

Background

This document is intended to provide additional detail on the staff proposal presented in the Greenhouse Gas Emissions Data Budget Note Staff Report. The proposal was the primary outcome of a project undertaken by Metro staff to address specific directives articulated in a Metro Council budget note, namely “to 1) analyze the agency’s data needs for inventorying the region’s greenhouse gas emissions using both a sector-based inventory and a consumption-based inventory and 2) to create a proposal to address those data needs that identifies a variety of approaches and the costs associated with each approach.”

The following sections outline the activities undertaken as part of the project, the stakeholders and factors considered, and the proposed regional greenhouse gas (GHG) emissions inventory data program.

Project Approach

The project team included staff from several Metro departments with a range of perspectives and areas of expertise. The initial phase of the project consisted of research and outreach conducted to catalog past and current Metro GHG emissions estimation activities as well as those ongoing at key partner agencies. Additional outreach was directed at expected consumers of potential regional GHG emissions inventories to ensure a thorough understanding of the needs that the inventories would be designed to serve.

The team then devised the structure of the proposed program and estimated the resources necessary to establish and maintain it.

Guiding Principles

Several core principles were identified by the project team in coordination with key stakeholders:

- Serve current/programmed Metro GHG emissions estimation needs
- Maximize alignment with GHG emissions estimation activities taking place at partner agencies
- Ensure that proposed methods are valid and defensible

GHG Emissions Inventory Overview

A GHG inventory represents an accounting of emissions of multiple gasses known to contribute to climate change, expressed in units of mass associated with a distinct geographic area. While direct measurement of GHG emissions is possible in certain instances, GHG inventories for relatively large geographic areas are typically calculated using estimated rather than directly measured emissions. This is done for two reasons, the first of which being that direct measurement of GHG emissions in a comprehensive manner at anything larger than the micro scale is effectively infeasible due to technological constraints. Secondly, even if such direct measurement were possible, the resulting inventory would consist of a single total with no understanding of the contributions of different types of

activities. Therefore, the inventories considered here consist of emissions estimates calculated by multiplying activity data (e.g. vehicle miles travelled, electricity consumed) by emission factors (expressed as a rate in terms of units of mass per unit of activity), normalizing the resulting quantities of emissions for individual gasses based on the strength of their effect on global warming, and then summing these normalized values to arrive at a total quantity of estimated GHGs emitted.

This project concerns itself with the two types of GHG emissions inventory that are generally considered to be the most appropriate and applicable to analysis at the community (i.e. municipal, regional) scale:

1. A sector-based emissions inventory accounts for GHG emissions associated with activities taking place within the geography of interest.
2. A consumption-based emissions inventory accounts for life-cycle (i.e. production to disposal) GHG emissions associated with consumption of goods and services by residents and businesses within the geography of interest.

A third type of inventory that is beyond the scope of this project but worth mentioning here is an internal operations emissions inventory, typically conducted by local governments and businesses, which accounts for GHG emissions associated with the business operations of the organization in question. This type of inventory is conducted at a more detailed scale and is most appropriately interpreted as a “drill-down” of the community-level inventory types referenced above, as many of the emissions in an internal operations inventory are assumed to be accounted for in a more aggregate manner in a community inventory.

GHG Emissions Estimation Protocols

Established protocols provide clear direction on community (i.e. city, county, region) GHG emissions inventory data sources, calculation, and reporting methodologies. Chief among these are the *U.S. Community Protocol for Accounting and Reporting of Greenhouse Gas Emissions* (US Community Protocol) and the *Global Protocol for Community-Scale Greenhouse Gas Emission Inventories* (GPC).

Recent/Current Metro GHG Emissions Estimation Activities

Regional Systems-based Inventory

In 2010 Metro, with consultant support, developed an inventory of estimated GHG emissions associated with the Metro jurisdictional boundary for 2006. This inventory, which blended sector- and consumption-based accounting approaches, was intended to establish a snapshot of the carbon footprint of the region in order to focus planning efforts to achieve long-term GHG emissions reductions from all sectors. The approach used in conducting this inventory relied on a national U.S. Environmental Protection Agency (EPA) framework published in 2009 (“Opportunities to Reduce Greenhouse Gas Emissions through Materials and Land Management Practices,” EPA, Office of Solid Waste and Emergency Response) as guidance in developing methods and data sources, while adjusting or replacing individual components with more geographically relevant data where possible.

It is important to note that, since the state of the practice surrounding consumption-based GHG accounting at the regional level was still developing at the time, this approach was considered

provisional and experimental. However, it significantly expanded the typical scope of GHG inventories and provided timely information that supported Metro's early climate mitigation communications internally as well as externally with local, regional, and state partners. There are no plans to update this inventory in its current form.

