, SLSI has imposed compulsory standards for several food product categories in Sri Lanka, including brown sugar, canned fish, condensed milk, and fresh fruit cordials. There are 33 stipulated food products that need the approval of Director General of SLSI at importations to ensure the quality and safety in line with the food standards stipulated in Codex and ISO. SLSI is one of the members of the FAC.

b. Legislations and regulations related to waste generation

Sri Lanka produces around 710,000 metric tons of vegetables and around 540,000 metric tons of fruits annually (EDB, 2013). It has been reported that large quantities of perishables are wasted during peak production periods. The estimated annual post-harvest losses of fruits in Sri Lanka is 30-40% of the production. The post-harvest losses of some local varieties such as local mangoes are approximately 40-60% (Gunawardane, 2019). The amount of waste generated from the perishable has a direct linkage with the quantities of perishable foods supplied to the market, how they are packed and transported to wholesale and retail sale points, methods used to preserve the food items, and how they were stored. Overproduction of fruits and vegetables causes huge food waste generation in the back end of the food supply chain. Controlling measures for overproduction is an unsound topic in the relevant acts, policies, and strategies.

Mode of transportation of vegetables and fruits from the farm gate to the markets is not regulated in Sri Lanka though it is hugely contributing to the food waste generation at the back end of the value chain. However, none of the legal provisions available in the country has paid attention to the proper transportation of food items from the farm gate to wholesale and retail points that would minimize the damages to occur for perishable foods during the transportation, loading, and unloading.

Food quality control in the country works at three levels; import control, domestic control, and export certification. Imports and export control Act of 1969 provides powers to inspect the imported food items at the port of arrival and also post arrival at the markets. Domestic control is done under the Food Act of 1980 through the authorized officers appointed throughout the country. All exporters need to be registered under the Food Control Act that provides export certificates.

Food act No 26 of 1980 and the subsequent amendments in 1991, 2011 has several provisions to control and regulate food manufacturing, food preservation, food safety and hygiene, food transport methods, imports, sale/expose to sale, storage and distribution. The main focus of the food Act is to ensure the supply of safe food to the consumers, but it has insinuations indirectly on reducing food waste generation. Part 1 of the Food Act has set some conditions for manufacture, import, sale, and distribution of food items. This will help to reduce the food waste at the early stages of the food supply chain and also avoid the flow of unsuitable food to consumers. There are also provisions to regulate the labeling, packing, and advertising standards, to prevent the creation of the wrong impression on character, quality, value, composition, or safety of the given food. The sale of food unfit for human consumption or sale for the use as animal food is not allowed except with the written permission obtained from chief food authority or authorized person.

Food waste associated with food spoilage occurs due to various types of microorganisms making food unacceptable to the consumer and change of smell, taste, appearance & texture. Assuring the supply of safe food through a well-established regulatory system able to reduce the untimely food spoilage and subsequent food waste. In this context, Sri Lanka has taken steps to review the Food Act no. 26 of 1980 and its subsequent amendment made in 1991. Under the provisions made in the Act, the Ministry of Health has published several regulations, and in the process of drafting new regulations based on current needs related to food safety. The National Food control system in Sri Lanka is further strengthened by the implementation of the Consumer Protection Authority Act of 2001 and the Drugs and Cosmetic Act of 1980 (Munasinghe et al, 2014).

Permitted food additives and preservatives that could be used in the food industry have been stated in the Food Act No 26. of 1980 and the relevant regulations are published in the Gazette No. 615/11 and No. 1660/30. Food additives are used to affect the food's keeping quality, texture, consistency, appearance, odor, taste, alkalinity or acidity or to serve any other taste, or to serve any other technological function.

Food Act No. 26 of 1980 also has issued Gazette No. 1694/5 focusing on expiry dates of food items that give an idea about the shelf-life period as well as indicate the suitable time for the next cycle of food production. Effective use of packaging can increase the shelf-life of food products. The regulations on the shelf-life of imported food items stipulate that all items of food imported to the country except fruits, vegetables, and potato at the point of entry possess a minimum period of sixty percent of unexpired shelf life.

Gazette No. 560/13 issued under the Food Act is addressing the regulations related to premises of food preparation, storage or sale, and cleanliness of articles and equipment. Good quality food products tend to produce less waste where food preparation, storage, and sales premises should follow accepted building requirements and ventilation and adopt the regulation concern on the cleanliness and hygiene practices of the premises used to prepare food. These procedures make sure minimal contamination of foods during food preparation/processing.

Under the Food Act, a new regulation was Gazetted in 2019 (No.2128/4) as “Food (Registration of Premises) Regulations of 2019”, and came into operation from 01.01.2020. According to the regulations, every person who manufactures, prepares, preserves, packages, stores, any food for sale or offers for sale in a premise should register such premises with relevant food authority and the approval will be given after the inspection of the premises as per the guideline and the medical reports of the food handlers. The regulation empowers the authorized persons to take actions to ensure food safety in case of violation

of stipulated conditions. Except for these regulations, no other regulations are addressing the hygiene of food directly or indirectly that has a relationship to food spoilage resulting in food waste generation.

c. Legislations and regulations related to waste collection and transport

Pradeshiya Sabha Act No 15 of 1987, Urban Council Ordinance No 61 of 1939 and Municipal Council Ordinance No 16 of 1947 are acting as the main bodies of waste collection empowered through the relevant Acts and ordinances to take necessary actions to ensure the cleanliness, neatness within the respective council areas. The sections 129,130 and 131 of the Municipal Council Ordinance, the sections 118,119 and 120 of the Urban Councils Ordinance, and sections 93 and 94 of the Pradeshiya Sabha Act, have clearly and adequately provided the legal provisions to perform the above tasks.

According to the technical guidelines issued on SWM in Sri Lanka, LAs make all the decisions related to the various aspects of waste collection and transportation including the waste collection areas, transportation routes, the number and type of the collection vehicles to be used, purchase of vehicles and other equipment, frequency of waste collection and the schedule for collection and transport and recruitment of necessary workforce that would ensure the smooth operation of waste collection and transportation. Also as per the regulations of the police and Road Development Authority (RDA), certain roads are prohibited for heavy vehicles at certain times of the day. Such rules and regulations should be taken into consideration when deciding the waste collection routes.

The legal enactments of LAs on solid waste management have following provisions; a) All street refuse, house refuse, night soil or other similar matter collected by LAs under the provisions of this part shall be the property of the council, and the council shall have full powers to sell or dispose of all such matter. b). Every LAs shall from time to time provide places convenient for the proper disposal of all street refuse, house refuse, night soil, and similar matter removed per the provisions of the law, and for keeping all vehicles, animals, implements, and other things required for that purpose and shall take all such measures and precautions as may be necessary to ensure that no such refuse, night soil, or similar matter removed following the provisions of the law is disposed of in such a way as to cause a nuisance (National Strategy for solid waste management, 2000).

Food waste which is the main focus area of this report has not been considered directly in legislation related to waste collection and transport and it is part of house refuse that has been mentioned to collect and remove at the proper time. The responsible body for all the collected waste is respective LAs.

d. Legislations and regulations related to waste disposal

Nuisances Ordinance No. 15 of 1862, which was subsequently amended No.61 of 1939; No. 3 of 1946; No. 57 of 1946 was the first piece of legislation introduced in Sri Lanka during the colonial administration about waste management. It has identified improper waste disposal, wastewater, and drain usage at houses as a violation of the law, which can be fined a stated amount. The Ordinance has given authority for city government and government sanitary inspectors to inspect, regulate, and control public nuisance, particularly inappropriate garbage disposal. The power vested by the ordinance is presently enforced by public health inspectors (PHI). Police Ordinance No. 16 of 1865 provides authority to police to take actions against improper disposal of waste. According to section 63(g) of the Police Ordinance, "Any person who throws or lays down any dirt, filth, rubbish, or any stones or building materials can be taken into custody

without a warrant if the person in view of the officers has committed any such offense. Such offenses are liable to a fine or imprisonment not exceeding three months.”

NEA of 1980 and the subsequent amendments are talking about waste disposal and management deeply throughout the policy on issuing of a license, inland water pollution, soil, and surface land pollution. Public responsibility and environmental concern over disposing solid waste were inescapable in laws and legislations enforced since 1988. Such regulations were initially enforced in section Part IVA, of the NEA (amended) 56 of 1988 and in environmental protection section 23A, which imposes a law on prohibition of discharge, emission, or deposit of untreated waste into the environment. It is noted that “...no person shall discharge, deposit or omit waste into the environment which will cause pollution except;

- a) Under the authority of a license issued by the relevant organization (CEA); and
- b) In accordance with such standards and other criteria as may be presented under this Act.

