VCM International
Measurement || Analysis || Training || Implementation
Value Chain Management Centre
A Division of VCM International

Food Waste:

Aligning Government and Industry

Within Value Chain Solutions

Contributing Authors: Dr. Martin V. Gooch
Dr. Benjamin Dent
Dr. Abdel Samie Felfel
Hon. Lyle Vanclief
Dr. Peter Whitehead

Editor: S. Caroline Glasbey

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No ministry or level of government has ultimate responsibility or is accountable for food loss and waste. This leaves industry in the unenviable position of having to grapple with an environment shaped by misaligned policies, legislation/regulations and systems.

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About VCMI

Value Chain Management International (VCMI) is dedicated to improving the profitability and competitiveness of commercial businesses through promoting and enabling the management of the value chains in which they operate. VCMI achieves this by assisting businesses to develop closer strategic relationships with their customers and suppliers. VCMI's global consulting team is located in North America, Europe and Australasia.

In addition to working with businesses, VCMI also consults with governments to improve the effectiveness of policies and programs to motivate and enable increased industry competitiveness.

VCMI has co-authored several publications on food waste[1] and founded the **"Cut Waste, GROW PROFIT™"**[2] initiative in 2012. VCMI is a leading public and industry voice in bringing awareness to the opportunities and solutions surrounding food waste reduction, traceability and the environment. VCMI applies specialized value chain diagnostic tools to detect where waste occurs, how to eliminate it, and then participates in the elimination implementation to ensure successful outcomes.

[1] See Appendix A

[2] **Cut Waste GROW PROFIT™** is a VCMI program, which enables farmers and food businesses to profit by eliminating as much waste as possible from within their operations from a whole of chain perspective.

Executive Summary

The demand for food is rising in many countries. To feed nine billion people by 2050 the world needs to produce at least 50 percent more food. However, climate change could cut crop yields by more than 25 percent. While Canada and the US produce a large percentage of their domestic food requirements, they also rely heavily on imports from nations prone to drought. Unless we change how we produce and handle food, and manage our natural capital, food security will be at risk for our present population, regardless of location. Reducing the food industry's environmental impact and feeding a burgeoning population cannot be achieved without significantly reducing the food loss and waste (FLW)[1] that occurs along the value chain in developed and developing countries.

That the topic of FLW is becoming politicized globally is concerning. Though the root causes of FLW are generalizable, where, what and why waste occurs within individual chains differs. Consequently, attempting "one size fits all" legislative approaches that prescribe how businesses must operate can create more challenges and create more FLW than they address. No ministry or level of government has ultimate responsibility or is accountable for FLW. This results in a lack of leadership and marginalization of FLW in the allocation of government time, funds and political capital.

Industry is left in the unenviable position of grappling with an environment shaped by misaligned policies, legislation/regulations and systems that do not reflect the realities of a complex 21st century global food industry. Governments primarily focus on reducing FLW in retail, foodservice and among consumers. This reflects the extent to which current efforts focus on addressing readily observable symptoms, not the root causes of FLW.

The lack of concerted, coordinated government policies and regulations, and misalignments between government and industry fails to produce the motivation required for industry to act in a coordinated manner, or for businesses to adopt new operating models. This situation defaults to businesses perpetuating unsustainable practices. They follow this approach rather than unilaterally adopting a strategy that is more environmentally and financially sustainable, because such strategy may place them at a short-term competitive disadvantage.

This report highlights the issue of FLW in Canada and, drawing on global comparisons, applies a systems thinking approach to put forward proposals to more effectively tackle food and associated wastes. It proposes how interactions within government and between government and industry be improved to enable the creation of an objective pragmatic roadmap for reducing FLW in Canada. Objective roadmaps are critical to engendering purposeful change, particularly given the deeply rooted structural, cultural and institutional barriers that typify the food industry and factor into the unnecessary FLW that occurs along value chains. The effectiveness of the proposed approaches relies upon industry committing to adopt a pre-competitive leadership role and government committing to sponsor efforts that will result in continually improving FLW reduction efforts along the value chain.

1 Introduction

The environmental, economic and social consequences of food loss and waste[2] (FLW) have implications beyond waste management.[3] The ineffective use of land, energy, water and labour are just some of the outcomes of FLW that threaten the sustainability of a vital industry.[4,5] Over one-third of all food produced globally for human consumption goes to waste. At the same time, close to one billion people are under-nourished; while, in parts of the developed world, obesity is an increasing problem.

The demand for food is rising in many countries. To feed nine billion people by 2050 the world needs to produce at least 50 percent more food. However, climate change could cut crop yields by more than 25 percent. With land, biodiversity, oceans, forests and other forms of natural capital being depleted at unprecedented rates, unless we change how we grow and handle our food, and manage our natural capital, food security will be at risk for our present population, regardless of where they live.

For example, in the UK, population and demand for food is rising,[6] yet access to and the cost of food will be impacted by the following:

- Meeting global food demand for 2050, using today's methods, could increase global temperatures by 2°C, resulting in changing weather patterns.
- Eight of the top 10 countries the UK imports food from are drought prone.
- For every three tonnes eaten in the UK, another tonne goes to waste. The UK currently wastes around £17 billion (equivalent of approximately C$29 billion – as per exchange rate at report date) of food per year.

While Canada and the US produce a large percentage of their domestic food requirements, they also rely heavily on imports from nations prone to drought.

1.1 Addressing Government and Industry Misalignments

The primary causes of FLW and the subsequent environmental consequences cited above can be grouped into two broad categories of market failures: dysfunctional markets and dysfunctional value chains that supply markets with food.

- **Market dysfunctionalities** include externalized costs (e.g., environmental consequences) and the long-term negative consequences that our food system has on public good (e.g., food security) not being reflected in market economics. This includes the price of food being below what it actually costs to produce in a sustainable manner.
- **Value chain dysfunctionalities** include a widespread lack of awareness about the root causes of FLW and its effect on individual businesses' and entire chains' efficiency. This is

combined with misaligned operations, behaviours and incentives that occur across food chains — further reducing the ability to tackle the issue effectively.

While where FLW occurs along the value chain can differ by country and food sector, why greater strides have not been made to mitigate the incidence and impact of food waste are similar across many jurisdictions. Interventions that can mitigate the incidence of food and associated wastes along the chain have been tested in several countries.

Attempting "one size fits all" legislative approaches can create more challenges and waste than they address.

So why is more not being done? We believe that the reasons why more earnest FLW efforts are not being enacted in Canada include how businesses interact with each other, and how government departments and tiers of government interact with each other and industry. The root causes of FLW are generalizable; however, the where, what and why waste occurs within individual chains differs. Consequently, attempting "one size fits all" legislative approaches can create more challenges and waste than they address.

With FLW becoming increasingly politicized in Canada and elsewhere, three fundamental questions drove this report:

1) Is FLW genuinely on governments' radar? Many policies[7] implemented around the world – such as France legislating against retail waste – could be viewed as governments seeking quick wins in response to public pressure to reduce food waste.
2) Do governments have the policy making and delivery mechanisms to tackle the issue systemically?
3) If governments' policy making and delivery mechanisms are not able to tackle the issue of FLW systemically, what new structures and processes might help?

This report aims to highlight the issue of FLW in Canada and put forward proposals to more effectively tackle food and associated wastes.

This report aims to highlight the issue of FLW in Canada and, drawing on global comparisons, put forward proposals to more effectively tackle food and associated wastes. It proposes how interactions within government and between government and industry be improved to enable the creation of an objective pragmatic roadmap for reducing FLW in Canada. Given the international focus of this report, the same considerations can be applied in other jurisdictions too. Objective roadmaps are critical to engendering purposeful change, particularly given the deeply rooted structural, cultural and institutional barriers that typify the food industry.

Who is ultimately responsible for FLW?

The problem in attempting to tackle food waste is exposed by the simple question: Who in government is ultimately responsible for FLW? The answer is no one, with multiple departments and tiers involved.

Typically:

- Treasury departments have overall responsibilities for national competitiveness/GDP and for regulatory enforcement costs.
- Ministries of agriculture and fisheries promote the interest of farmers and fishers, but lack the capacity, networks or mandate to deal directly with other parts of the food sector.
- Departments within ministries of trade or industry sponsor the food processing industry.
- Ministries of health are responsible for food safety, quality and labelling.
- Ministries of environment have responsibility for climate change and waste disposal policy.
- Local authorities are responsible for waste disposal operations from commercial sources and households, along with the location and organization of waste management infrastructure.

Divisions of responsibilities can be even more complicated in federated structures, as exist within Canada, US, UK, EU and Australia.

This lack of a single point of accountability results in a lack of leadership and marginalization of FLW in the allocation of government time, funds, political capital and legislative capacity.

