OURFOODFuture

GUELPH-WELLINGTON – Canada's
first food smart community

A Smart Cities Challenge initiative

Background Material:
Leveraging Municipal Assets
in a Circular Economy
(Draft for Discussion)

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CITY OF
Guelph
Making a Difference

The Corporation of the
County of Wellington

SMART
CITIES
CHALLENGE

Leveraging Municipal Assets in a Circular Economy

VALUING WASTE AS A RESOURCE

Specific to the waste component of the Smart Cities collaborative, key strengths and synergies emerged through the collaborative process that informed the proposed 5-year work-plan. The Guelph-Wellington Waste Innovation Smart Cities Core Team is an outcome and is comprised of The County of Wellington, The University of Guelph, Provision Coalition and the City of Guelph, who together bring the depth, breadth, tools and community reach to effect change. Specifically, the Waste Innovation Core Team's multi- year work plan includes:

1. Circularity in Municipal Waste Systems

Integrated Urban & Rural Solid Waste Management Master Planning and Execution
- Including baseline data collection, identification of opportunities for synergies amongst the partners to maximize diversion of food waste and organics and food waste from landfill, and creating opportunities for innovation, communications and engagement through partnerships and planned challenge opportunities.

Waste KPI Dashboard Development
- Develop and integrate waste KPIs into the envisioned public facing comprehensive Smart Cities dashboard. KPIs could include avoidable food waste targets, waste stream percentage organic contamination.

Municipal Food Waste Reduction Best Practice Review
- Review and consolidate circular food waste related best practices and create a published best practices guides for waste management practitioners and consumers.

IoT Measurement and Sensor Technology
- Utilize the Municipal Waste System to test and develop new technology, utilizing civic accelerator model to develop challenges and opportunities for proof of concepts and pilots.
- Leverage Guelph's automated and integrated collection technology including RFID and GPS technology to generate targeted geospatial data and support development of AI and sensor technology.
- Develop an 'Orange Button' standard for waste, similar to the Green Button application that enables households to access personal energy usage data. Development of application that allows smart phone access to household waste practices, avoidable food waste and cost, carbon footprint implications, and to enable waste program message sharing in multiple languages and formats.

2. Food and Organic Waste Intervention Strategy - Reducing Food Loss and Waste along the Value Chain

Value Stream Mapping Process & Visualization Tools
- Development of a repeatable Value Stream Mapping lab process that engages participants along the food value chain to visualize a food production process from start to finish, from raw inputs to the consumer through to landfill, in order to identify and design opportunities for interventions that increase circularity
- Interactive online geospatial maps that will allow users to interface with potential sites for innovating to reduce wasted food in Guelph-Wellington including different potential paths for the prevention or repurposing of currently wasted food, according to the principles of "highest and best use" set out in the USEPA's food waste hierarchy
- Baseline data gathering, intervention testing and tool development
    - Identify significant county/city landfill waste producers and design interventions to prevent food loss and waste, and recover resource value from unavoidable food loss and waste
    - Identify and integrate processing related data and linkages to on-farm and distribution practices.
    - Partner with restaurant and service industry to record and analysis kitchen and plate waste & test interventions

3. Increasing Circularity and Use of Carbon Credits in the Food System

- Utilize civic accelerator & challenge model to develop challenges and opportunities for proof of concepts and pilots.

Food Processing Sector
- Establish metrics to support upstream prevention as a viable CO_2e offset source and credit and advocate for supporting policy.
- Pilot CO_2e aggregation approach across processing sector
- Complete a proposal for the policy changes necessary to reflect prevention as a carbon offset eligible initiative.

Municipal Waste Carbon Credits

- Develop and pilot social currency platform using blockchain technology to leverage carbon credits and increase impact per tonne CO2e offset by promoting sustainable behaviours