Section 23A was further amended in NEA No. 53 of 2000 specifying the activities that could potentially cause environmental pollution, and which requires the acquisition of a license. In Part IV B Environmental Quality of the Act from section 23 G, 23 M, 23Q and 23V impose the restrictions standard and other criteria for disposing of the waste. Further section 23A-3 stated that fine and punishment should be given to those violate the demands of section 23 A. Whilst these laws are in place; they seem not to be instituted in many localities as the disposal of untreated wastes (particularly solid waste) continues to plague most parts of the country.

According to the Municipal Council Ordinance of 1980, sections 118,119 and 120, the Urban Council Ordinance No. 61 of 1989 sections 41,93,94 and 95 and the Pradeshiya Saba Act No. 15 of 1987, all MSW generated within the boundary of Local Authorities (LAs) is their property, and they are mandated to remove and dispose of such waste materials without causing any nuisance to the public. These Acts and Ordinances provides power to the LAs to make the decisions on waste disposal sites and management of the site. The responsible body of the collected waste is the particular local council that they can sell or discharge it. However, the provisions specified in the Act do not stipulate the requirement of environmentally friendly and most appropriate methods of waste disposal and it is a punishable offense in Sri Lanka. National Thoroughfares Act No. 40 of 2008 addresses the dumping of solid waste or sending wastewater or liquid waste to the road is prohibited and actions could be taken against the violators.

Prevention of Mosquitoes Breeding Act No.11 of 2007 also prohibits the disposal of waste that would create a condition favorable for mosquito breeding. Regulations published under the Gazette No. 1627/19 National Environmental (Municipal Solid Waste) Regulations, No. 1 of 2009, specifies that no person shall dump municipal solid waste along sides of any national highway and should be dumped in the places designated for such purpose by the relevant LA or any person or body of persons authorized by them in that behalf. The regulations provide power to take legal action or impose punishment under section 31 of the Act, for those are violating these provisions.

e. Legislations and regulations on Resource Recovery from Waste

Resource recovery from waste has been the central focus on contemporary policy and legislation launched in the recent past in Sri Lanka. National Strategy on Solid Waste Management (NSSWM), National Policy on Solid Waste Management (NPSWM), Technical guidance of SWM, and Pradeshiya Sabha Act are

directly playing a role at nationally in emphasizing the critical importance of resource recovery from waste.

Waste sorting at the source is recognized as a strategy that contributes to making waste reuse economically viable. Even though the NSSWM clearly states “Sustainable waste collection systems should be established to make recycling economically viable”, the absence of regulations/by-laws to follow sorting and separation of waste at the source at most of LAs is one of the major obstacles and a challenge in recovering resources from the waste.

Composting from MSW is the major resource recovery approach largely adopted in Sri Lanka as approximately two-thirds of the waste consisted of organic materials. However, there is an issue with the quality of the compost made from waste. Therefore, Sri Lanka Standard (SLS) 1246: 2003 (UDC 628.477.4) provides a general specification for the compost made from both MSW and agricultural waste. The specification was amended and improved by SLSI based on the collaborative work conducted with IWMI in 2019 developing separate SLS specifications for MSW compost (SLS 1634: 2019, UDC 628.477.4), and agricultural waste compost (SLS 1635:2019, UDC 628.477.3).

According to the technical guideline for SWM in Sri Lanka, any SWM facility should maintain the noise levels as per the gazette (Extra Ordinary) No. 924/12 of 1996. The building plan of the SWM facility should have approval from the LA and the effluents and leachate quality should be monitored and treated to conform to the standard.

2.3 Provincial policies and regulations on municipal solid waste management

Under the 13th amendment made to the constitution of 1987, LAs are under the purview of Provincial Councils (PCs). Since the handling and management of MSW is a responsibility of LAs, it is by and large a decentralized function. The rights of LAs relating to waste management were accordingly handed over to the PC as per the Provincial Council Act No. 42. Therefore, the respective PCs and LAs need to adopt appropriate institutional arrangements and formulate regulatory systems adopting provincial-level policies, strategies, laws, and by-laws to achieve the devolved tasks. To assist the task of PCs, CEA has established Provincial Offices and district offices providing the services to the people and industrialists who require services. The Provincial CEA Office is headed by a Regional Director and is supported by Assistant Director, Senior Environmental Officers (SEO), and Divisional Environmental Officers (DEO).

The PCs are empowered to make all decisions on capacity building, resource allocation, and adopting a provincial-level policy on solid waste management projects. It is the responsibility of the PCs to provide assistance and guidance to the LAs in the execution of waste and sanitation-related activities. The PCs are also the main regulatory bodies for supplying equipment and allocating sufficient resources to perform the function of solid waste management in the LAs in the Province. Also, any foreign-funded solid waste management projects implemented in the province should be coordinated and regulated by the respective PC.

As per the authority given to the LAs under the Local council acts and ordinances, each council shall focus on by-laws to be made in promoting waste management. The PCs will consider the national policy on solid waste and its strategies with a view of waste minimization, waste segregation, and resource recovery against waste. For instance, the following strategies are considered in formulating by-laws under the LAs Act in addressing the problem of Solid Waste Management.

- Promote the composting of bio-degradable waste and releasing it back to the environment in a healthy and environment-friendly manner.
- Provide all necessary measures to encourage resource recovery from recyclable waste materials such as paper, plastics, metals, and glass.
- Take all possible measures to minimize adverse effects and damage being caused to the environment such as pollution of water soil and air.
- Utilize methods such as sanitary landfilling for the disposal of waste to reduce any adverse impact on the environment.

The PCs and LAs have made different regulatory and institutional arrangements to handle the delegated function of waste management. For example, under the policy guidelines given in the NPSWM, Western Provincial Council has enforced the Municipality Solid Waste Management Rules No.01 of 2008. The rule promotes the separation of waste at the source adopting a clause, “Every Municipal Solid waste generator shall maintain a minimum of two containers mainly for biodegradable and non-biodegradable wastes set out in Schedule 1. Such containers shall have lids with sufficient space to accommodate the daily collection of waste without spilling any waste outside such containers. The waste generator may have more than one container for non-biodegradable wastes such as papers, plastics, and glass, etc., No generator of waste shall mix their toxic or clinical wastes with the Municipal Solid Waste”. This provision is applicable for MSW generators in the Western province where Colombo, Kaduwela and Kotte municipal councils are strictly adapting in their daily waste-collecting from the generators.

The same rule adopted by the Western PC also specifies that every LA in the western province should collect organic waste twice a week and the time of the collection should be informed to residents in advance. A similar awareness should be given for non-organic waste generators (residents/businesses) as well where it should be collected at least in a fortnight. According to the accepted policy of the National Solid Waste Management of Sri Lanka, ‘Polluter should pay the cost’. The Municipality Solid Waste Management rules suggest the ability of LA to collect a fee for waste collection in the western province. There are local authorities in the eastern province who have introduced such a charging system. Accordingly, LKR. 20 from Samurdhi families (families under the government poverty alleviation program) and LKR.50 from others have been charged to cover up the portion of SWM cost (Eastern Provincial Council, 2012).

Another statute of the Western Provincial Council, No. 03 of 2012, adopted to enforce the preventing public health nuisances has also recognized putting waste materials into water, throwing garbage to the road or drain or public places, keeping garbage or any such thing threatening public health and allowing wastewater and toilet water to flow as a disturbance for public health is considered as offensive disposal of waste.

The Western Province has established a separate organization called Western Province Waste Management Authority in 2004 to act upon their entrusted task on waste management under statute No. 09 of 1999. The statute on waste management was amended as No. 01 of 2007 to further strengthen the legal status of waste management. Western Provincial Council introduced Solid Waste Management Rules No 01 of 2008 via the Extraordinary Gazette No 1560/6 on 30th July 2008 to get the legal support

to implement the seven management steps in MSW management³. Similarly, North Western Province has created its own Provincial Environmental Authority. Despite the own arrangements for SWM in some of the PCs, it has been noted that the active engagement and supports provided by the PCs in MSW management are not adequate except for the Western Provincial Council (Karunarithna, UD.). The National Waste Management Policy of 2018 (Draft) recommends strengthening the Waste Management Authority of the Western Province to deliver required services in the Western Province and also to provide services to the other provinces and Local Authorities as well on demand.