The causes of policy misalignments include, for example, ministries of agriculture and farm advocacy groups not wanting to reduce waste. Concerns voiced to us include that reduced FLW will decrease the volume of farm gate sales, thereby negatively impacting farmers' profitability. However, farmers' profitability is primarily impacted by revenue and cost of production; and farmers' revenue is heavily influenced by the percentage of goods produced that reach consumers. The fact that farmers incur the costs associated with producing their entire crop, a large proportion of which may not reach consumers, could mean that producing less though more consistent quality products could increase farmers' profits.[8] More strategic use of land and resources would benefit everyone, not only farmers. It could reduce deforestation and increase the use of marginal land, which could in turn help feed the growing global population.

That the majority of industry and institutions (incl. government, researchers and industry associations) remain focused on reducing food waste at the retail, foodservice and consumer levels of the food chain is telling. The majority of measurable FLW **by value** occurs in households and foodservice, though much of this food waste is a manifestation of how industry operates. A continuing focus on selling high volumes at discounted prices can lead to increased waste from people purchasing more food than required. A multitude of smartphone apps are further ingraining this behaviour into our society, through identifying and promoting deals in retail and foodservice.

Greater onus needs to be placed on efforts designed to address the lack of alignment that exists between businesses and markets.

Instead of addressing symptoms and pointing at quick wins, greater onus needs to be placed on efforts designed to address the lack of alignment that exists between businesses and markets, which creates unnecessarily high waste. The slim margins that result from this misalignment perpetuates a culture of pushing volume into and along the value chain. The lack of concerted, coordinated government policies and regulations,[9] and misalignments between government and industry, fails to produce the motivation required for industry to act in a coordinated manner, or for businesses to adopt new operating models.

This situation defaults to businesses perpetuating unsustainable practices – even when they know such practices may result in a situation that is extremely difficult, if not impossible, to defend. They follow this approach, rather than unilaterally adopting a strategy that is more environmentally and financially sustainable, because it may place them at a short-term competitive disadvantage. However, adopting the latter strategy would provide tangible profits. For example, VCMI has estimated that a one percent reduction in FLW could produce benefits for businesses equivalent to a four percent increase in sales.

The only way to fully address the environmental, economic and social impacts of FLW is to prevent it from occurring at the earliest possible point in the value chain. This sounds a simple proposition, though it may require entire food chains to be redesigned. Yet such change is required. How governments typically operate was developed decades ago — their structure and systems not keeping pace with the development of a highly complex global food industry. The lack of 21st century governance systems has led to FLW mitigation efforts predominantly focusing on addressing issues occurring at the end of the chain. Why? Because within fragmented government systems, it is easier to deal with symptoms rather than root causes.

2 Diversion Versus Prevention

Previous VCMI reports, including the report co-authored with Ivey and Network for Business Sustainability for Provision Coalition, described why FLW reduction efforts must be addressed from a whole of chain perspective. To date, the majority of efforts around the world have been waste diversion,[10] not waste prevention. Global evidence shows that failure to more effectively tackle root causes are due to systemic problems that exist in government and industry, which collectively make FLW a highly complex issue to address. What results is a preference to introduce generic partial solutions, sometimes in isolation and potentially in opposition to each other, rather than seek more effective long-term solutions.

Four primary issues lie behind the reasons why diversion versus prevention initiatives have been the focus of businesses' and governments' food waste efforts:

1) They are relatively easy to accomplish, because they do not require fundamental change.
2) Such initiatives typically require a comparatively small financial commitment to "look good," or even in some cases produce a positive financial return (e.g., by diverting food from landfill to animal feed, so it no longer incurs a disposal fee).
3) They are high profile and popular with the public, because they create a sense that action is being taken. Creating a sense that an issue which negatively impacts the environment and addresses food insecurity is being tackled is particularly important for governments.
4) Such initiatives place the onus of success on a third party, and therefore pose little risk from political and corporate social responsibility perspectives.

The key weaknesses of diversion versus prevention initiatives are that they do not address the volumes of waste being generated and can lead to the creation of unintended consequences. Laying the onus of blame and solution at the feet of one sector of industry is unproductive and can create inefficiencies that raise food prices. Legislation can also be difficult and costly to enforce.

For food waste reduction efforts to be effective, they must address root causes.

For food waste reduction efforts to be effective, they must address root causes. Lack of coordination within or between businesses leads to imbalances in the amount and quality of food produced on farms or harvested from the sea compared to market demands. Incorrect handling of food as it moves along the chain from its source to consumers creates enormous FLW. The only way to address such issues is through whole of chain coordination and a more concerted policy context, ideally consistently applied across the different jurisdictions in which global value chains operate. Embracing whole of chain approaches relies on effective communication and planning. However, the deeply rooted structural, cultural and institutional barriers that typify the food industry lead to lack of effective communication and coordination along the value chain.[11]

Waste that occurs from lack of coordination can halve (or more) businesses' profitability compared to what is achievable.

As identified by VCMI and other researchers, the waste that occurs from lack of coordination can halve (or more) businesses' profitability compared to what is achievable. The costs incurred from FLW can increase the prices consumers pay by 10 percent or more.[12]

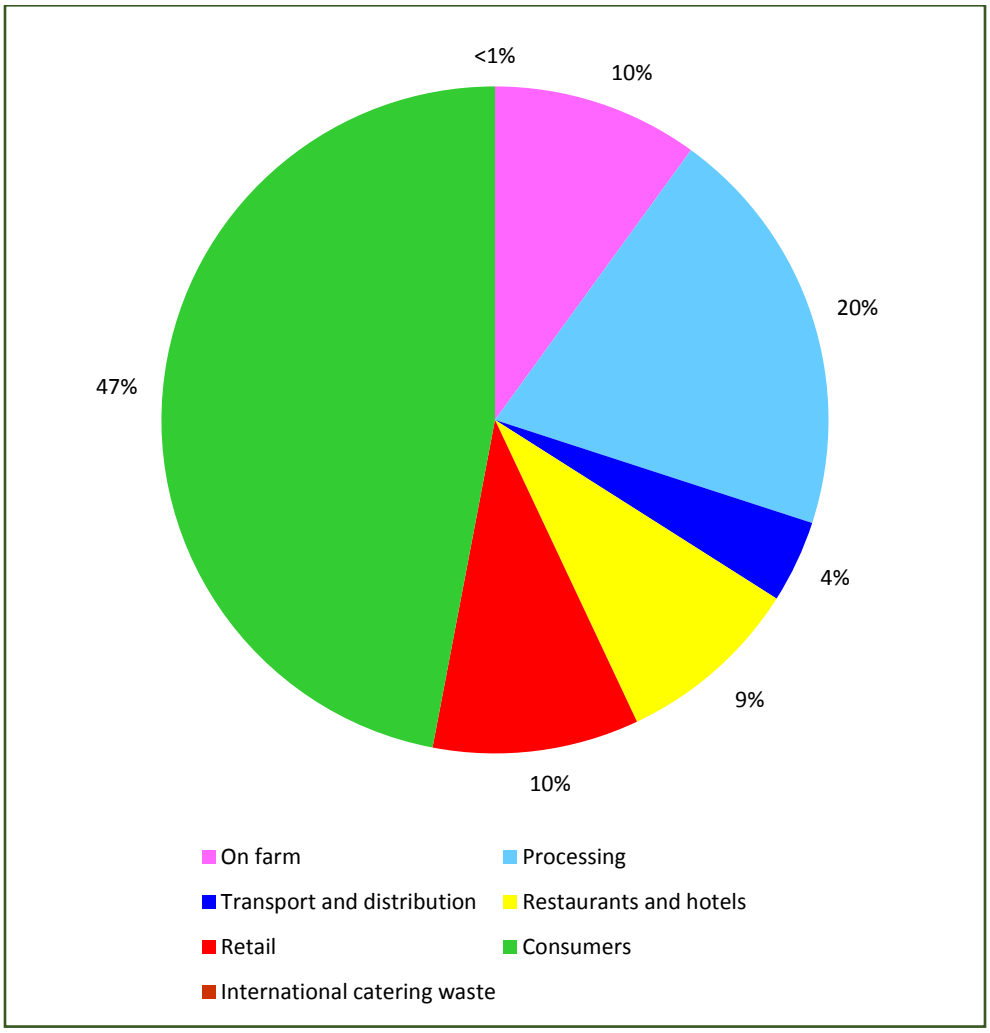
Government generated dysfunctionalities that exacerbate FLW along the chain are compounded by the differences that occur between ministries responsible for the environment, industry, trade, food safety, etc. This is especially the case when differences occur between federal and provincial, and provincial and municipal governments. Inter-municipal rivalries and the failure to adopt common standards also drive FLW and its economic/environmental impacts to unnecessarily high levels.

3 Volume Versus Value

The following section uses Canadian data and international insights to show why government policies and legislation need to reflect value chain approaches.

In 2014 VCMI estimated the value of Canadian FLW to be C$31 billion. FLW data is poor to non-existent for Canadian institutions (incl. universities, schools, prisons and hospitals); hence, the true value of FLW occurring in Canada likely exceeds our estimate. Our 2014 estimate of where food loss and waste occurs by **value** along the value chain is presented below in Figure 3-1.