Detailed Description

1. Circularity in Municipal Waste Systems

Integrated Guelph and Wellington Solid Waste Management Master Planning: Optimizing Food Waste, Organics and Diversion
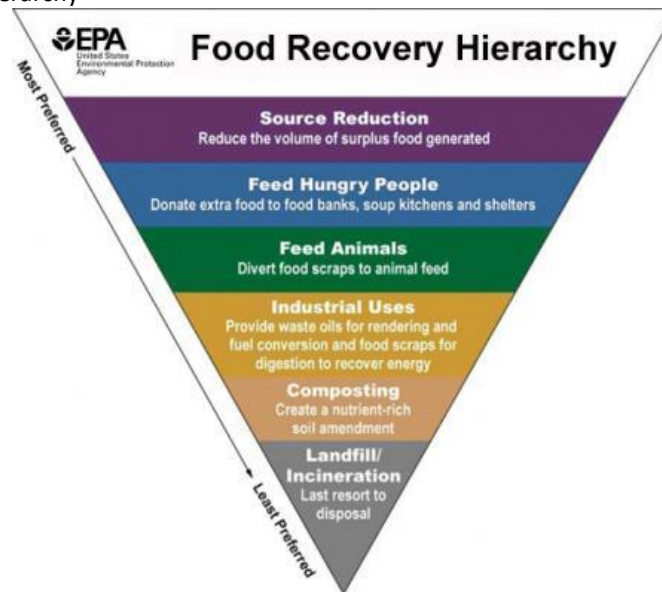
In response to the Provincial Climate Change Action Plan and the multi-billion-dollar food issue of food waste in Canada, the City of Guelph, County of Wellington and Smart Cities partners including the University of Guelph and non-profits such as the Provision Coalition, intend to formalize Smart Cities initiatives and operationalize the Food and Organic Waste Framework through the development of an Integrated Solid Waste Management Master Plan (ISWMMP). The plan will assess needs and develop approaches as related to building a circular food economy, specifically food waste reduction, resources recovery, resource recovery infrastructure, and the promotion of beneficial uses through the reimagining of food waste.

The ISWMMP, as proposed, leverages the work and resources of all partners including existing programs, studies, research, approaches and infrastructure and by focusing on peri-urban linkages, addresses the considerations outlined in the Provincial Strategy for a Waste-Free Ontario and Waste Free Ontario Act including landfill diversion and building data capacity in support of evidence based decision-making.

Greenhouse gas reduction and limited landfill capacity, siting and expansion concerns are a shared concern for the City of Guelph and the County of Wellington.

The ISWMMP will help to assess the needs of both the County and City and develop approaches based on the US EPA's Food Recovery Hierarchy (Figure 1) that leverage Smart Cities partnerships to maximize resource recovery, food rescue and diversion of organics and food waste from landfill. The ISWMMP creates the required feedback loops, track-ability, reporting and transparency to create the continuous improvement framework that is required to feed into the Smart Cities governance structure and build a truly Circular Economy. It is envisioned that the lessons learned, data generated, and technologies developed will not only be portable to other local jurisdictions, but will be scalable nationally, and globally, and will also expand and support circularity objectives as related to packaging and commercial waste over time.

Figure 1: US EPA Food Recovery Hierarchy

Waste KPI Dashboard Development

- Develop and integrate waste KPIs into the envisioned public facing comprehensive Smart Cities dashboard. KPIs could include avoidable food waste targets, waste stream percentage organic contamination for example.

Municipal Food Waste Reduction Best Practice Review

- This task seeks to review and consolidate circular food waste related best practices and create a published best practices guides for waste management practitioners and consumers

IoT Measurement and Sensor Technology Development

The City of Guelph currently provides state of the art automated three stream waste collection service to the community, including multi residential properties. Guelph's investment in technology and public in-house operation creates unprecedented access to waste data, advanced technology and infrastructure that can be leveraged and extrapolated. Guelph's integrated system uses RFID and GPS technology to gather real time geospatial collection data and generates data for waste, recycling and organics resource streams that is assignable to a residential address or area.

Guelph is currently working with a start-up proprietor who is piloting the application of AI technology to add a second order level of automation to the waste collection process whereby the truck can "recognize" the target cart, mimic the actions of the operator, and pick up the cart autonomously, thereby allowing the operator to focus on other key aspects of the collection operation such as traffic and safety.

This level of sophistication, combined with known available measurement and sensor technologies leads the Smart Cities partnership to believe that the right conditions exist in Guelph-Wellington to support development of sensor technologies to address one of the key barriers to enhancing data capacity in support of evidenced based decision-making and the development of a circular economy; ready measurement.

Ready measurement of waste and waste composition is one of the key challenges impeding the development of a food-centric circular economy. Currently only aggregate measurements are practical and current practices are labour and resource intensive and only provide a snapshot of conditions at a given time, making trends difficult to ascertain. Research conducted by the University of Guelph in 2018 and in collaboration with the City of Guelph revealed that approximately 45% of the organic waste stream is comprised of avoidable food waste, or in Guelph's case ~ 4,500 Tonnes per year if extrapolated. This data; however, was derived after an intensive week of physical labour, sampling and auditing of roughly 2,000 organics carts, or ~4% of the deployed organics carts in the City. This work was followed by further analysis and timeline. The opportunity to automate this process using the potential of IOT, AI and Data Analytics would greatly increase reliability and capacity, as well as creating the potential for a feedback loop to residents. Increasing the frequency and reliability of measurement is critical in support of building trends, informing business cases and meeting the objectives of building a food-centric circular economy.