The North Western Provincial Council (NWPC) has formulated Provincial Environmental Statute No. 12 of 1990. Under the provisions given in the statute, the Provincial Environmental Act of 1991 was adopted superseding the NEA except for areas under the Department of Wildlife Conservation or Department of Coast Conservation and Coastal Resources Management. The Act provides power to the NWPC for the establishment of the North Western Provincial Environmental Authority, to make provision concerning the powers, functions, and duties of the Authority and to make provision for the protection, management, and enhancement of the environment and the regulation maintenance and control of the quality of the environment.

The by-laws adopted by the councils may vary from place to place depending on the context and requirements. The by-laws adopted by the Colombo Municipal Council (CMC) on food safety and food waste and losses are listed in Annex Table 1. The provincial waste management functions are linked with the central government through the Ministry of Provincial Councils and Local government which is responsible for the implementation of policies, plans, and programs in respect of provincial councils and local authorities. The connectivity of organizations in central and provincial level is illustrated in Figure 1

³ Seven steps are; Evaluate your waste, store your waste, label the waste, transport and dispose your waste properly, plan for emergencies, train personnel, keep records

2.4 Self-regulation and voluntary standards by the private sector/NGOs

There are hotels, restaurants, and caterers, private traders, supermarkets, NGOs and charity organizations have adopted self-regulation and voluntary standards in their entities as a measure to reduce food waste and invest on reuse and recycling practices of the generated food waste mainly due to ethical and moral reasons, economic benefits, environmental concerns and as a part of corporate social responsibility (CSR) (Sandaruwani, and Gnanapala, 2016; Kumara et al., 2018; Prematunge, 2018; Reitemeier, 2019).

The large tourist hotels which are keen to obtain international green awards/environmental awards are bonded to implement several standard environmental management interventions according to Agenda 21 of the Rio Earth Summit. Waste minimization (reduction, reuse, and recycling); wastewater management, and implementation of environmentally sensitive purchasing are some of the important management items directly connected with waste management. In Sri Lanka numbers of hotels have received national and international green awards considering their commitment towards ensuring a cleaner environment and efficient use of resources including Heritance Kandalama, Heritance Ahungalla, and Hotel Sigiriya.

Key informant interviews conducted by the authors of this report with the management of various hotels and supermarkets in Sri Lanka revealed various voluntary self-regulation practices implemented to reduce, reuse, and recycle food waste. For example, Water's Edge Hotel generates 300-400kg of food waste every day, but they have embraced a policy of zero waste going to the landfill sites by channeling the food waste generated to the network of Piggery farms. In addition, they have declared a day in each month as no bin day for hotel staff that would not permit any leftover food in their plates. Similarly, Jet Wing hotels produce 35-80 kg of food waste daily, but they are prohibited from reusing food waste. Therefore, many of the Jet Wing hotels are utilizing food waste for energy or compost production.

Another method adopted by some supermarkets, restaurants, and caterers to curb food waste is tie-up with local charity organizations to redistribute the food in good conditions to the families in need. We Give Stuff Away (WGSA) is one of such organizations involved in distributing excess food from supermarkets and stores to give to those who are unable to purchase. The Robin Hood Army is another voluntary organization engaged in collecting excess food from hotels and restaurants and redistribute to the urban poor by repacking and timely delivery of the food before the food gets spoiled. These kinds of food rescue programs are being implemented by many organizations to rescue excess, non-perishable and perishable food and redistribute to families in need, elders' homes, and orphanages in their contacts.

3 Lessons and best practices from the regulatory frameworks adopted in other countries

Policies and regulatory initiatives create an enabling environment to promote, incentivize, and change the behavior and mindset of the people to enhance the reduction of food waste. Around the globe, governmental bodies have introduced regulatory and other incentive mechanisms to mitigate food wastage either on a national, regional, and local level (Chalak et al., 2016). The interest in the challenge of food waste reinstated in the 2010s, as per Thyberg & Tonjes (2016).

Many initiatives followed the call of the Sustainable Development Goal 12.3, to halve per capita food waste at the retail and consumer level by 2030. For example, the EU and the EU countries developed a multi-stakeholder platform (EU Platform on Food Losses and Food Waste) to share best practices and experiences.

In 2014, the European Commission established a dedicated Working Group, with experts from the Member States to facilitate food waste reduction. As one target, regulatory barriers or grey zones, existing either at EU or national level, which lead to food waste shall be removed wherever possible, whilst ensuring the safety of food and feed, as well as protection of animal health (EU, 2020)

The EU Waste Directive (2008/98/EC) integrated a hierarchy for the mitigation and management of waste (EU, 2019). Several member states adapted a modification of this hierarchy to consider the particularities of food (European Court of Auditors, 2016). A similar approach is recommended by the Environmental Protection Agency of the United States (US EPA, 2017).

In the following, policy examples of certain countries are exemplified in order of the hierarchy (Figure 2).

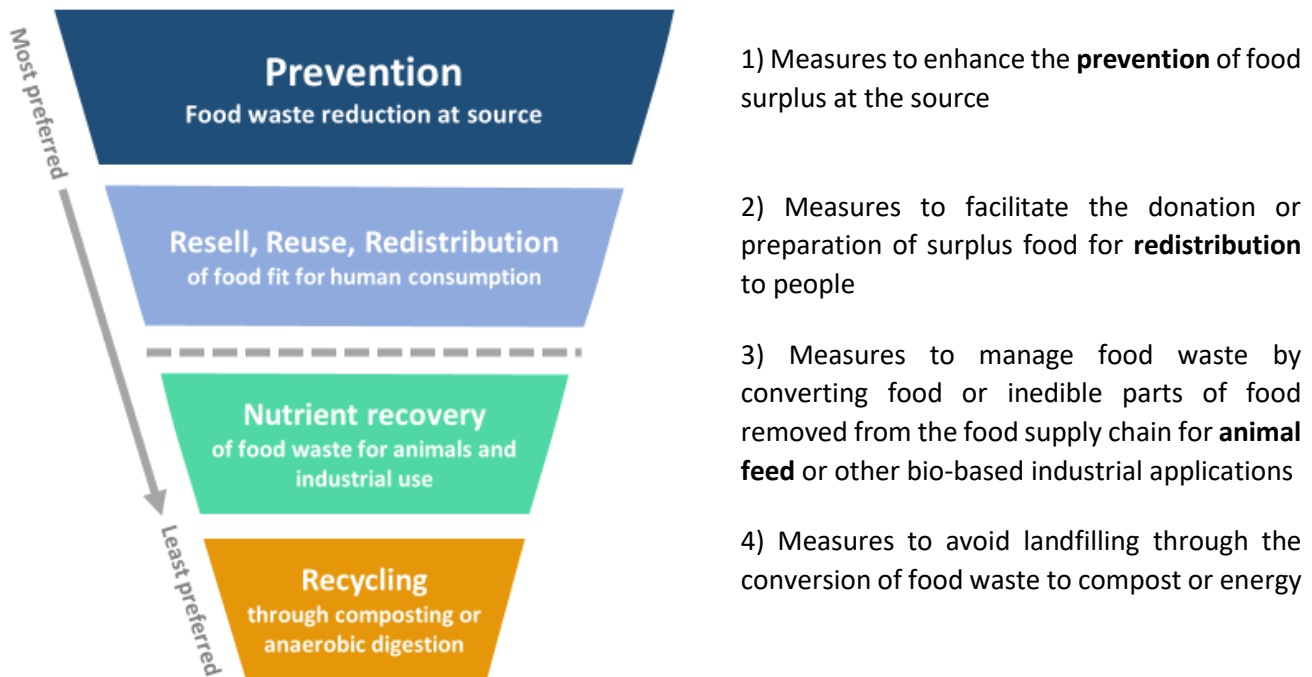


Figure 3: Food waste mitigation hierarchy; adapted from US EPA (2017) and the European Court of Auditors (2016)

3.1 Prevention

Policies that address the prevention of food waste can substantially reduce the amounts disposed of, presenting an alternative to the collection and treatment of wastes (Thyberg & Tonjes, 2016). One obstacle to effective policymaking is the scarcity of solid data on how much and where food loss and waste occur (FAO, 2019). Hence, a quantification process of the food waste magnitude is crucial for the development of well-planned food waste management policies (Thyberg & Tonjes, 2016). It is also necessary regarding the evaluation of an intervention’s success. Out of this reason, a consistent food waste measurement should be performed as a first step (FAO, 2019).