Figure 3-1: Where Food Waste Occurs through Canada's Food Value Chain (% Distribution)



Source: "Food Waste in Canada - $27 Billion Revisited" - VCMI

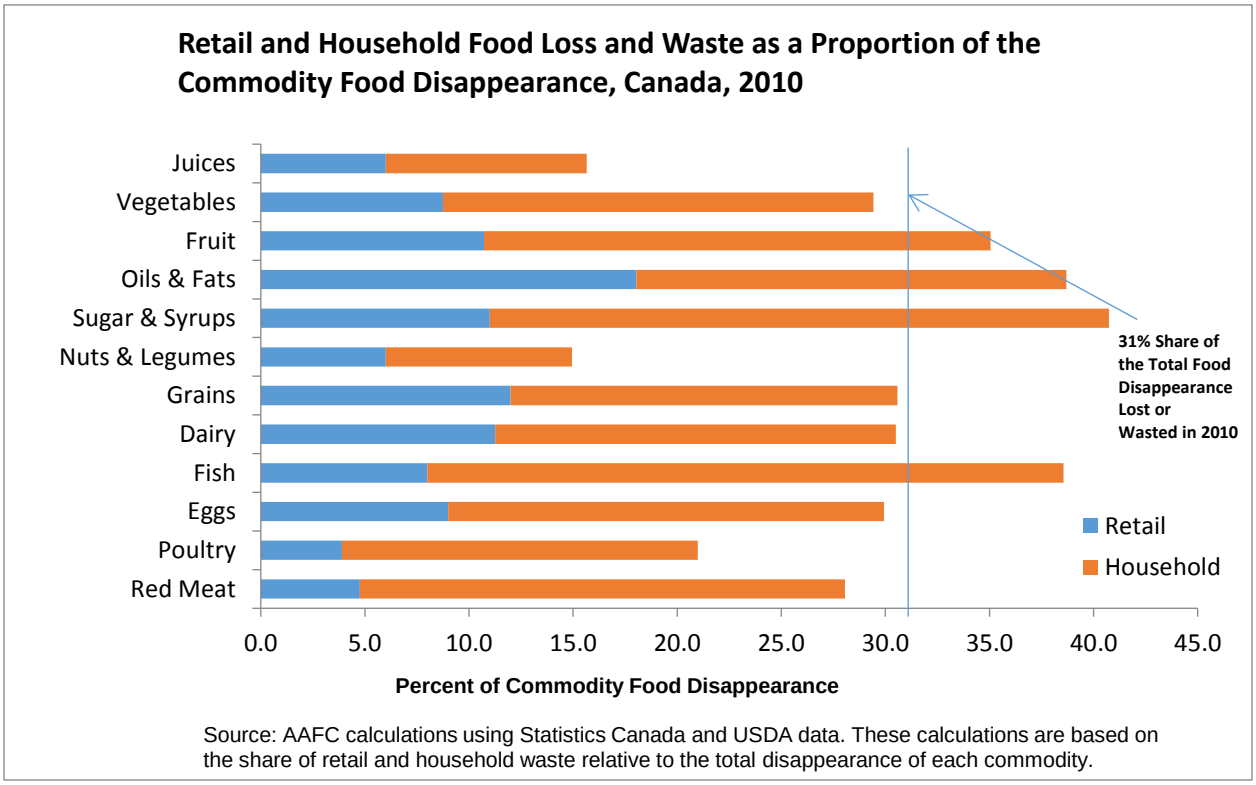
In Canada, similar to other countries, approximately half the estimated value of FLW occurs in the home.

In Canada, similar to other countries, approximately half the estimated **value** of FLW occurs in the home. It should be noted that viewing FLW from a **volume** perspective would paint a different, more meaningful, picture from a policy perspective. However, with the exception of isolated studies, the rigorous data required to produce this analysis does not exist in any of the countries researched. Given that the value of a product increases exponentially as it moves along the food chain, as does FLW's economic and environment costs, using volume versus value would present a truer picture of where FLW occurs. The challenge is that even the EU, a leading source of FLW data, only recently began to monitor FLW in primary production.

What we are able to estimate at present in Canada is that, while processing and distribution represents 20 percent of food waste by value, it is also where more than 20 percent of estimated food waste by volume occurs. This is because each unit of the food waste that occurs during processing has a lesser value than that which occurs at the consumer level.

By comparing Canadian and US data, the estimated percentage of the six billion kilos of food and beverages lost or wasted at retail and in the home by commodity, is shown below in Figure 3-2.

Figure 3-2: Percentage Distribution of 6 Billion Kgs of Retail and Household Waste by Commodity



Source: AAFC calculations using Statistics Canada and USDA data. These calculations are based on the share of retail and household waste relative to the total disappearance of each commodity.

To visualize the magnitude of the six billon kilos — it would fill 60,000 rail cars, stretching 1000 kilometres.

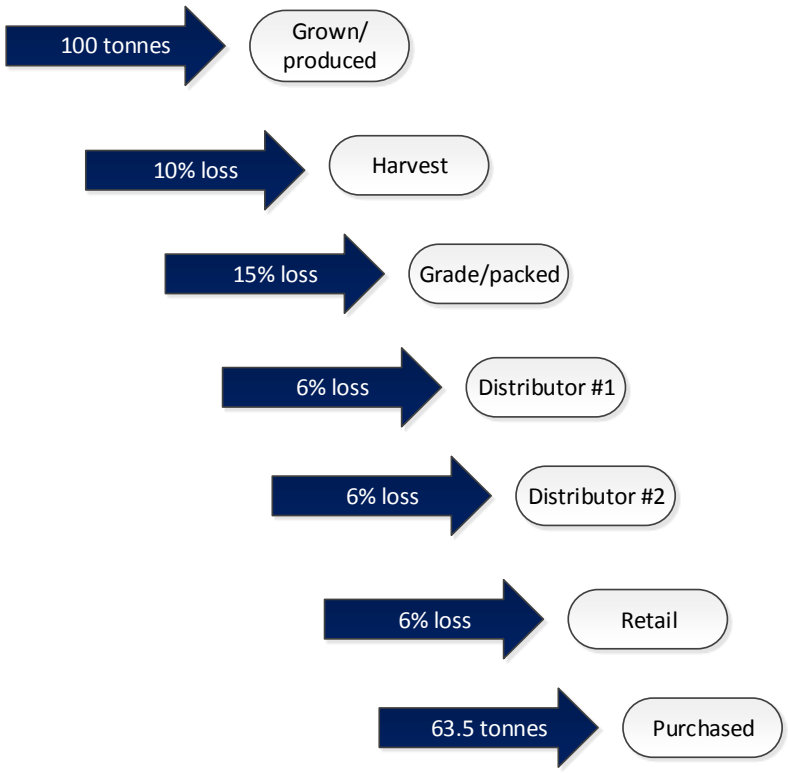
As indicated in Figure 3-2 above, 31 percent of the total food available for consumption in retail (10%) and household (21%) is estimated to have been wasted in Canada during 2010. To visualize the magnitude of the six billon kilos — it would fill 60,000 rail cars, stretching 1000 kilometres. As a proportion of the food disappearance in Canada by commodity, the greatest waste is estimated to have occurred in added sugars and syrups (41%) and fish (40%).

Value versus volume considerations do not take away from the importance of addressing consumer level waste, which is influenced by culture. For example, Middle Eastern household behaviours that drive waste include a tendency in Arabian culture for hosts to show how much they value their guests by offering much more food than required. At events, parties and ceremonies people provide much more food than is consumed in a region that imports approximately 90 percent of its food. Deeply ingrained cultural drivers of waste cannot be addressed through knee jerk policy and legislation.

In the UK, by weight, household food waste makes up 70 percent of the post-farm-gate total, manufacturing comprises 17 percent, hospitality and food service 9 percent, and retail 2 percent.[13] Reasons for the difference between UK and Canadian figures include the fact that the UK does not consider food that goes for animal feed to be waste. The UK's Waste Resources Action Programme (WRAP) has previously published an estimate for food waste at primary production (on-farm) of around three million tonnes; but stressed that this was indicative based on a 2004 Environment Agency synthesis of evidence available at that time. A recent FUSIONS[14] (Food Use for Social Innovation by Optimising Waste Prevention Strategies) report on food waste across the EU-28 suggests this figure could be a significant over-estimate.

While individual incidents of FLW along the value chain may not necessarily appear significant, the cumulative loss can be enormous. Using estimates from VCMI and others research on fruit chains, the chain map presented below in Figure 3-3 shows that 63.5 percent (calculated cumulatively) of a commodity produced on farms may reach consumers. The 36.5 percent FLW that this represents does not include the additional waste that occurs in the home.