The Smart Cities collaborative sees measurement development and data management as the fuel that will incentivise numerous economic benefits derived from entrepreneurs who take advantage of the collaborative and supportive environment embodied in the Guelph-Wellington plan. The plan will leverage data and integrated geospatial technology and mapping to identify circularity and increase access to nutritious foods and reduce food waste. The plan will also leverage partnerships, the principles of community based social marketing, and data and technology to build bridges and overcome barriers such as awareness, socio-economic status, language and accessibility for Guelph-Wellington residents. This project aspires to enable households to access their waste data, similar to the Green Button application for personal energy usage data. For example, with the current RFID technology and envisioned sensor technology (to be developed), a customized report could be sent to a homeowner's smart phone app (to be developed) outlining sorting practices, avoidable food waste and cost, carbon footprint implications, and to push key message around access to programs and services, and in multiple languages.

2. Food and Organic Waste Intervention Strategy - Reducing Food Loss and Waste along the Value Chain

Value Stream Mapping

Value stream mapping helps participants to visualize food production processes from start to finish, from raw inputs to the final consumer. The team developed a **prototype for a Value Stream Mapping** exercise in order to visualize the macro steps involved in the food value chain, in order to create discussion amongst participants along the chain, explore what types of information is available, what gaps exist and what might be some approaches to either develop interventions or the information required to support the development of interventions.
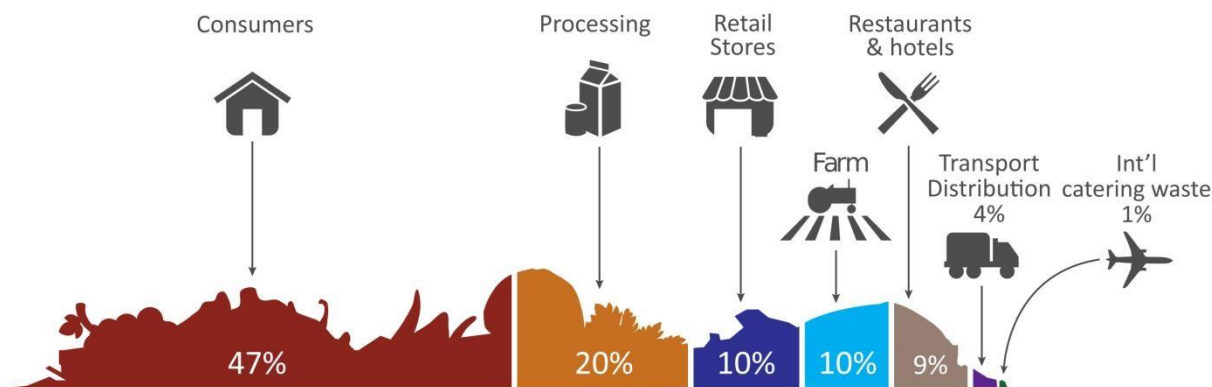
Value Stream Mapping Prototype

As part of the Smart Cities Challenge process, a value stream mapping workshop was held in late November 2018 that included representatives from the City of Guelph, County of Wellington, the University of Guelph and the Provision Coalition. The purpose of the workshop was to conduct a deep dive with respect to the fate of food through the value stream with a focus on food waste by sector as illustrated in Figure 2 below, taken from the Province's Food and Organic Waste Framework, and specific to Guelph-Wellington. Participants attempted to follow a protein stream from farm through to consumption and then to its waste destination in order to identify areas of wastage and opportunities for intervention.

Learnings:

I. Good data and research is available, but not consistently across all sectors; and,

II. A mechanism needed to be established to allow for data aggregation, integration, management, access, and development; and,

III. Enhanced data sets would be required to in order to better understand what proportion of the multi-billion-dollar food waste problem in Canada can be attributed to Guelph-Wellington, and,

IV.   That this data is required in support of business case development and assessment of scale up of opportunities for interventions, especially interventions requiring infrastructure investments; and,

V.   Diverse partnerships and a comprehensive and adaptable engagement strategy and approach would need to accompany any data aggregation and integration initiative; and,

VI.   Processing and consumer (including the food services sector) waste are key focus areas for intervention and impact

Figure 2: Value of Food Wasted by Sector in Canada

Data Gathering, Intervention Testing & Tool Development

The Value Stream Mapping Prototype revealed that by leveraging the reach, resources and depth of Smart Cites collaborative, and by strategically focusing on processing and consumer (municipal) waste, Smart Cities enabled initiatives could be developed that target the sectors contributing to ~67% of the total food waste issue in Canada directly; processing and consumer waste. Further, from a consumer waste focused center (municipal), it is envisioned that the direct linkages to retail, restaurants and hotels would allow access and influence to an additional 19% of the total waste stream, and through a focus on processing the direct linkages to on-farm and distribution practices would allow further access and influence to an additional 14%, thereby creating a roadmap and opportunity to address the complex issues facing food waste comprehensively over time.