The European Commission is elaborating on a common EU methodology to measure food waste consistently in co-operation with EU countries and stakeholders. The revised Waste Legislation (DIRECTIVE (EU) 2018/851), adopted on 30 May 2018, requests member states not only to monitor food waste levels but also to set mandatory targets for food waste reduction and formulate prevention plans. A national food waste reduction strategy can be an important cross-cutting catalyst for Target-Measure-Act at the country level.

The development of those policies is performed jointly by different stakeholders, as shown in the case of Italy. The National Plan for Food Waste Prevention (Piano Nazionale di prevenzione dello spreco alimentare) was developed by the Italian Ministry of Environment together with Last Minute Market, one of the Italian major players in food waste management (STREFOWA, 2019). With the Charter launched in 2013 from this collaboration, the public administrations committed themselves to carry out various actions, e.g.:

- *to promote discounted sales when a product is close to expiring or has a defect, instead of throwing it away*
- *to simplify the food labeling system regarding expiration dates*
- *To establish an observatory or national agency for the reduction of waste to minimize any losses and inefficiencies in the food industry by promoting the direct relationship between producers and consumers and by involving all relevant stakeholders to make more eco-efficient logistics, transportation, inventory management, and packaging*

National strategies for food loss and waste reduction and prevention created in Argentina in 2015 and Chile in 2017, were consisted of dedicated policies. In Chile, an action plan for 2018–2019 was prepared by public institutions and private organizations focusing on three pillars: (i) governance; (ii) information and communication; and (iii) research, technology and knowledge required to reduce food loss and waste. As part of the Argentinian program, the national campaign named “Valoremos los Alimentos” provides information and videos on how to prevent food loss and waste (FAO, 2019).

To inform the public on food waste challenges and useful prevention practices, many civil society organizations have collaborated with governments. In Europe, one of the most successful campaigns is the “Love Food Hate Waste” campaign. It was initiated by the British private non-profit company WRAP and sponsored by governments across the United Kingdom and Europe. In the period 2007-2011, WRAP has achieved a reduction of household food waste by 13 percent nationwide through public campaigns (Chalak et al., 2016).

The Australian government has granted 1.3 million dollars over two years to organizations such as food rescue groups to support the national initiatives on food waste reduction. One grant recipient is an independent organization that will develop an implementation plan and a monitoring and evaluation framework for the National food waste strategy (Australian Government, 2017).

3.2 Redistribution

Specific regulations and guidelines related to food recovery and redistribution have been formulated in several European countries, as well as Canada, New Zealand, and the United States of America (FAO, 2019). Food donors are protected ‘*from criminal and civil liability, should the product – given away in good faith – cause any injury to a person*’ through legislations like the Good Samaritan Law of the US (FAO,

2013). In Australia, food recovery organizations/charity organizations have established formal partnerships to redistribute the surplus food to the people in need ⁴.

In France and Italy, it has been politically reinforced for grocery retailers to hand out the unsold food stock in edible conditions food to foodbanks (Filimonau & Gherbin, 2017). In comparison to the French law, which penalizes supermarkets that fail to comply with the rules, the Italian law focused on making it easier for companies to donate unsold food by relaxing regulations that had hindered the procedure. Food can now be donated even if it is past its sell-by date (Winnow, 2019). In 2019, one party of the German Bundestag claims to design a law against food waste, comprising similar regulations as in France and Italy. Through the law, the act known as 'containern' should no longer be treated as crime, and local Food sharing initiatives shall be supported (Deutscher Bundestag, 2019).

A common challenge for businesses and food rescue organizations is the costs associated with transporting the food. Lack of facilities and equipment might prohibit the redistribution or repurposing of food. Governments can enable the establishment and improvement of infrastructure. For example, Italian authorities contributed to the capacities of redistribution initiatives, through finding adequate spaces for their operations (Galli et al., 2019).

Rescued food can be made available for the community in public fridges, which are open-access spaces where food can be freely and anonymously shared. The first public fridges were set up in Berlin by the initiative Foodsharing.de (Davies, 2019). Such Brazil, Israel, New Zealand as well as in Asian countries like Singapore or India. Their operation requires the commitment of volunteers to keep the fridge clean but also the support of local authorities, i.e. health officers. Members of those initiatives like Foodsharing. must commit to follow internal hygiene regulations. One example is to ensure the maintenance of cold temperature for chilled goods during transportation from the donating partner to the fridge ⁵.

Annakshetra is an initiative of an NGO called Centre for Development Communication (CDC) based in Jaipur, India aiming to rescue the excess food from weddings, parties, restaurants, and temples. The initiative has a 24-hour helpline number, circulated among party places, caterers, and the general public in the area, through newspapers, posters, banners, and pamphlets. In addition, a smartphone App has been developed to connect donation stakeholders. The collected food is tested on its conditions for consumption and in case of unsuitability, it is sent for composting. (Agarwal and Nag, 2013)

Another pathway, the government can fund and promote the reduction of food waste are award schemes (Giroto, et al.2015). In Germany, the Federal Ministry of Food and Agriculture is hosting an annual event where the best initiatives and projects with concrete ideas to reduce food waste are selected and rewarded with a prize of 15,000 Euro in total. In 2017, a start-up company won the first prize with its concept of reusing unsold bread from bakeries ⁶.

3.3 Animal feed and other waste recovery

Feeding food waste to pigs is an archetypical practice (Salemdeeb et al., 2017). Swill feeding was banned in the EU as a result of the foot-and-mouth disease (Bovine Spongiform Encephalopathy – BSE) outbreak in the UK in 2001 (FAO, 2013; Salemdeeb et al., 2017). When surplus food is properly heat-treated (cooked), any organisms that might otherwise develop diseases are killed, making it safe to feed to

⁴ <https://www.environment.gov.au/search/site/food%20waste>

⁵ <https://wiki.foodsharing.de/Hygienerregeln>

⁶ <https://www.zugut fuer dietonne.de/der-bundespreis/2017/>

animals (FAO 2013b). As reported by the FAO, there had been a law on boiling food waste for an hour to kill off pathogens, which was not observed by the farmer in the UK on whose farm BSE occurred.

In 2009, the Japanese government developed a certification system to give incentives and promote the recycling of food waste (Liu et al., 2016; Sugiura, et al., 2009). By July 2014, 21 companies in Japan have been certified for 50 types of products under the “Eco-feed” label for animal feed comprised of food waste (Liu et al., 2016). This certificate includes guidelines on preventative measures for the spread of BSE (Sugiura et al., 2009).

3.4 Recycling through composting and energy production

Similar to Japan, such a ‘green label’ encourages organizations, institutions, and companies to make an active effort to reduce and recycle food waste in Denmark. This label has been launched by Daka ReFood in collaboration with the Danish Agriculture and Food Council and the consumer association “Stop Wasting Food Movement Denmark” (Daka Denmark, 2020).

As reviewed by Chalak et al. (2016), ‘Pay-as-you-throw’ (PAYT) schemes are implemented in countries including the United States, Canada, Japan, Taiwan, South Korea, Thailand, Vietnam, and China. Such schemes involve a fee that is charged to consumers in proportion to their generated waste upon collection designed as a monetary incentive to reduce the waste.

The Authority of the Korean capital Seoul initiated an urban farming project using food waste as compost. Residents of an apartment complex were provided with a machine to process the residential food waste as well as farming lessons. With a grant of \$60,000 the government is planning to expand the project to three other neighborhoods. Besides, urban farms which apply food waste shall be subsidized with up to \$16,000. In every household, electronic devices (RFID machines) have been installed, where residents have to swipe a personal card to weigh their waste and be charged accordingly. According to the South Korea’s Ministry of Environment, the food waste recycling rate increased from 2.1% in 1995 to 90.2% in 2016⁷.

⁷<https://abcnews.go.com/International/south-koreas-food-waste-reduction-plans-feature-urban/story?id=62480905>

3.5 Overview on engagement of national governments

The mentioned UN SDG goal 12.3 to halve per capita global food loss and waste has been explicitly addressed in national or subnational targets, through either mandatory or voluntary governmental pacts and plans (Figure 4).