Figure 3-3: Individual and Cumulative FLW Occurring in a Fruit Value Chain



The comparative volume of waste occurring in individual commodities may be considerably higher than 36.5 percent. For instance, it has been estimated that up to 40 percent of seafood can be lost at the point of capture, and seafood can be handled by 20 individuals and businesses before it reaches a consumer. Fish also has one of the highest incidences of at-home waste. The chain shown in Figure 3-3 had seven steps; this is relatively short compared to other food chains, such as seafood.

4 Business Dysfunctions

4.1 Opposing Trends

While researching for this report, we were regularly told of two opposing trends impacting industry and the occurrence of FLW in Canada, and elsewhere. The **first trend** is that achieving the transparency required for managers to make informed decisions at multiple points along the value chain is deemed "the Holy Grail." This is because a seemingly rational decision made by an individual at one point in the food chain (perhaps due to their annual bonus structure being based on the financial performance of the department for which they are responsible) is irrational when viewed from a whole of chain perspective. VCMI's work has identified many examples of this. Called "bounded rationality," its impact on creating inefficiencies and increased FLW that would otherwise occur can be tremendous.[15] Encouraging and enabling managers to make informed decisions requires the sharing of information (e.g., on waste data) and the development of sustainable solutions. This ability hinges on establishing mutual trust and commitment within and between businesses.

Simultaneously, we were told that a **second more concerning trend** is how stagnant market growth (in an age where investors' expect profitable returns) has produced a new normal of hyper competitiveness between retailers, foodservice operators and their suppliers. A tendency to compete versus collaborate, despite years in which efficient consumer response (ECR)[16] practices have been promoted and encouraged, leads businesses to opportunistically grab at occasions to increase margins — usually at someone else's expense. This behaviour destroys mutual trust and commitment. This practice discourages the sharing of information and development of sustainable solutions. Businesses' lack of willingness to share data on FLW occurring in their respective operations fails to produce the information and culture required to implement mutually beneficial solutions, resulting in continued inefficiencies and waste.

Businesses' lack of willingness to share data fails to produce the information and culture required to implement mutually beneficial solutions.

The first trend, transparency, produces the ability to reduce FLW along the food chain. The second trend, opportunistic behaviour, invariably increases the level of FLW that occurs along the food chain, because it increases distrust and unwillingness to share information. Current policies and regulations are unable to address the latter trend, partly because it is very difficult for governments to quantify and respond to such issues unless they too adopt value chain approaches in the development and implementation of policies and legislation.[17] Legislation focused only on the retail level, such as occurred in France, will not address the upstream issues that drive FLW. In fact, they could exacerbate the creation of FLW and related inefficiencies, by motivating retailers to pass more issues back up stream, where they are more difficult to quantify.

The value chain inefficiencies that stem from ineffective communication and collaboration within and between businesses was first quantified in the 1950s. Known as "demand amplification" or "the bullwhip effect,"[18] ineffective communication can halve (or more) businesses' profitability. The businesses who gain the greatest from opportunistic situations are always the most powerful — those with the highest clout and resources at their disposal. However, even the most powerful businesses lose financially from demand amplification, due to the inefficient and ineffective practices that it creates along the chain; not least because these inefficiencies are factored into suppliers' future prices and business arrangements.

4.2 The Need for Whole of Chain Solutions

No matter how carefully they are developed, if not implemented well, policies and regulations cause businesses to react defensively.

How policies and regulations are implemented has an enormous impact on whether they create unintended consequences that negatively influence industry competitiveness and the existence of an efficient food system. No matter how carefully they are developed, if not implemented well, policies and regulations cause businesses to react defensively. They can also discourage businesses from innovating. This has the potential to increase the adversarial culture and misaligned behaviours that are a root cause of FLW. How will retailers and their suppliers react to onerous policies that attempt to force farmers, manufacturers and retailers to adopt practices that result in them selling less or incurring higher costs? Increased costs are ultimately passed onto consumers.

A more constructive approach is motivating businesses to voluntarily adopt collaborative operating models. For example, because revenue is no longer used to subsidize inefficient practices, the financial benefits of reducing waste go beyond the value of the actual products themselves. Countering present industry activities from a value chain perspective is also required, because household waste is partly a manifestation of how industry operates. For example, a proven driver of household waste is using deals to pull products through the chain by incentivizing consumers to buy beyond their needs. While the retail fliers shown below are Canadian, price discounting is a global tactic used to drive sales.

Retail fliers: **Motivating consumers to buy beyond their needs through price discounting is a driver of waste.**

Photograph by Kaarina Venalainen

In Canada, individual retailers have tried to reduce their use of fliers, by not using them at all or by removing prices and just featuring products. Both efforts have failed, because the practice is so ingrained in businesses' and consumers' psyche that it hurts sales per se. From the retailers' perspective, driving consumers to your store by offering products at prices that return very low margins is a rational business decision, despite the fact that it potentially increases household waste.

Discounts are also instigated by suppliers, who then partner with retailers to implement them. In the UK, retailers have replaced "buy one get one free" with "buy one get one free later."[19] The limitations of individual efforts highlight the need for carefully crafted pre-competitive initiatives. It also emphasizes why FLW is a whole of chain issue, which can only be addressed by adopting whole of chain policies, regulations and behaviours.

Other commercial activities that drive FLW along the chain and in the home include the following:

- Portion size and control; that is, selling packs unrelated to trends in household size, which in many countries has been reducing;
- Adherence to on-shelf availability targets that bear no relation to shopping patterns; for example, maintaining high levels of availability at bread counters late in the day;
- Setting very conservative use-by and best-before dates, and assigning a use-by date when a best-before date would suffice – thereby driving consumers to throw away food that is safe to eat;

- Promotions and new product launches that encourage consumers to buy more than they need;
- Promotions, particularly those that are seasonal or event driven, leading to large inventories of unsold products with limited shelf life;
- Lack of or insufficient on-pack storage guidance for consumers, particularly in respect of freezing;
- Not using optimal packaging design, including resealable and modified atmosphere packaging;
- Products or transport containers not being correctly chilled prior to distribution, resulting at times in entire shipments being lost;
- Buyers modifying orders at short notice, at times after food has been packaged under private label – thereby preventing its redirection (or at least making it highly inefficient to redirect) to another market; and
- Retailers returning products to suppliers well after the fact, with little if any information about why or what caused the issue.

FLW has multiple drivers and behaviours which differ by chain.

The above descriptions show that FLW has multiple drivers and behaviours which differ by chain. FLW is not the fault of one overarching stakeholder group, such as retailers, manufacturers or consumers; it is a systemic issue that arises from how the food industry operates. It is also an issue that arises from a lack of research into practices that retailers and their suppliers can adopt to reduce waste by encouraging changes in consumer behaviour. Countering the supply and demand behaviour that drives unnecessarily high levels of FLW requires the development of policies, regulations and public/private agreements that reflect whole of chain approaches. This is typically not presently the case and is challenging for government to enact.

5 Policy and Legislation Dysfunctions

The unnecessary FLW that typifies the global food industry is not due to one stakeholder group. FLW is due to the dysfunctional behaviours that occur in industry and in government, and in how the two interact. The difficulties faced by governments in attempting to legislate against FLW is reflected in the statement made by Jean-Claude Poissant, Parliamentary Secretary to the Minister of Agriculture and Agri-Food Canada.[20] "This is a government-wide issue that goes beyond the responsibilities of the Department of Agriculture, which increases the complexity of the file. Food waste also touches on the mandate of many government agencies and industry organizations, given that this is an important issue for agriculture, security, and the environment."

In most governments, each ministry is accountable for interacting with specific sectors (e.g., farming, processing and retail) and establishing or implementing policies and legislation in specific sectors. It is common, however, for the ministry that developed the policy or regulations not to be the enforcement body. For example, legislation developed by Agriculture and Agri-Food Canada (AAFC) is enforced by the Canadian Food Inspection Agency (CFIA). This division of labour creates a tendency among governments to implement unrealistic "one size fits all" policies and legislation. Regardless of the intent that lay behind the development of AAFC legislation, it will be enforced according to the culture and capabilities of CFIA. As governments' transition from prescriptive to outcome based legislation, the culture and capabilities of the enforcing institutions (from corporate behaviour down to individual inspectors) is an increasing concern for industry in Canada and elsewhere.

Historical cause of ministerial misalignments in Canada

When the Canadian Constitution was established in 1864, sustainability – including FLW and the environmental consequences of industry or consumer behaviour – was not considered. It fell between the cracks, with shared responsibility assumed over time by federal and provincial governments. Fast forward to 2016 – a very different food industry exists today than in 1864. What has resulted is that no ministry or level of government has ultimate responsibility or is accountable for FLW. This leaves industry in the unenviable position of having to grapple with an environment shaped by misaligned policies, legislation/regulations and systems. The more provinces in which a business operates, the larger the problem.