Regional Consumption-based Inventory

GHG emissions associated with the products and services consumed in the Metro region is one of the key indicators in Metro's 2030 Regional Waste Plan, adopted by the Metro Council in March 2019. In order to align with a new focus on the holistic nature of the regional waste system, GHG emissions were estimated for the full life cycle of products, materials, and services consumed in the region, from production to disposal. This consumption-based approach is increasingly being used by states and local governments to better understand how the choices and behaviors of their residents, businesses and governments impact climate change.

Development of the baseline consumption-based emissions inventory for the 2030 Regional Waste Plan was conducted by the Oregon Department of Environmental Quality (DEQ) in 2018 using the same methodology for the tri-county area that it uses for the state as a whole. This inventory estimated the emissions generated locally, nationally and internationally as a result of the goods and services consumed by the region in 2015 at around 46% of the state's total consumption-based emissions. Two-thirds of these emissions were estimated as coming from how products are made and less than one percent from the disposal of products or packaging after use.

RTP

The Research Center conducts a regional emissions analysis with each update to the Regional Transportation Plan (RTP), in which on-road mobile source emissions are estimated for base and forecast years using the regional transportation model coupled with EPA's Motor Vehicle Emission Simulator (MOVES) model. Until October 2017, the regional emissions analysis was performed primarily for the purposes of federally mandated air quality conformity determinations. While the region is no longer required to demonstrate conformity, regional emissions analyses continue to be conducted to estimate the emissions of GHGs and other pollutants associated with the RTP, major transportation projects subject to the National Environmental Protection Act (NEPA), and other initiatives.

Climate Smart Strategy

In HB 3543 (2007), the Oregon Legislature adopted statewide GHG reduction targets for all sectors. In HB 2001 (2009) and SB 1059 (2010), the Legislature directed the Land Conservation and Development Commission (LCDC) to adopt targets for reducing light-duty vehicle transportation-related GHG emissions in metropolitan areas consistent with the overall target from HB 3543. Those regional targets, first adopted in 2011, were updated in January 2017 to extend to 2050.

Metro was directed by HB 2001 and by LCDC rules to develop a plan for meeting its regional GHG reduction target in coordination with the Oregon Department of Transportation (ODOT). After a vigorous and collaborative regional process, this plan – known as the Climate Smart Strategy – was adopted by the Joint Policy Advisory Committee on Transportation (JPACT) and the Metro Council with broad regional support in 2014 and approved by LCDC in 2015. The development of the strategy was informed by a detailed modeling analysis of various scenarios conducted by Metro, in partnership with

ODOT, to identify the types of transportation-related mitigation strategies that would have the greatest potential for long-term reductions in GHG emissions and meet state targets for the year 2035.

Incorporated into the RTP in 2018, the Climate Smart Strategy included a set of performance measures and monitoring targets for tracking implementation and progress. One of the monitoring targets that is evaluated for these purposes is the estimated reduction in annual per capita GHG emissions from light-duty vehicles by 2035 and 2040 compared to 2015 levels. These estimated reductions were calculated and reported during the most recent update to the RTP by the Research Center using the approach described above that combines Metro's regional transportation model with the EPA's MOVES model. This analysis is documented in Appendix J to the 2018 RTP.

Regional Barometer

Metro Council adopted legislation in 2008 outlining six desired outcomes for the region and, in following years, approved the concept of a dashboard that would allow Metro staff and members of the public to measure regional progress toward these outcomes. An ongoing cross-departmental project is in the process of implementing this dashboard concept in the form of a web-based data hub called "By the Numbers" that will house a series of Regional Barometer Measures designed to assess the region's status vis-a-vis the outcomes.

Given that one of the six desired outcomes consists of leadership on climate change, the Regional Barometer includes a regional GHG inventory as one of its measures. The current Regional Barometer, scheduled to go public in December 2019, makes use of the existing 2015 consumption-based emissions inventory as well as on-road vehicular GHG emissions estimated in the 2018 RTP. Future phases of the Regional Barometer would incorporate the regional inventories potentially resulting from the proposal outlined here.

Metro Operations

In 2003, the Metro Council set an ambitious target for business operations to be sustainable within one generation. To this end, the Council adopted goals in five key categories: climate, waste, toxics, water and habitat. Metro's Sustainability Plan, adopted in 2010, identifies strategies and actions to achieve the goals and sets a baseline, indicators, and interim targets to measure progress over time.