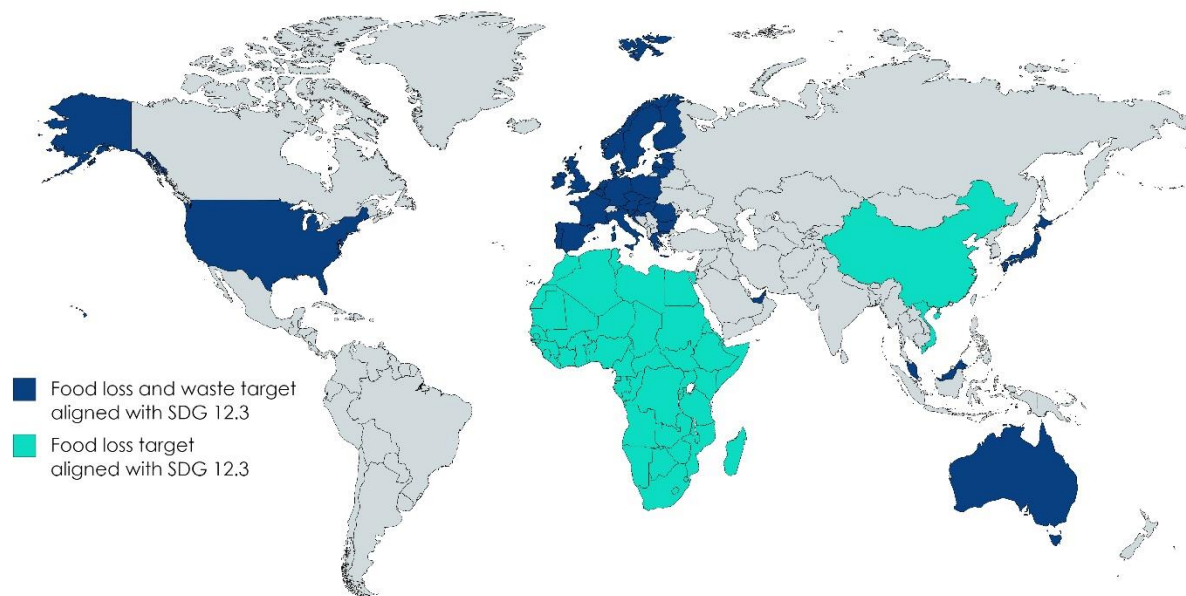


Figure 4: National and Regional Governments with Food Loss and/or Waste Reduction Targets Aligned with SDG Target

Source: WRI, 2019

In response to the situation of a country, policy makers have different objectives. While low-income countries might set a focus on reducing food loss and waste at early stages of the supply chain, high-income countries are likely to intervene at the retail and consumption level (FAO, 2019). Table 2 presents a non-exhaustive summary of national interventions led or supported by governmental bodies.

Table 2: Prospective public sector driven food waste management policies from international experiences (non-exhaustive)

Initiative examples	Countries examples	Description
SDG Goal 12.3	UN Member states	Agreements to halve food waste at the retail and consumer levels and reduce food losses, including postharvest losses, along supply chains, by 2030 > Target - Measure - Act Approach
National Food Waste Reduction Plans and Pacts	Australia, Argentina, Canada, Chile, European countries, Dubai, USA	Design of country-specific action plan or food waste reduction roadmap through collaboration of key stakeholders involved
Mother Earth Law	Bolivia	Promotes the adaptation of institutional, technical and legal tools to prevent waste, encourages food waste recovery and reuse

Governmentally backed networks, education, and awareness campaigns	Belgium, Brazil, Denmark, Germany, The Netherlands, Singapore, Turkey, UK, USA	Increase of public attention and knowledge to reduce food waste, e.g. through information on proper food preparation, portion sizes, food reuse, ordering flexibility in restaurants, food purchasing, food storage, food safety, and meal planning. The campaigns may be done through various media outlets, including school programs and other face-to-face training as well as social media
Investments, and partnerships to improve national or regional food systems	Gambia, Mexico, The Netherlands, Tanzania	Governmental funds to support research on farming systems, food storage and processing technologies to reduce food losses and/or bringing together governmental bodies, private companies and farming communities for knowledge exchange and policy design
Promotion of food preservation	West Africa	Solar drying of excess mangoes
Incentivizes for research and industry on food innovations	Germany, Kenya, Singapore, USA	Tax incentives, award schemes, competitions, or grants for applicants engaged in food waste prevention, reuse or recycling (3R-Funds ⁸) including food packaging for self-life extension
Groceries Code Adjudicator Bill (GSCOP)	UK	The GSCOP was created by the UK Competition Commission to protect farmers from bearing food waste costs caused by actions of supermarkets, e.g. last-minute cancellations or forecast orders
National laws on food redistribution	USA	Good Samaritan Food Donation Act; protects donors including individuals, businesses, governmental entities, food recovery organizations and gleaners in their donations to foodbanks
	France, Italy	Supermarkets with > 400 m ² are obliged to donate edible excess food to charities; Mislabelled and past "best before" date products can be donated. Donation practices are facilitated through provision of infrastructure
Promotion of food waste reuse for animal feed	Japan	The Ministry of Agriculture, Forestry, and Fisheries provides guidelines for transportation and production of feed. Recycling loops are created between producers of waste, recycling organizations, and farmers for a consistent and identifiable market for products
Changing design of waste collection system	Canada, China, Japan, South Korea, Taiwan, Thailand, Vietnam, and USA	National or municipal regulations on charging the waste generators per weight or volume, e.g. 'Pay-as-you-throw'

Source: Authors; based on Chalak et al. 2016; FAO 2013b & 2019; Sugiura et al. 2009; Thyberg & Tonjes 2016; United Nations 2015; WRI 2019

⁸ <https://www.nea.gov.sg/programmes-grants/grants-and-awards/3r-fund>

By the end of calendar year 2018, two-thirds of the world’s 50 largest food companies (by revenue) had a food loss and waste reduction target. These companies include AEON, Kellogg’s, Nestlé, Walmart, and Woolworth. Therefore, the 2018 SDG milestone “Sixty percent of the world’s 50 largest food companies by revenue have set specific FLW reduction targets aligned with Target 12.3” was exceeded. However, just under one-fifth of the world’s largest companies have set targets also for their suppliers missing the related milestone (WRI, 2019). Examples of some of the ongoing initiatives are presented in Table 3.

Table 3: Prospective private sector driven food waste management initiatives from international experiences (non-exhaustive)

Initiative examples	Company examples	Description
National alliances		
National Food Waste Reduction Pacts (I) (UK; 2018)	The UK Food Waste Reduction Roadmap, with more than 150 companies, incl. all main grocery retailers in the UK	To help food and consumer goods companies reduce their food waste, the companies are committed to Target, Measure and Act on their food waste, with 121 already reporting on progress. These 121 companies have a combined turnover of half of the overall turnover for UK food manufacture, retail and hospitality food service.
National Food Waste Reduction Pacts (I) (Canada; 2019)	Kraft Heinz (Canada), Loblaw Companies Ltd., Maple Leaf Foods, Metro Inc., Save-on-Foods, Sobeys Inc., Unilever (Canada), Walmart (Canada)	The group of 8 companies are committed to reduce food waste in their Canadian operations by 50 percent by 2025.
National Food Waste Reduction Pacts (II) (USA; 2016)	U.S. Food Loss and Waste 2030 Champions	With support by the U.S. Department of Agriculture (USDA) and the U.S. Environmental Protection Agency (EPA) this group of businesses and organizations made a public commitment to reduce food loss and waste in their own operations in the United States by 50 percent by the year 2030. ⁹
Multi-national alliances		
Global alliances I (2015)	The EU based International Food Waste Coalition (Founding members: Ardo, McCain, PepsiCo, SCA, Sodexo, Unilever Food Solutions, WWF)	The coalition uses a farm-to-plate value chain approach for impacting local, national and international regulations as well as conducting specific projects (e.g. with FAO on schools) aimed at the end-users achieving measurable results and creating momentum in society.