Whether ministries have sole accountability for a sector or share accountability with another ministry(ies) for that sector differs by commodity, food type and the purpose of the policy or legislation. For federated jurisdictions, in particular (such as Canada, where federal, provincial and municipal governments have overlapping and sometimes opposing responsibilities), this creates an extremely complex and potentially unenforceable policy and regulation paradigm. It also severely reduces governments' ability and motivation to adapt to a changing industry. It is safer to do nothing and blame the system than risk promoting changes that are unpalatable to their constituents.

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The present system penalizes those in government who propose or pilot a creative or novel idea that is unsuccessful, through unconstructive criticism voiced in parliament or by the media. Current systems are so unwieldy that lessons learned from successes or failures cannot be factored into the development of new policies and regulations. This transpires into a situation where industry and government adopt increasingly polarized perspectives and behaviours, resulting in an even more dysfunctional environment. Industry attempts to innovate in line with changing markets within a policy and legislative environment that is increasingly detached from 21st century realities.

Reasons for the present situation stem in part from provincial prerogatives enabling regulators to divert from the precedence established in the Magna Carta, whereby individuals are innocent until proven guilty. The onus is on businesses proving that they are not guilty. The result is an environment where regulators do not need to change, and businesses may not be able to reduce waste without going through a costly, complex and potentially painful compliance process. Businesses and their advocacy groups become defensive and wait for legislation to be enacted before making investment decisions on waste reduction initiatives, rather than proactively seeking solutions within their own operations. What has transpired is a woefully inefficient and ineffective use of public and private resources that discourages innovation. It also lessens the likelihood that collaborative agreements will evolve between government and industry.

What has transpired is a woefully inefficient and ineffective use of public and private resources that discourages innovation.

5.1 Examples of Specific Regulations That Drive FLW

5.1.1 Canada

Numerous examples of Canadian policies and regulations that result in unnecessary FLW along the chain were identified during the research. Examples include the following:

- The Department of Fisheries and Oceans does not consider economic factors in the development and implementation of catch policy and regulations. This, at times, results in enormous losses and waste along seafood value chains.

- Legislation enacted under Ontario's Farm Products Marketing Act plays a role in driving FLW at the farm level and along the value chain, including household waste. Specific examples include fruit, with research identifying that marketing legislation can impact producers' and downstream businesses' motivation to produce according to customer and consumer demands.
- Decisions made under Ontario's Environmental Protection Act (EPA) are determined in isolation and designed to protect the EPA, rather than enabling businesses to continually improve performance. Reducing emissions below targets agreed with the Ministry of the Environment and Climate Change (MoECC) can create challenges that are similar to those if businesses exceed targets.
- Canadian Food Inspection Agency (CFIA) regulations prevent reworking of fresh food that may pose a concern into safe processed food; for example, through cooking.
- Federal and provincial grading and packaging regulations not evolving with market and consumer demands results in unnecessary FLW in a wide variety of fresh and processed foods.

5.1.2 International

Government drivers of FLW are not solely a Canadian issue, as demonstrated by just a few examples of the international regulations identified during our research.

- Random loads of food imported into the US are sampled at the border. On arrival at their destination, the entire carton or tote in which the food is transported can be discarded, because it has been tampered with. This is despite the fact that a certified inspector will have performed said "tampering." Such incidents can result in tonnes of products being condemned.
- Concerns have been voiced in the US about the impact of the Food Safety Modernization Act (FSMA) on driving increased FLW along the value chain. Specific concerns include
    1) the impact that misalignments between the Food and Drug Administration (FDA) and the multiple federal, state and local authorities that FDA will partner with to implement FSMA will have on its execution;
    2) food and beverage bi-products going to landfill instead of animal feed; and
    3) farmers'/distributors' ability to adopt auditable good manufacturing practices within a short timeframe.
- Countries revising labelling regulations at short notice and without effective communication results in unnecessary FLW. Examples identified include sudden changes in import regulation introduced by Qatar — a country which imports more than 90 percent of its food requirements.

- Seafood is the only major food system that continues to follow a "hunt and gather" approach, due to the nature of fishing. Increasingly stringent catch licences prevent perfectly edible seafood from being landed legally. Instead, it becomes bycatch and is thrown back into the sea.
- Ineffective food product certification mechanisms and ineffective consultation with industry during the development of food safety and quality related regulations cause additional FLW.
- Grading is an important determinant of value that can drive inefficiencies, particularly when grading practices produce outcomes that do not reflect consumer perceptions of value.[21] The Agricultural Organization of the United Nations (FAO) have led FLW reduction efforts; although, simultaneously through CODEX Alimentarius, they play a role in creating unrealistic market expectations. During our research, the non-acceptance of even one percent decay (blemish) in Extra Class Aubergines is an example of where grading is at odds with responsible management of the food system.
- Changes to "temporary foreign worker" programs have limited the availability of farm workers, resulting in North American crops not being harvested.

6 Responsible Resource Management

Regulations also impact the responsible handling of food that needs to be removed from the food chain.

> Case example: In certain circumstances, regulations make the disposal of organic products at landfill the preferred recourse, even though preferred options (e.g., bio-digestion or using a lethality treatment, such as cooking) could turn inedible food into animal feed. When, due to no fault of their own, a food processor received a shipment of frozen meat products from the US that had thawed during transportation, CFIA's Meat Hygiene Manual of Procedures (MHMP) deemed it an illegal import. The only recourse allowed by MHMP in such circumstances is to send the products to landfill. The processor calculated that transporting the load many kilometres to an anaerobic digester would produce a considerably less environmental impact than sending the load to landfill. It would also provide a sufficient financial benefit to offset transport and handling costs. At a considerable cost to the company, it was able to appeal CFIA regulations and send the load to bio-digestion.

This case example highlights the need to rewrite MHMP in ways that encourage environmentally responsible practices.

Current regulations also prevent responsible and efficient use of natural resources.

Similarly, current regulations also prevent responsible and efficient use of natural resources. Examples given during our research included regulations that prevent Canadian meat processors from reusing water in their plant, for any purpose. This results in processors using significantly higher volumes of water than otherwise required; in response to which, municipalities increase their water rates and sewage fees. These opposing regulations exist even though modern reticulation technology can produce re-used water that is cleaner than when it first entered the processing facility.

Lack of harmonization between federal, provincial and municipal government policies has also prevented the development of the infrastructure required to enable the responsible management of natural resources. Harmonized planning and investment would, for example, enable the creation of an integrated bioenergy infrastructure. Presently, because effective organic management systems have not been implemented by municipalities, organic matter can travel past biodigestors on the way to landfill.

Ontario is an example of a government continuing to follow disharmonized generic, process-driven approaches to reduce food and associated wastes. The "*Strategy for a Waste Free Ontario: Building the Circular Economy"* and "*Circular Economy Act, 2015"* (CEA) are at advanced stages of development. To be administered by MoECC, the Act will create programs that are 100 percent funded by industry and apply to all businesses, regardless of their performance. The Resource Productivity and Recovery Authority that will oversee implementation of the "Strategy" and

associated programs will be governed by elected officials and public servants, with industry unlikely to have direct input into programs' design and operation. This runs counter to the need to a) foster change from a value chain perspective at an enterprise level, and b) complement other ministries' responsibilities.

Because there is no harmonization between other provinces or the federal government policies and regulations relating to the management of organics, businesses believe that the CEA and the above strategy will increase compliance and operating costs, particularly for businesses located in multiple provinces. With packaging and labelling regulations – including allowable food packaging materials and instructions for consumers on recycling and safe food handling practices – determined by Health Canada and the CFIA, there is a limit to what businesses can achieve to ensure food and packaging is fully reused or recycled. With other Canadian provinces developing unilateral organic waste management legislation, including carbon cap and trade, the challenges faced by industry through the politicizing of FLW are increasing exponentially. The problem of disharmonized regulations is especially prevalent in federated countries, such as Canada, where no common standards exist between municipalities' organic management and recycling bylaws.

A further example of the consequences of disharmonized planning across municipalities and provinces is how a lack of coordination between, and investment in, foodbanks prevents edible food from reaching underprivileged families. For example, some foodbanks receive more bakery goods than they can distribute, while others cannot accept meat due to lack of cooling facilities. Some foodbanks only open intermittently, severely lessening the donation of food by retailers, etc. Such scenarios create unnecessary food waste.

7 Developing Effective Policies and Legislation

Government policies, regulations and programs should incentivize and assist industry to reduce FLW.[22] The remainder of the report focuses on why reducing FLW requires concerted and coordinated systemic initiatives between government, industry and NGOs.

7.1 Systems Perspective of Dysfunctional Policy and Legislation

Current policies and regulations too often perpetuate, even exacerbate, FLW along the value chain. Some of the key reasons why food waste is a systemic challenge, rather than one which can be tackled through unrelated policies, legislation and investments, include the following:

- Causes and effects occur along different parts of the value chain; hence, they have an impact on different government jurisdictions, and on different ministries' policies.
- Some consequences (chiefly environmental) are externalized, resulting in market failure even in highly functioning value chains. Such incidences require effective government interventions.
- Uncoordinated interventions/targets can have unintended negative consequences.