As an example, to address data gaps in food waste generation statistics, including in sectors that are under-studied or not currently monitored, the City of Guelph and County of Wellington will partner to procure a license for LeanPath software and equipment that enables restaurants to record and analyze their kitchen and plate waste generation and integrate this service into ongoing municipal waste reduction programming. The City and County in conjunction with the University of Guelph and the Provision Coalition will seek partners from the restaurant and food service industry to participate in a short-term loan of this system to establish a baseline of food waste generation across diverse restaurants in Guelph-Wellington. Participating restaurants will then be supported in the creation of interventions to reduce food waste through the Smart Cities collaborative, including through analytical support and sharing of best practices. As part of the envisioned program, the LeanPath system will then be loaned out to the participating restaurants again to assess the effectiveness of the interventions supporting evidence based decision making and the development of robust data sets.

Value Mapping Visualization Tools - Making the Guelph-Wellington Smart Cities Work Readily Accessible

Smart Cities Partner, The University of Guelph developed a prototype for a dynamic and pragmatic way to make data readily accessible in a useable way. The attached geospatial maps (Attachments 1 and 2) depict potential sites for innovating to reduce wasted food in Guelph-Wellington. The interactive legend highlights different potential paths for the prevention or repurposing of currently wasted food, according to the principles of "highest and best use" set out in the USEPA's food waste hierarchy. Geospatial data can be presented in layers in support of interventions and business development.

While this prototype version is a static image of the places where food waste could currently be diverted or processed in Guelph-Wellington, as a Smart Cities enabled project this concept would be further developed into an interactive online version that will allow users to interface with additional aspects of the circular food economy. For example, a community organization could call up the sites that currently "feed people" (e.g. emergency food aid services), and turn on an underlying map layer that depicts differing rates of food security across the region. This combination of data would enable them to see whether there are sufficient services in high-need areas, and also whether there might be potential local food donors (such as retailers or restaurants) who might support the development of new services. An entrepreneur interested in generating value from commercial organics that are currently sent to landfill could use the interactive map to identify industrial biodigesters in the region that might accept new feedstock, and also to call up a directory of nearby food-related businesses that may be willing to source-

separate waste for private hauling to the digesters. Researchers and policy-makers may use the map to assess the logistical feasibility of large-scale diversion of food scraps to local livestock or alternative protein enterprises. In this way, this visualization exercise supports both the value stream mapping activities associated with "valuing waste as a resource," and also the integration of the environmental, social, and economic goals of Guelph-Wellington's circular economy for food.

3. Increasing Circularity and Use of Carbon Credits in the Food System

The City of Guelph has a long standing track record of environmental stewardship and innovation including management of landfill emissions and source separated organics composting. These two initiatives generate carbon credits for the City and historically the City has partnered with the Federal Government as part of Environment Canada's Pilot Emission Removals, Reductions and Learnings (PERRL) program and later the Greening Canada Fund L.P. to sell carbon off sets, and has sold carbon credits independently on the voluntary market. Guelph currently quantifies and verifies its credits using the most stringent protocols.

On May 7th 2018 Guelph City Council City Council endorsed a recommendation from Our Energy Guelph Task Force that the city strive to become net zero carbon emissions by 2050 and look into what can be done to help make that happen. Guelph's contract to supply carbon credits was fulfilled in 2018 and now Guelph is at an important intersection; use the carbon credits to offset the City's carbon footprint or seek to leverage carbon credits to increase the overall impact in the community per tonne CO2e.

In order to support Council in their decision making, the Smart Cities collaborative is looking to pilot the concept of a carbon credit backed social currency. Leveraging carbon credits, it is envisioned that a platform can be created whereby carbon backed social currency through blockchain technology or equivalent can be traded at the local level to increase awareness and incentivize local and sustainable consumer food choices and increase the overall impact per tonne CO2e.

In addition, through the Smart Cities collaborative and partnerships, an exploratory meeting was held with Smart Cities Partner Provision Coalition and technical experts. Leveraging Guelph's experience, Provision proceeded to conduct a feasibility study with respect to aggregating carbon credits from their work to reduce food waste at food and beverage manufacturing sites, sell the carbon credits, and leverage the sale to, in part, fund further processing waste reduction initiatives. In addition, the feasibility study identified the opportunity, through advocacy, to have policy changed to reflect prevention as a carbon offset eligible initiative. Embedded in the Smart Cities application are the funds to promote aggregation and utilization of carbon credits and to assess the policy framework and advocate for prevention as an eligible carbon offset credit.