⁹ <https://www.epa.gov/sustainable-management-food/united-states-food-loss-and-waste-2030-champions>

Global alliances II (2016)	The Consumer Goods Forum of about 400 retailers, manufacturers, service providers, and other stakeholders across 70 countries	In June 2016, the first-ever global standard to measure food loss and waste, the FLW Standard ¹⁰ was introduced through an international partnership. The standard is a set of global definitions and reporting requirements for companies, countries and others to consistently and credibly measure, report on and manage food loss and waste.
Global alliances III (2017)	Global Agri-business Alliance	Supporting SDG 12.3 including measuring food loss and waste as part of the Food and Agricultural Loss Resolution (using a common Food Loss and Waste Accounting and Reporting Standard)
Global alliances IV (2018)	10 of the world’s largest food brands incl. Mars, PepsiCo, Tesco and Unilever	Committed to halve their food waste by 2030, to publish the food waste data for their operations, and to take concrete steps to reduce food waste in the supply chain and in customers’ homes.
Global alliances V (2019)	Sustainable Rice Platform	Represents some of the largest rice producers in the world, the platform is committed to implementing the Target-Measure-Act approach and to halving on-farm and near-farm rice losses by 2030
Global alliances VI (2019)	“10x20x30” Food Loss and Waste Initiative by AEON, Ahold Delhaize, Carrefour, IKEA Food, Kroger, METRO AG, Pick n Pay, The Savola Group, Sodexo, Tesco, and Walmart	An initiative to engage the supply chains in the fight against food loss and waste. The initiative brings together 10 of the world’s biggest food retailers and providers to each engage with 20 of their priority suppliers to aim to halve rates of food loss and waste by 2030.
Company examples		
Company commitments (I)	Sysco	Committed to divert 90 percent of food waste from landfill by 2025 from the current level of 65 percent. To help meet this goal, Sysco is working on repurposing and donating excess food and redirecting food waste through agricultural feed.
Company commitments (II)	Google	Since 2014, over 2,700 tons of food waste avoided by implementing LeanPath technology across 189 cafes and using the information to alter menus and purchasing, repurposing trims of food that would otherwise be wasted into other products, and donating any surplus food to those in need
Company commitments (III)	Kellogg,	Since 2016, a 12% reduction in organic waste (food waste plus animal feed and biomaterial/processing) across its global manufacturing plants (Kellogg).

¹⁰ <https://flwprotocol.org/flw-standard/>

	Morrison's, Co-Op	Since 2016, a 13% reduction in its food waste (Morrison's). Since 2015, a 29% reduction in food waste (Co-Op).
Company commitments (IV)	Tesco	Between 2017-19, Tesco UK achieved a 63% increase in the amount of surplus food redistributed to charities, community groups, colleagues, and animal feed. This resulted in a 51% decrease in the amount of food safe for human consumption going to waste (energy recovery) and a 17% reduction in total food waste in tonnage. Between 2016 and 20-19 Tesco Central Europe reduced its total food waste by 47% through reducing surplus and increasing the amount of surplus food redistributed to charity partners.
Company commitments (V)	Nestlé	Between 2017 and 2018, Nestlé reduced milk losses during transportation from the farms to factory by nearly 40 percent.
Company commitments (VI)	Sodexo	In June 2019, Sodexo, which serves more than 100 million meals a day, announced new food waste reduction activities with a data-driven waste management program called "WasteWatch powered by LeanPath", to be deployed across 3,000 sites worldwide.
Company commitments (VII)	Kroger	Kroger, the second largest food retailer in the United States, estimated that in 2017, 27% of retail store food waste was diverted from landfill, and in 2018, 40%, supported by better store engagement and execution.

Source: Authors; based on WRI 2019

4 Gaps and recommendations for improvement in the existing policies and regulatory system for sustainable waste management

The policies dealing with food production and waste management in Sri Lanka are not directly addressing the question of food waste reduction or reuse, despite food waste is one of the major categories of solid waste generated and potentially posing threat of polluting water, air, and the land environment by dumping waste, sending direct kitchen lines of hotels, restaurants, and domestics to the open environment. Food waste per se is not specifically mentioned in any of the available legislation and policies. The existing policies and legislations are mainly centering on avoiding/minimizing the waste going to landfill sites except few policies and regulations put in place for food safety and hygiene aspects that have a role in reducing food waste generation.

There are several gaps identified in the existing regulatory system in the review process. Table 4 describes how major legislations dealing with food and waste management cut across the different stages of waste management. Although Sri Lanka has established several effective measures to ensure the provision of safer food, there is still much work remaining to fully address certain food safety issues that has a linkage in triggering food waste generation. Capacity building and technical assistance are urgently required to prevent contamination of food with pesticide residues, mycotoxins, and antibiotic residues in the supply chain. Rice, the staple food for Sri Lankans, needs management under Hazard Analysis Critical Control Point Principles (HACCP) to eliminate mycotoxins/aflatoxins and pesticide residues in processed rice.

Food Act No 26 of 1980 is the main legal provision related to the food sector in Sri Lanka, but it is mostly limited to food processing and handling without due attention to agricultural produce and to food waste reduction and management. More government and public intervention are required to regulate the activities of poor food processing, manufacturing, handling, and sanitation practices, particularly in the area of fruit ripening and handling. Effective food regulations and proper sanitary inspections and quality assurance need to be adopted for small-scale food establishments such as food outlets and small restaurants to minimize food-borne infections that would lead to food waste generation. To ameliorate the acute shortage of properly trained personnel such as food inspectors, analytical chemists, and microbiologists, it is important to have policy directives to implement further training initiatives in collaboration with international organizations such as FAO. There is also a need for more provincial food laboratories to meet the demand for food testing services at provincial levels. Resources must be moved towards the most important sources of risk with consolidated authority that can address the food system from the farm gate to the food plate.

Though the Scheduled Waste Management License (SWML) is stipulated in the Extra Ordinary Gazette No. 924/13 of 1996, No. 1159/22 of 2000, and No. 1533/16 of 2008, there is no penal clause for non-compliance. Therefore, legal action is not enforceable against the violation of regulations.

None of the legal statements available address the hygiene requirement, food safety parameters, and minimum quality standards required for redistribution of left-over food to needy or poor people by individuals, groups of people, or charity organizations.

Table 4: Crosscutting and gaps in major Legislations related to food waste management

	Pradeshiya Sabha Act No. 15 of 1987	Food Act No. 26 of 1980	National Environmental Act No. 47 of 1980	National Thoroughfares Act No. 40 of 2008	Urban Council Ordinance No. 61 of 1939	Nuisance Ordinance No. 62 of 1939 and No 57 of 1946	Municipal Council Ordinance No. 16 of 1947	Provincial Councils Act No. 42 of 1987	Prevention of Mosquitoes Breeding Act No.11 of 2007
Waste collection	✓	✗	✓	✗	✓	✗	✓	✓	✗
Waste segregation	✗	✗	✓	✗	✗	✗	✗	✗	✗
Waste recycling	✓	✗	✗	✗	✓	✗	✓	✓	✗
Waste disposal	✓	✗	✓	✗	✓	✗	✓	✓	✓
Food processing, preservation/ hygiene	✗	✓	✗	✗	✗	✗	✗	✗	✗
Reuse of food waste/redistribution	✗	✗	✗	✗	✗	✗	✗	✗	✗
Indirect considerations of food waste	✓	✓	✓	✓	✓	✓	✓	✓	✓

Attempts to segregate waste at the household level in terms of biodegradable non-degradable and recyclable is made in a number of local authorities in the Western Province and many other areas,

nonetheless source segregation of food waste and resource recovery from food waste is not practiced or promoted, though it has an added value. Promoting food waste segregation also would give a quantitative impression of the food waste generated by the households themselves. Local authorities have not provided sufficient attention to develop by-laws to encourage the waste generators to reduce, reuse, or recycle food waste and source segregation.

Further reduction in food waste is attainable by creating an enabling environment/ formulating by laws on following areas (a) providing incentives to eating-houses engaged in food waste RRR activities; (b) enforcing reduction of food waste by both educating and regulating food portion size and plan the amount of food preparation according to demand, etc.; (c) introduce penalties for high food waste generators/apply polluter pay principle (d) Promote eateries and restaurants to introduce incentive mechanism motivating the customers for zero food waste and/or penalties for food waste as a result of serving large food portions.

Laws are essential to curb the food waste in supermarkets, retail outlets, and restaurants that would motivate them to organize the charities and sharing of food to the needy people. The regulatory enforcement that would change the mindset of the people to take food wastage with gravity is needed. Alternatively, by-laws could be introduced to encourage food waste reduction in restaurants and catering. One option is standardizing the size of the food portions or selling food items based on weight aiming to standardize the food portions.

Though some of the excess fruits produced during the peak seasons are used to produce traditional jams, cordial, and fruit juices, the attention to produce dried fruits is not very popular despite the international demand (Gunawardana and Wanninayake, 2018). The policy support, enabling environment, and technological support are missing to promote the dry fruit industry. Excess production of foods could be used for the production of value-added products.