Metro conducts periodic inventories of GHG emissions associated with internal operations to track progress over time toward Metro's climate goal and to understand trends and manage emissions from specific sources and activities. The most recent inventory estimated emissions for 2017 (fiscal year 2016-17), following on previous 2008 (baseline) and 2013 (fiscal year 2012-13) inventories.

Current Partner Agency GHG Emissions Estimation Activities

State of Oregon

DEQ produces a sector-based inventory annually and a consumption-based inventory every five years, with both inventories accounting for GHG emissions associated with the entire state. These are the primary GHG emissions inventories published by the State.

The sector-based inventory is calculated using reported data from DEQ's Greenhouse Gas Reporting Program, waste emissions estimates from DEQ's Materials Management section, and modeled emissions estimates from EPA's State Inventory Tool (SIT). Approximately eighty percent of the annual emissions in the most recent inventory years are derived from data reported directly to DEQ through its Greenhouse Gas Reporting Program. This program collects greenhouse gas emissions information annually from major emitting sources in Oregon, including industrial facilities with air quality permits, fuel distributors, natural gas and electricity suppliers and large landfills. Emissions estimates for sources that do not report directly to DEQ, such as agriculture, are primarily developed using the SIT, whose emissions are estimated utilizing a modeling approach that relies on the disaggregation of national data.

Oregon's consumption-based inventory was originally developed by Stockholm Environment Institute (SEI)'s US Center under contract to DEQ and, when first published by SEI in 2011, constituted the first such inventory at the sub-national scale in the United States. Subsequently updated twice by DEQ, the consumption-based inventory follows the commodities purchased by Oregon's consumers and assigns to these commodities their total life-cycle emissions, from cradle (the production phase) to grave (the post-consumer disposal phase). It considers the purchase of a final good or service by an Oregon consumer as the act that determines whether a commodity's life-cycle emissions should be in or out of the inventory, regardless of where the consumption or emissions actually occur.

The consumption-based inventory relies on highly segmented spending data as its primary input, and its emissions estimates are based on consideration of four different types of consumers (households, federal government, state/local government, and business capital and investment), 536 different commodities, five life-cycle phases (production, pre-purchase transportation, wholesale/retail, use, and post-consumer disposal), and three locations (in-state, other-US, and foreign).

City of Portland/Multnomah County

The City of Portland's Bureau of Planning and Sustainability (BPS), in conjunction with Multnomah County, produces a sector-based inventory annually and a consumption-based inventory that is updated periodically. Both inventories account for GHG emissions associated with the entirety of Multnomah County. The sector-based inventory has been conducted annually since 1990 and is used to inform policy and planning to reduce emissions. It followed the US Community Protocol for a number of years but switched to the GPC with the 2017 inventory published in 2019 in order to comply with international commitments associated with membership in C40 Cities. The consumption-based inventory has been calculated twice to date by DEQ, with BPS staff compiling input data and DEQ adapting the statewide inventory tool to Multnomah County.

Other Jurisdictions

A number of other jurisdictions in the region have either previously produced or are taking steps toward producing GHG emissions inventories. In response to another budget note (FY20 Budget Note #2), a concurrent effort to the one detailed here is underway to propose a regional climate change mitigation strategy. This project's outreach to partner jurisdictions includes a survey that asks for, among other things, details on any past/current/future GHG emissions inventories as well as feedback on how they could benefit from a coordinated regional inventory data program. At the time of writing, the deadline for survey responses has not yet arrived and so a current summary is not yet available.

Anticipated GHG Emissions Inventory Data Consumers

The proposed GHG emissions inventory data program would serve the needs of a range of programs internal to Metro as well as potentially enabling partner jurisdictions to more easily and consistently develop their own inventories.

Regional Mitigation Strategy

The work that culminated in the proposal detailed here was carried out in close coordination with the work associated with the response to Budget Note #2 that is proposing a regional climate change mitigation strategy. Monitoring and reporting of progress toward regional GHG emissions reduction targets established by that strategy would be done using GHG emissions estimates from the inventory program proposed here.

Regional Transportation Plan

The RTP would make use of the GHG emissions estimates for the transportation sector in the sector-based inventory to support monitoring and reporting needs.

Regional Waste Plan

The 2030 Regional Waste Plan calls for reporting on sets of key and goal indicators at least every three years, and it relies on a regional consumption-based GHG emissions inventory to quantify the key indicator of GHG emissions associated with the products and services consumed in the Metro region.

Regional Barometer

Phase 2 of the Regional Barometer would update the “By the Numbers” web-based data hub to incorporate a regional sector-based GHG emissions inventory as the measure used to track the emissions and waste indicator.