Fragmented responsibilities and lack of a congruency between ministries and regulations perpetuate an adversarial industry culture, and result in defensive rather than solution-driven relationships developing between government and industry. Table 7-1 presents reasons why value chains and governments suffer similar systemic challenges, which constrain their scope to act effectively.

Table 7-1: Value Chains' and Governments' Systemic Challenges

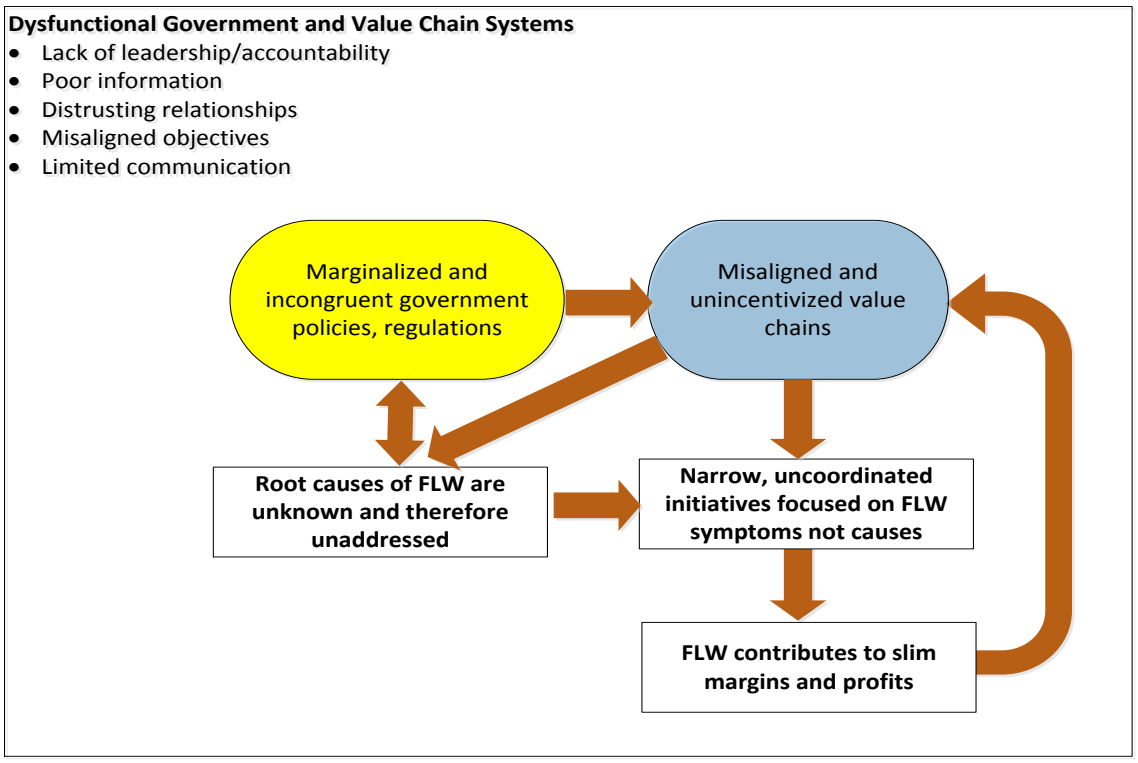
	Value Chains	Governments
Lack leadership/ accountability	• Retailers nominally act as leaders; but the cause and effect of waste is poorly understood, not a priority, and costs are endured upstream. • Scope for leadership in food service value chains is much lower. • Responsibility for food waste is spread within companies. Rarely is: a) a single executive made accountable for waste, or b) waste reflected in executives' incentive packages.	• No one minister is responsible. Interest in food waste is dissipated across department and tiers. (See page 7) • With international/inter-provincial supply chains, FLW cause/effects are an intergovernmental problem, further diluting leadership. • Ministers and public servants change posts frequently, which discourages them from focusing on issues that would have a lot of upfront investment (e.g., time, money, legislation, political capital, potential controversy) and would not provide the emergence of positive outcomes until they had long since moved on.

Poor information	• Waste data collection/ transparency is partial (though improving in some cases) – both within companies and across chains. Industry-wide data is insufficient for informing chain-specific priorities, and the programs that do exist are insufficient to implement effective continual improvement programs. • Consumers seem resistant to campaigns trying to raise their awareness of the consequences (financial or otherwise) of their wasteful behaviour.	• Macro data is partial (though improving in some cases) and disputed, tainting the evidence-base for policymaking, and providing excuses for delaying action. • Most data relates to consumers and retail, where it is comparatively easier to observe or estimate.
Distrusting relationships	• In the food sector, relationships are often fractured and unstable; thereby reducing the scope for concerted, collaborative initiatives required to derive value creation from reducing food waste. • Individual businesses' accountability and bonus systems create an unwillingness amongst individuals to collaborate. In addition, mutual understanding across chains of each other's businesses is often low. Consequently, causes of FLW and the implications of purchasing and stocking decisions on waste are poorly understood. • Accountability is delegated across functions and individuals, whereas control is not. This results in distrust and blame-driven versus solution-driven relationships.	• Relationships between tiers of government are often strained, especially when different political parties are in power. • Relationships with industry are impacted by the skills, knowledge and behaviour of inspectors that enforce the regulations, and the culture exhibited by the regulator during interactions with businesses. • Incongruent regulations – perhaps because one is prescriptive, while the other is results-driven – impact relationships within and between ministries and hamper innovation.
Misaligned objectives	Industry stakeholders' objectives differ according to: ▪ businesses' motivation being geared to only doing enough to satisfy CSR/shopper perception and to meet compliance regulations; ▪ publicly-owned companies needing to respond to investors' quarterly expectations, whereas farmers' operate according to multi-year production cycles;	Different departments and tiers of government have different priorities, such as: ▪ facilitating economic growth, ▪ sponsoring farming/fisheries industries, ▪ food security, ▪ food safety, ▪ controlling government taxes and expenditure , ▪ reducing municipalities' budgets devoted to waste management and emissions, ▪ lowering society's environmental impact, and ▪ trading agreements.

	▪ whether they seek to minimize short-term costs in isolation versus maximize long-term shared value; and ▪ bonus schemes at one level of the chain driving behaviours that are counter to reducing waste at other points in the chain.	That these priorities and the agencies delivering them are not aligned makes the process of negotiating a coherent strategy a complex and potentially impossible task.
Limited Communication	• Communication between colleagues in strategic and operational roles, or who work in different business units, can be ineffective. Incidences of ineffective communication are especially evident when it occurs between companies along the same chain. This weakens the scope for strategy development and implementation.	• There is a lack of structures and organizations to facilitate constructive inter- and intra-governmental discussions. NGOs have tried to fill this vacuum, but often lack the resources and influence to drive better coordination. They are themselves nationally based, without the scope to influence across borders, or are viewed as too partisan.

These factors lead to the current state of value chain and government systems presented below in Figure 7-1, which perpetuates industry and government's inability to tackle the root causes of FLW.

Figure 7-1: Vicious Cycle of Dysfunctional Governments and Value Chains



The report now proposes how these dysfunctions can be addressed. Essentially, this involves developing new cultures and structures within and between government, industry and NGOs to align policies and initiatives to ensure their suitability for addressing the root causes of FLW. In many cases this will deliver both commercial and societal outcomes.

7.2 Addressing Government and Industry Dysfunctions

Developing the apparatus required to establish chain length policies and regulations is challenging, though possible. The most challenging aspect is overcoming human factors, including distrust, self-interest and politics.

Examples of the apparatus used to establish chain length mechanisms include the UK government's 2001 formation of the Department for Environment, Food and Rural Affairs (DEFRA).[23] Amalgamating the Ministry of Agriculture Fisheries and Food with parts of the Department of Environment (including food waste) and other portfolios into one ministry (which is overseen by a single Secretary of State and scrutinized by one Parliamentary Select Committee) arguably makes it easier to develop effective policy approaches compared to (for example) Canada. DEFRA's overseeing of waste policy and the food industry has aided the development and success of initiatives such as Waste Resources Action Programme (WRAP).[24] However, regional variations (e.g., between Scotland and England) mean that there is not one single UK policy on food waste. DEFRA is not responsible for overall local government policy and finance. This results in local variations existing in the collection and disposal of food waste. A historical overview of WRAP and its achievements, which include successes achieved through voluntary agreements and outcomes enabled through the existence of pan-sector Ministry DEFRA, forms Appendix B.