Existing food waste reuse system by the livestock industry (Example, pig farmers) is through the informal networks. LAs in the respective areas could facilitate the networking between the hotels, restaurants, and institutions and the livestock industry that would integrate this waste producer into the overall waste management. There are no safety parameters and quality standards available in reusing food waste for livestock. By-laws are needed to ensure the hygiene and food safety in reusing food waste. Similarly, interested individuals, groups, and charity organizations have initiated redistribution of good quality excess food available in the hotels and restaurants. Local authorities have to formulate and adopt by-laws to legalize the food redistribution ensuring hygiene and safety through set standards.

Sri Lanka has developed HACCP systems for several food processing factories, though it is not compulsory to adopt. However, the application of the HACCP system to great numbers of small and medium to large scale food processing factories is mostly not practiced. The requirement for such a progressive system is increasingly important for certain food processing industries, such as rice, vegetables, and fruit as their demand and consumption have increased greatly (Munasinghe et al, 2015). Issues in domestic food safety can be addressed to a large extent by adopting effective HACCP systems. Mandating HACCP also reduces the cost of regulatory enforcement and ensure the periodic verification of quality standards.

The roles and responsibilities of stakeholders and actors in SWM are well articulated in the existing policy frameworks, but these roles are not well operationalized, and the policy guidelines are without well-specified coordination mechanisms (Marasinghe, 2018). Also, food safety aspects are nationally regulated and monitored by the Food Act, while local-level governance is decentralized and it is under the purview of LAs. However, there is a missing link between the two-layer administration system on the effective implementation of food control administration. The Food Act can potentially delegate powers to Provincial Councils (Provincial Councils Act No. 42 of 1987) to handle the regulatory activities locally with their existing vested powers in agriculture and health to enforce specific actions. Food Act also needs an amendment to change the composition of the Food Advisory Committee (FAC) to allow representation from the PCs due to newly vested additional responsibilities in food system administration.

Food Control Administration Unit (FCAU) of the Ministry of Health is the central food controlling body but that has the legitimate mandate only to control items that are of food products, not agricultural produces. The existing general guidelines are limited to stipulated conditions on food processing given the provisions made in section 32 of the Food Act (Hygiene and regulations, 1989). The central food control administration system has, therefore, failed to impose mandatory legislations to have a well-structured preventive measure of good practices such as Good Agricultural Practices (GAP), Good Management Practices (GMP), and HACCP aiming to eliminate food hazards and quality losses. Therefore, the regulation of artificial ripening practices, phytosanitary aspects and trade of fresh fruits, and vegetables internationally, etc. are being out of the mandate of FCAU. For example, haphazard use of chemicals for artificial ripening of fruits causing over-ripening of fruits leading to a large amount of wastage. Therefore, the practice of chemical use for fruit ripening should be controlled by strengthening the rules and regulations. Thus, the fragmented mandate of food controlling without sufficient coordination between diverse groups in the implementation of regulations, inspection services, and information/ education/ communication (IEC) in food controlling is a major concern in the local food controlling system.

Another gap in ensuring the food safety aspect at LA level is lack of capacity with LAs to handle the task, especially lack analyst and food laboratory facilities to address the food safety issues. According to section 17 of the Food Act, the authorized officer for enforcement is the government analyst, but the Minister-in-charge of Local Government has the power to appoint additional analysts for LAs. Currently, food quality control laboratories are available in Colombo and Kandy Municipal Councils, food quality control laboratory in Anuradhapura, provincial food quality control laboratory in Kurunegala, Medical Research Institute, Colombo and National Institute of Health Sciences, Kalutara with additional analysts. There is a lack of adequate capacity in testing and inspection facilities in most of the country to address food safety issues properly. Food analysts should be appointed at least at the district level and require to establish new food labs or upgrade the existing provincial and regional labs as authorized analysis centers to provide effective and efficient service on food safety aspects.

Though the national policies on solid waste management highly focused on promoting RRR business, the enabling environment should be created to motivate the private sector organizations to actively enter into the industry. The government could offer some financial tools to mobilize the private sector into the RRR business offering special credit schemes, tax holidays for RRR business, subsidies for instruments, and other financial facilities. There are numbers of hotels that have voluntarily adopted measures to conserve the environment including waste management while expanding the tourism simultaneously and able to win international environmental awards. However, this is not replicable widely unless the tourism sector has developed and enforced the necessary legislative and institutional framework that could systematically ensure the protection of the environment in tourism developments.

Another important reason directly contributing to high food waste at the retail and consumer level is connected to people's knowledge, attitudes, and behavior. Consumer knowledge and attitude on food waste reduction should be understood starting from the purchasing of raw food ingredients, food storage, cooking, consumption, to the disposal of food waste. Understanding knowledge and attitudes would help to formulate strategies, awareness programs, and directions for food waste management. Policy direction is required to prioritize the allocation of sufficient funds to conduct public awareness campaigns leading to behavioral change and the mindset of the people through vigorous social engagement. Some consumers are rejecting food items at the retail level due to minor optical defects in the appearance. Therefore, customers should be motivated to buy and consume optically imperfect foods, promoting related regulatory frameworks, and seeking other incentives (Kumara et al, 2018).

The awareness program should be planned from the school level with necessary additions to the educational curriculum. It is equally important to change the mindset and the level of awareness of the policymakers and officials engaged in waste management to understand the value of food waste and the concept of RRR. Kuruppuge and Karunarathe (2014) reported that the level of awareness on reduce, reuse and recycle (3R) concept among the policymakers and administrators at LA level is very low, where their attention is mostly on recycling, but not on reduction and reuse. It is also reported that instead of making effort to reduce the waste at household, commercial and institutional levels, some LAs are encouraging people to produce more organic waste to make the compost plant commercially viable (Kapuge and Karunarathe, 2014). More public awareness programs about food safety and sanitation are necessary where both commercial stakeholders and consumers should get involved.

5 Concluding remarks

There are many measures available to prevent/reduce, reuse, and recycle food waste that would minimize the economic, social, and environmental implications. However, the effectiveness of these measures largely depends on a compelling structure of national policies and laws that are being transformed into local bylaws and implemented by the mandated agency. These regulations need to focus on economic incentives as well as an enabling environment for behavior change. Other than economic concerns, there may be ethical, social, or ecological concerns and benefits resulting from food waste prevention measures may result in generating less food waste (FAO, 2014; WRAP, 2015). National policies, strategies, and plans play an essential role in providing economic incentives and creating an enabling environment for behavioral and attitudinal changes. Proper regulations, policies, and enforcement of regulations are vital to increase the participation level to minimize the food waste at the source itself.

Depositing the waste in the landfill is the cheapest method in Sri Lanka, and therefore, investing in the alternative food waste management technologies such as energy generation and composting it is not attractive to the private sector and the key payers handling the waste. Therefore, tipping fees/levies for landfill sites should be substantial to make the alternative technologies are cost-effective and attractable to the private sector and LAs.

Food waste prevention per se is not on the agenda of the major stakeholders attending the waste management. A package of prevention policies is necessary to prevent food waste. There is an urgent requirement to understand the implications of food waste and adjust attitudes and behaviors towards food. The involvement of private organizations and NGOs in waste management is seldom reported. Governments, industry, business, academia, food rescue organizations, and all of the community have a role to play.

The government should provide sufficient Budgetary allocation to invest in public education and awareness campaigns to reduce food waste. Local councils could encourage home composting by providing their residents with home compost bins or offering composting equipment on subsidized rates as practiced by some of the LAs.

There are large numbers of agencies and legislations dealing with food safety and waste management aspects operating under different mandates with contradicting, duplicating, and overlapping policies and activities. The existing regulatory mechanism is lacking an integrated and comprehensive approach to ensure food production, food safety, and quality across the food value chain.

6 Way Forward

Food waste is not included in the development agenda of the organizations handling food production, food processing, sustainable development, combatting climate change effects, and waste management. The battle against food waste reduction should gain a prominent place in the country's food strategy. Sri Lanka as a signatory country of Agenda 2030, is obliged to reduce the food waste by 50% in 2030. Therefore, providing priority attention to food waste reduction should reach higher on the agenda. Hence creating an enabling environment through necessary changes in the regulatory system understanding the gaps and weaknesses in the existing system and allocating sufficient money to invest in the food waste reduction and management projects is an immediate priority.