Local Jurisdictional Partners

To the degree that community-scale GHG emissions inventories have historically been developed in a somewhat fragmented manner across the region, a regional inventory program conducted by Metro would provide an opportunity for a more coordinated regional approach that could produce several potential benefits. First, a regional inventory data program would serve as a template for partner jurisdictions to follow and would therefore promote consistency in data sources and calculation methods. In addition, the presence of an established regional framework would make it easier for jurisdictions developing inventories for the first time to begin their work. Furthermore, if a high level of methodological alignment were to be established between the state, region, and city/county levels, certain aspects of the data collection effort could be coordinated and rendered more efficient. One example is the process of requesting usage data from utilities which, if unified, would be beneficial to all parties.

GHG Emissions Inventory Data Program Proposal

In order to focus attention on several key tradeoffs and decision points, staff determined that structuring the proposal in the form of three alternatives was most appropriate. It is assumed that any new FTE would be housed within the Research Center regardless of alternative.

Basic Option

The basic option would satisfy the requirements of the budget note and establish a robust GHG emissions inventory data program. It would entail the development of a new sector-based inventory by Metro staff that is compliant with either the US Community or GPC protocol. Given that the protocols are very similar and further deliberation is required, the choice of the preferred protocol does not impact the estimated level of effort and it is assumed that this decision would occur during development of the work plan. With respect to the consumption-based inventory, this alternative assumes the continuation of the arrangement that produced the baseline inventory for the 2030 Regional Waste Plan, whereby Metro staff compile input data and DEQ staff adapt the statewide inventory tool to the tri-county area.

Expanded Option

The expanded option would supplement the basic option with additional resources designed to produce a more durable program with farther reach. It assumes additional staff capacity for outward-facing technical support and coordination to assist partner jurisdictions with conducting and interpreting results of their own inventories. Additionally, the expanded option would include staff time to pursue formalization of the relationship with DEQ pertaining to the consumption-based inventory in the form of a memorandum of understanding (MOU) or an intergovernmental agreement (IGA). Furthermore, this alternative would allocate resources to enable exploration of advanced topics such as forecasting and the potential applicability of emerging data sources such as direct measurement of emissions using mobile sensors.

Consultant-led Option

The consultant-led option would rely on a consultant with subject matter expertise to conduct the majority of the technical work necessary to produce the sector- and consumption-based inventories. The consultant would develop the necessary software tools to calculate the inventories as well as preparing materials to present results. The consultant-led option would assume the same level of investment in staff knowledge building as the basic option and the same level of investment in technical support to local partners as the expanded option.

Making GHG Emissions Inventory Data Accessible

Staff recommends that the GHG emissions inventory data be made available to internal and, potentially, external consumers via one or both of the By the Numbers and RLIS data hosting platforms. The feasibility and nature of this arrangement would ultimately depend on details related to considerations to be addressed during development of the work plan, namely data formats and update schedules.

Budgetary Implications

Given the current lack of a GHG emissions inventory program within Metro, there is very little in the way of existing or programmed budget resources associated with activities such as those included in the proposal. The Research Center's established on-road mobile source emissions modeling program, which supports efforts related to the RTP and the Climate Smart Strategy, amounts to an estimated average annual 0.08 FTE. This estimate includes technical work associated with estimating emissions of several dozen pollutants rather than GHGs alone, and it accounts for the highly intermittent nature of the demand for this work.

Table 1. Comparative Table of Proposal Alternatives (resource estimates include 25% contingency to account for uncertainty)

		Basic Option	Expanded Option	Consultant-led Option
FTE	One-time	1.0	1.5	1.0
	Ongoing	0.5	0.75	0.75
M&S	One-time	\$22,500	\$22,500	\$35,000
	Ongoing	\$2,500	\$2,500	\$25,000
Benefits		<ul style="list-style-type: none"> Aligns with state methodologies Quick start-up 	<ul style="list-style-type: none"> Aligns with state methodologies More durable than Basic option Demonstrates long-term commitment Engages partner jurisdictions 	<ul style="list-style-type: none"> Aligns with state methodologies Leverages consultant expertise Allows Metro staff to focus on regional coordination and support
Risks		<ul style="list-style-type: none"> Relies on DEQ goodwill for consumption-based inventory Potential for periodic loss of institutional knowledge in the event of staff turnover Lack of regional coordination 	<ul style="list-style-type: none"> Potential for periodic loss of institutional knowledge in the event of staff turnover Potential for conflicting numbers between inventories for identical geographies using different methodologies 	<ul style="list-style-type: none"> Metro less involved in technical details than in other options Potential for appearing less engaged Higher ongoing costs