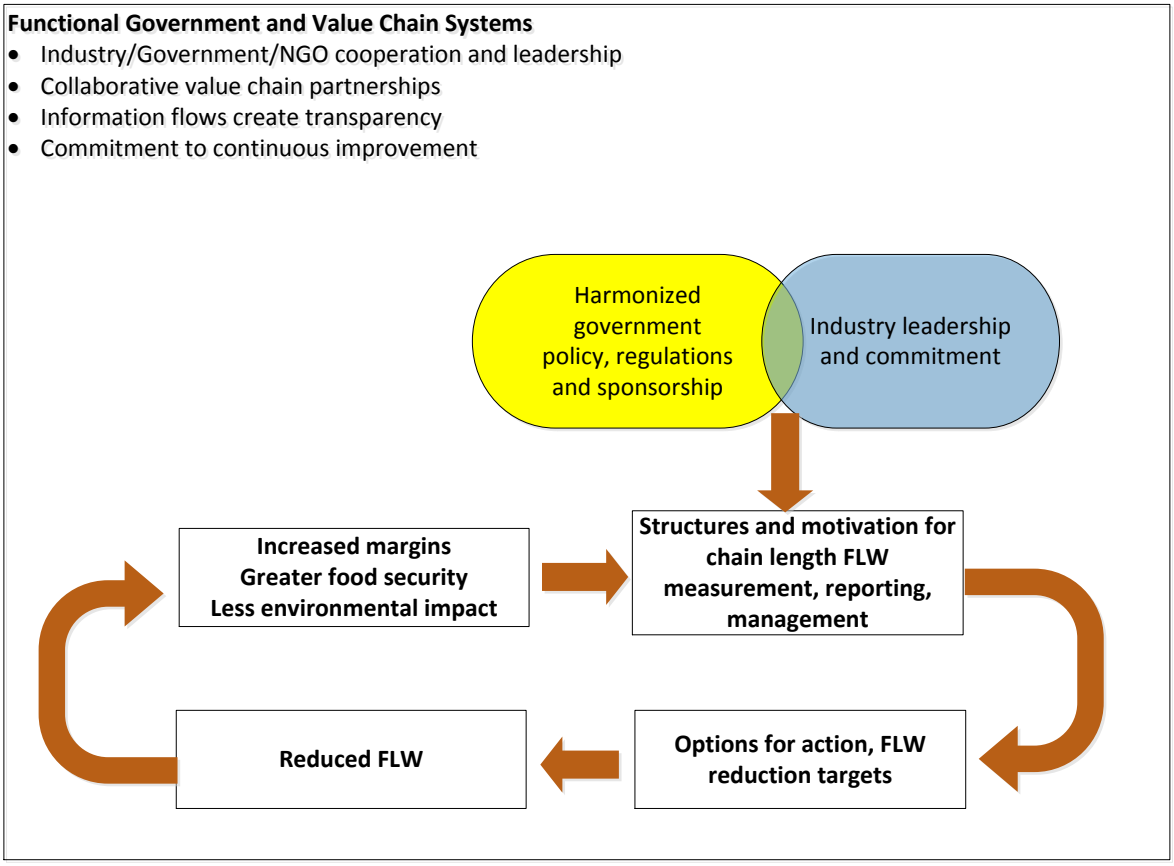
Policy experts consulted during our research also cited the Netherlands' Organisation for Applied Scientific Research[25] (TNO) as a body which succeeds in engaging industry stakeholders, regulators, planners, conservation authorities, academic institutions and agencies in a continuous learning process. The result: less dysfunctional policies and regulations, and less dysfunctional relationships between government and industry. The outcomes this produces include policies and legislation with fewer unintended consequences, including the creation of unnecessary wastes. In developing KPIs that drive improvements in future policies and legislation, the TNO model also enables businesses to use their resources and adapt to changing markets more effectively and efficiently. Lessons learned are incorporated into university courses and academic research; thereby increasing the potential of long-term collaboration between government and industry. The culture that evolves is also more akin to motivating change through voluntary agreements, versus forcing change through legislation.

7.3 Systems Perspective of Functional Policy and Legislation

Our experience working with industry and governments in developed and developing countries has convinced us that the starting point for achieving the changes required to reduce FLW, through aligning policies and legislation from a value chain perspective, relies on senior leaders from industry and government partnering on round table initiatives. Industry leaders should set bold targets for reducing FLW, commit to work collaboratively, and invest in the development of pre-competitive solutions. They should then identify options for action and the government resources required to motivate and enable chain level changes. Government commitment to contribute financially to the implementation of voluntary industry agreements would result in the measurement, reporting and management systems required to produce continual improvements in industry practices. It would also lessen the need for prescriptive policies and regulations.

As shown below in Figure 7-2, the above-mentioned government sponsorship would result in lessons learned from initiatives conducted within individual businesses and value chains being shared across industry. Voluntary partnerships result in more effective and efficient regulations. They also result in more functional solution-driven relationships existing between industry and government.

Figure 7-2: Virtuous Cycle of Functional Governments and Value Chains



The stark differences portrayed in the conceptual diagram presented in Figure 7-1 compared to that presented above in Figure 7-2 emphasize the importance of industry exhibiting the collaborative leadership required to drive and enable change. The differences also emphasize the importance of government commitment and sponsorship to supporting the development of sustainable FLW reduction efforts that subsequently produce environmental and economic benefits for the involved businesses and society. Each iteration of the cycle provides industry with increasingly sophisticated FLW solutions, and governments with the ability to implement policies, regulations and programs that are more effective in motivating and enabling FLW reductions along the value chain than the present situation allows.

8 Conclusion

The world needs to produce at least 50 percent more food to feed nine billion people by 2050. However, climate change could cut crop yields by more than 25 percent, and one-third of food produced could be lost or wasted. Countering the unprecedented rates at which land, biodiversity, oceans, forests and other natural capital is being depleted relies on changing how we grow and how we manage food from a whole of chain perspective.

Food loss and waste (FLW) is created within individual businesses and households. Prescriptive "one size fits all" government policies and regulations, the development and implementation of which typically occur in isolation without due consideration to other factors, cannot motivate and enable the changes that must occur to create a sustainable food industry. This is especially the case in federated jurisdictions, where fragmented ministerial responsibilities and government prerogatives can be at odds with each other.

Reducing FLW to aid the creation of a sustainable food industry will rely on significant changes occurring in how industry and government interact. Voluntary agreements, supported by results-driven legislation and programs, are an effective means to develop FLW mitigation solutions suited to addressing the challenges faced by the businesses and value chains that operate in today's complex food industry.

The development of a constructive policy and legislative environment, combined with visionary voluntary agreements between businesses situated along the value chain, can achieve considerably more constructive and impactful change than the present situation. The formation of voluntary agreements relies on collaborative leadership from industry and government and a willingness to invest in innovative solutions. This paper proposes a process for enabling strategic collaboration between government and industry, resulting in the ability to sustainably reduce FLW within Canada and internationally, through continual improvements occurring within individual businesses, households and the entire value chain.

8.1 Seven Key Takeaways

1) Thirty-one percent of the total food available for consumption in retail (10%) and household (21%) is estimated to have been wasted in Canada during 2010. Weighing six billon kilos, it would fill 60,000 rail cars, stretching 1000 kilometres.

2) Most efforts introduced to reduce FLW are waste diversion, not waste prevention. Reasons for this include the fact that waste diversion a) does not require fundamental change, b) requires limited investment to appear effective, and c) poses limited risk to government and industry.

3) No two food chains are alike, with the unnecessary FLW that occurs along each chain differing in location, type and cause. FLW mitigation efforts need to occur within individual value chains and the businesses which they comprise.

4) Government policies and legislation that are not transparently congruent have the potential to increase rather than decrease unnecessary FLW that occurs along the value chain.

5) The deeply rooted structural, cultural and institutional barriers that create unnecessary FLW would be best addressed through industry / government partnerships.

6) The development of effective government policies and legislation is hindered due to the fact that insufficient information exists on what, where, why and how FLW is created along the value chain.

7) Effective and sustainable FLW solutions could be achieved by voluntary agreements between industry and government versus forcing change through policies and regulations.

9 Appendix A: VCMI Food Waste Publications

"Food Waste: Aligning Government and Industry within Value Chain Solutions" (October 2016)

VCMI's fifth report describes how government policies and regulations can exacerbate the unnecessary food loss and waste (FLW) that occurs along the value chain, due in part to the fact that their design and method of implementation does not reflect 21st century realities. The negative impact of government policies and regulations on the creation of FLW can be particularly acute in federated nations.

To sustainably reduce FLW, policies and regulations need to reflect value chain thinking. Policies, regulations and programs also need to be developed in partnership with industry. The UK and the Netherlands are examples of countries whose governments have introduced mechanisms to partner with industry to develop sustainable whole of chain solutions. The report recommends a process that governments and industry can adopt to address the negative economic and environmental impacts of FLW more effectively than is currently the case.

"Cut Waste, GROW PROFIT™ — $27B Revisited" (December 2014)

VCMI's fourth report on food and associated waste shone a new perspective on the topic of food waste. Using insights gained since our initial research into food waste in Canada, the report estimated that the annual cost of identifiable food waste in Canada is $31 billion. Based on FAO research, the cumulative costs from an environmental economic perspective would exceed $100 billion. The report also showed why tackling food waste presents a financial opportunity to businesses operating in today's complex food industry.