The public sector should take the lead in reducing food waste in Schools, Universities, Hospitals, and other government agencies with a target of zero food waste in the public buildings through necessary instructions and guidance that could be shared with the private sector for waste minimization. It is also a timely requirement to connect businesses that are seeking to reduce food waste with necessary funding support and innovations to develop good models that would be replicable and up scalable within the sector.

A vigorous campaign is needed with the support of the government, private sector and donor organizations to make Sri Lankan people change their attitudes in choosing food and behaviors around food and food waste able to advocate the people for food waste reduction.

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8 Annex

Annex Table 1: Legislative and Policy Framework Relating to food production

Policy/Act/Regulation	Reference Area
National Seed Policy (1996) The Seed Act (2003) National Agriculture Policy (2007)	Ensure high quality of the imported and locally produced seed; Regulate seed testing and certification and planting material production of food crops; Guide production support and service delivery under different Ministries and line Departments.
Paddy Marketing Board (PMB) Act (1971) and amended Act (1978)	Provide regulatory provisions for the establishment of a board to purchase, sell, supply, distribute and process paddy and rice
Agrarian Development Act No. 46 of 2000	Development of minor irrigation, rainfed cultivation, and agricultural support services
National Livestock Development Policy (2006) Animal Breeding Policy Guidelines (2010) The Animal Feed (Amended) Act (2016)	Guide production support and service delivery, breeding guides for cattle, buffaloes, goats, sheep, and pigs; Quality of the semen imported for artificial insemination; Vaccination and drugs required to provide quality veterinary service; Provide high-quality feed material to the livestock and poultry industry
The Pesticides Control Act (1980)	To regulate the import, distribution, and use of pesticides
The Export Agriculture Promotion Act (1992) National Policy on Export Agricultural Crops (2018)	Authorizes DEA to provide service delivery function on export agricultural crops; Updated policy environment
Fisheries and Aquatic Resources Act (1996) National Fisheries and Aquaculture Policy (2018)	Legal authority relating to the sector and provides a regulatory framework on the use of fisheries genetic resources
The National Plantation Industry Policy Framework (2006)	Tea, rubber, coconut and sugarcane sector on the provision of planting materials and extension services
Crop Insurance Act (1961) Agricultural Insurance Law (1973)	Regulates the undertaking of agricultural insurance for specified crop and livestock; Make provision for compulsory insurance and establishment of crop insurance advisory board
Agricultural and Industrial Credit Corporation (Amendment) Act No. 5 of 1970	Regulates the functions of agricultural and industrial credit
Agricultural Products (Guaranteed Prices and Control of Hulling and Milling) Act, No. 33 of 1961	Grading of, and the fixing of guaranteed prices for certain agricultural products
Regulation of Fertilizer Act, No. 68 of 1988	Importation and distribution of fertilizer; licensing of private fertilizer imports

Source: Adopted from Overarching Agricultural Policy (Draft), Ministry of Agriculture (2019)

Annex Table 2: By-laws on food security and related aspects of Colombo Municipal Council

	Municipal council ordinance (No. 29 of 1947)	CMC by laws
Food safety	<p>272(19)- The regulation, supervision, inspection and control of the sale, or the storage or manufacture for the purpose of sale, of articles of food or drink including the sale, or the storage or manufacture for the purpose of sale, of such articles at hotels, shops and places other than markets.</p> <p>272(20)-</p> <ul style="list-style-type: none"> • Itinerant vendors, including – the supervision or control of itinerant vendors • The issue of licenses for the purpose of such supervision or control, and the conditions to be attached to such licenses. • The regulation or prohibition of the sale of any specified article or the sale of articles in any specified Place or area. • Facilitating inquiry in connection with the spread of infectious or contagious diseases through dairies. 	<p>By laws relating to eating houses (Eating houses) By laws,1962</p> <ul style="list-style-type: none"> • The premises must be equipped with the kitchen which has <ol style="list-style-type: none"> 1. A minimum superficial floor area of 120 square feet and are least one window capable of being opened on to an external open space. 2. Expect where cooking is done by gas or electricity, an efficient smoke vent. 3. The eaves of the building must be not less than 6 feet from ground. 4. The premises must be provided with adequate surface drainage, and a sanitary dustbin. 5. No licensee in charge of mobile eating houses shall permit any person who is suffering from or who has recently suffered from any contagious, cutaneous, infectious or loathsome disease, to enter the eating house or to take part in preparation or sale of any food or drink therein, until the periods of infection and incubation have elapsed. 6. Every licensee shall keep the licensed premises free from rats or other vermin, and shall cause all rat holes to be filled with broken glass and plastered with cement. <p>Seizure of articles unfit for food</p> <ol style="list-style-type: none"> 1. Prohibition of the mixing of injurious ingredients and of selling the same 2. No person shall expose for sale any cooked food, pastry, sweetmeats, confectionery, or preserved or dried fruit intended for human consumption, unless he has taken all reasonable precautions to protect it from dust, flies and bad odors. <ul style="list-style-type: none"> • Except as otherwise provided in these by laws, no carcass of any animal not slaughtered at a municipal slaughter house shall be brought into a public or private market.

	<ul style="list-style-type: none"> • The inspection of dairies and dairy cattle and the medical examination of those engaged in Dairies or the distribution of milk for sale. • The cleanliness of premises in which milk is kept, and of milk shops, and of vessels used for containing milk for sale. • 272(2)- the structure and stability of walls, foundations, roofs and chimneys of new buildings, the prevention of fires and purpose of health 	<ul style="list-style-type: none"> • No owner, occupier, or lessee of or vendor shall sell or expose or permit to be exposed for sale or permit to remain in, any such market or shop any noxious or unwholesome meat, offal, or fish etc. <p>Under the Ordinance 8 of 1901</p> <ul style="list-style-type: none"> • It shall be lawful for a municipal inspector or superintendent of a slaughter house, upon the seizure by him as unwholesome or unfit for human food of any meat, poultry, fish, game, flesh, vegetable or other article, he shall order the same to be destroyed or to be disposed. • No person shall mix, color, stain, or powder, or order or permit any other person to mix, color, stain any article of food with any ingredient so as to render the article injurious to health. • No person shall expose for sale any cooked food, pastry, sweetmeat, confectionery, or preserved or dried fruit intended for human consumption, unless he has taken all reasonable precautions to protect it from dust, flies and bad odor. • It shall not be lawful for any person to sell, hawk about or expose for sale any cow's milk or buffalo's milk which has Been adultererd. • No person shall in any market or shop shall sell, or expose or permit to be exposed for sale, or admit into , or permit to remain in any such market or shop any noxious or unwholesome meat , offal , or fish or decomposed vegetable matter.
Nutrition	<ul style="list-style-type: none"> • 272(23) The standardization of milk and prevention of the sale of milk below prescribed standard. • The determination of the deficiency in any of the normal constituents of genuine milk, cream, butter or cheese 	<ul style="list-style-type: none"> • No licensee shall keep or sell any cow's milk which contains less than 12 per centum of milk solids, or less than 3.5 per centum of milk fat, or any buffalo's milk which contains less than 16 percent of milk solids or less than 7 per centum of milk fat. • No person shall sell or offer for sale any milk from which the cream has been removed, unless he previously informs the person to whom he sells or offers it that the cream has been removed. • Prohibition of the mixing of injurious ingredients and of selling the same.
Food waste and losses	<ul style="list-style-type: none"> • The Seizure, forfeiture and removal and destruction of unwholesome flesh, 	<p>By laws relating to eating houses</p> <ul style="list-style-type: none"> • Every licensee shall cause all refuse and dirt to be places in an impervious covered receptacle until removed by the scavenging laborers of the council.

	<p>fish, or other provisions</p> <ul style="list-style-type: none"> • The seizure and removal of articles exposed for sale on contravention of any by law. • 272(5)- sanitation including-the inspection, regulation, maintenance and cleansing of all drains, privies, earth closets, cesspools, ash pits and sanitary appliances. 	<ul style="list-style-type: none"> • No licensee shall permit any waste tea, coffee or milk or remnants of food to be thrown on the ground. • Night soil, dung, or other filth, dust, dirt, ashes, rubbish, or refuse to be deposited only in places provided. • To cause filth, garbage to be promptly removed to receptacle and market to be swept and cleaned and washed. • Every person holding a license for a stall in a public market shall keep on or near such stall a receptacle to be approved by the chairman, in which such person shall deposit all rubbish and refuse matter.
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