"Cut Waste, GROW PROFIT™ — Food and Associated Wastes" (May 2013)

VCMI's third report expanded on how businesses can benefit financially from reducing food and associated waste, and provided a framework that businesses can use to identify and capture opportunities. Examples given of the scale of opportunities to improve performance included how improving the feed conversion of Canadian beef cattle could save the equivalent of one million tonnes of grain annually. The same factors that increase farmers' production costs also impact downstream business, such as processors, from forcing them to manage variations in carcass composition.

"Cut Waste, GROW PROFIT™" (October 2012)

Our second report marked the launch of the **"Cut Waste, GROW PROFIT™"** initiative. This report brought the environmental impacts of food waste to the fore. Researchers have estimated that the average US farm uses three kcal of fossil fuel energy to produce one kcal of food, and that wasted food accounts for an estimated 300 million barrels of oil per year. One thousand two hundred and thirty-two gallons of water are used to produce one 8 oz. steak. Add to this the fertilizer, medications, land and chemicals used in the production of food that is wasted. The report also presented concrete examples of how businesses have benefited financially (including to the tune of millions of dollars) from reducing food waste, and how consumers can markedly reduce the money that they spend on food.

"Food Waste in Canada" (November 2010)

Our first report estimated the cost of food waste on the Canadian economy to be $27 billion. This was greater than the value of all Canada's agricultural and agri-food imports in 2007. It was also greater than the combined gross domestic product (GDP) of the world's 32 poorest countries for 2009. That report also described why food miles and plastic packaging are not necessarily the demons that they are purported to be from an environmental perspective. Local food can produce higher levels of waste and negatively impact the environment more than food produced in large scale operations. Plastic packaging plays an important role in reducing food waste, by extending shelf life and maintaining quality beyond what is otherwise possible. The downside of packaging is often not the material itself; rather, it is the lack of coordination that exists in industry and between municipalities on how to manage packaging and distribution from a life-cycle perspective.

10 Appendix B: Waste Resources Action Programme (WRAP)

The UK has had large-scale interventions in place since 2005 in the form of two high-profile voluntary agreements – the Courtauld Commitment, and the Hospitality and Food Service Agreement. Supported by a consumer-facing campaign "Love Food Hate Waste," aimed at reducing food waste across supply chains and within households, these programs have contributed to a reduction in post-farm-gate food waste.

The Courtauld Commitment is aimed at improving resource efficiency and reducing waste within the UK grocery sector. The agreement is funded by Westminster, Scottish, Welsh and Northern Ireland governments and delivered by WRAP.[26] It supports the UK governments' policy goal of a "zero waste economy" and climate change objectives to reduce greenhouse gas emissions.

WRAP is responsible for the agreement and works in partnership with leading retailers, brand owners, manufacturers and suppliers who sign up and support the delivery of the targets.

The agreement has focused on the UK and has undertaken three phases:[27]

- Courtauld 1 (2005-2009) looked at new solutions and technologies, so that less food and primary packaging ended up as household waste. It brought food waste onto the agenda. Over the four-year period of Phase 1, 1.2 million tonnes of food and packaging waste was prevented, with a monetary value of £1.8 billion, and a saving of 3.3 million tonnes of CO2e, which is equivalent to the emissions from 500,000 round-the-world flights.

- Courtauld 2 (2010-2012) built on Phase 1, still aiming to reduce primary packaging and household food and drink waste, but also included secondary and tertiary packaging, and supply chain waste. It moved from reducing weight to reducing the carbon impact of packaging. A total of 1.7 million tonnes of waste was reduced through the influence of Phase 2. This impact has a monetary value of £3.1 billion and equates to a reduction of 4.8 million tonnes of CO2e.

- Courtauld 3 (2012-2015) has three targets: 1) reduce household food and drink waste by 5 percent by 2015; 2) reduce traditional grocery ingredient, product and packaging waste in the grocery supply chain by 3 percent by 2015; and 3) improve packaging design through the supply chain to maximize recycled content as appropriate, improve recyclability and deliver product protection to reduce food waste, while ensuring there is no increase in the carbon impact of packaging by 2015. Final results are due to be published shortly.

In 2016 an ambitious new voluntary agreement was launched called Courtauld 2025.[28] For the first time this agreement brings together organizations and businesses across the food system – from producer to consumer – to make food and drink production and consumption more sustainable. At its heart is a ten-year commitment to identify priorities, develop solutions and

implement changes at scale – both within signatory organizations and by spreading new best practice across the UK. The agreement aims to

- provide lower impact products,
- provide them more efficiently,
- help people get more value from the food and drink they buy, and
- make best use of remaining waste and surplus food.

The new agreement aims to reduce the resources needed to produce food and drink by one-fifth in ten years, increasing value for everyone. The targeted overall outcomes from 2015 to 2025, calculated as a relative reduction per head of population, are:

- 20 percent reduction in food and drink waste arising in the UK,
- 20 percent reduction in the GHG intensity of food and drink consumed in the UK, and
- A reduction in impact associated with water use in the supply chain.

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12 Endnotes

[1] Food waste is the loss of food along the value chain that is suitable for human consumption, or will be fit for consumption after processing — such as wheat that is manufactured into flour, then bread. The term "food loss and waste" has the same meaning, though is not measured the same in all countries. For example, the UK do not consider uneaten food that is fed to animals as waste.

[2] See endnote #1 referenced in the Executive Summary.

[3] http://www.wri.org/publication/reducing-food-loss-and-waste

[4] Attenborough, D. (2012). How Many People Can Live on Planet Earth; Horizon, British Broadcasting Corporation; http://www.youtube.com/watch?v=wa3ZDEZj3P8 .

[5] http://www.eu-fusions.org/phocadownload/Publications/Estimates%20of%20European%20food%20waste%20levels.pdf

[6] http://www.wrap.org.uk/content/courtauld-commitment-2025

[7] A policy is the plan of action that a government develops to influence and determine decisions and implement subsequent activities. They heavily influence the design and nature of legislation, methods employed to achieve Government and Ministries' intended objectives, and the relationships that exist within and between Ministries.

[8] In the UK, efforts designed to encourage producers to focus on quality ahead of volume include whole crop purchasing initiatives.

[9] A regulation is a law that determines how businesses must operate to comply with government legislation.

[10] Legislation-driven examples of this include the French law banning supermarkets from sending food that would otherwise go to waste to landfill. Zero landfill does not automatically reduce FLW, it can simply shift the issue to another part of the chain. This includes motivating retailers to return more unsold food to suppliers rather than modify their own practices and take a leadership role in driving more sustainable practices along the entire chain.

[11] The same issues can occur in vertically integrated chains, those were a single owner controls all levels of the chain.

[12] Previous Cut Waste Grow Profit reports describe examples of the extent to which misaligned value chain behaviours create unnecessary FLW. http://vcm-international.com/food-waste/food-waste-publications/

[13] http://www.wrap.org.uk/sites/files/wrap/UK%20Estimates%20May%2016%20%28FINAL%20V2%29.pdf

[14] http://www.eu-fusions.org/phocadownload/Publications/Estimates%20of%20European%20food%20waste%20levels.pdf

[15] Examples include FLW occurring in pork partly driven by incentive systems occurring at the processor level, and FLW in lobsters, partly due to misalignments in government policies and legislation.

[16] http://ecr-all.org/about-ecr-europe/

[17] Examples include FLW occurring in lobsters, partly due to misalignments in government policies and legislation.

[18] See "$27B Revisited" for details on demand amplification, impact on food waste, and causes.

[19] BOGOF type promotions are used for about 2% of all promotions in the UK only: http://www.wrap.org.uk/sites/files/wrap/WRAP%20promotions%20report%20FINAL%20241111.pdf

[20] https://openparliament.ca/debates/2016/5/12/jean-claude-poissant-1/only/

[21] Gooch, M., Brethour, C. Cortus, B., Liu, D. (2005). International Study to Compare and Contrast Legislation, Regulation and Support Initiatives Related to the Quality of Agri-food Products; George Morris Centre

[22] https://champs123blog.files.wordpress.com/2016/09/sdg-target-12-3-progress-report_2016.pdf

[23] https://www.gov.uk/government/organisations/department-for-environment-food-rural-affairs; https://en.wikipedia.org/wiki/Department_for_Environment,_Food_and_Rural_Affairs

[24] http://www.wrap.org.uk/; https://en.wikipedia.org/wiki/Waste_%26_Resources_Action_Programme

[25] https://www.tno.nl/en/

[26] The Waste Resources Action Programme (WRAP) is a registered charity: http://www.wrap.org.uk/

[27] http://www.wrap.org.uk/node/14507

[28] http://www.wrap.org.uk/content/courtauld-commitment-2025