Improving Transportation Inventories

Summary of February 14th Webinar

Developing a Multi-Year Urban GHG Emission Inventory by Harnessing the Breadth and Depth of an Urban Traffic Count Program

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Motivation:

- On-road transportation constitutes a significant portion of GHG emissions in urban areas.
- Exposure to traffic-related air pollution has been associated with a wide range of health effects: chronic illnesses, respiratory, cardiovascular diseases.

Why are we doing this:

- To better understand GHG emissions and traffic related air pollution

How can we use count data from traffic counts to generate volumes on the road and use those to further generate an emission inventory?

- We are generating an emission inventory for transportation
- There are two ways – from travel demand model – issue: we cant account for all cars

Challenge:

- Traffic counts are not conducted on every single road in an urban area
- To move from these isolated points where traffic counts are conducted, into generating a map that featured annual average daily traffic or other measure throughout the entire network.

Opportunity

- The city of Toronto manages an extensive traffic count network which allows them to estimate traffic volumes across their entire road network.
- The data is collected by:

- permanent stations - located on highways and major roads and they are capturing data from 1990 till now.

- short-period traffic count – these are done by automated recorders. They cover a large part of the city but the challenge is that they only capture a certain period of time (day of data, week of data and etc.).

- turning movement count – which are conducted manually – short period, usually for a specific project.

Research Question: How do we use the information from all these types of stations in order to create volumes across the entire network?

We develop an algorithm:

- **Traffic component:**

  - PECOUNT -1 – looks at the long-term traffic database;

  - PEACONT -2 - looks at the medium range traffic database. We have an aggregation algorithm.

  - PRTCS – the short – traffic database where we have an algorithm for pattern recognition.

  - KCOUNTS - is predicting volumes where we don't have a station at all

  - AADT database – Annual Average Daily Traffic for every road for every year.

- **Emission Component:** Using the volume (AADT) we can estimate emissions

- Traffic Emissions Prediction (TEPs) scheme is also a software application that generates all the information in an automatic way.
- Using Traffic Prediction Emissions we can generate:

    - AADT and vehicle kilometers travelled on all roads (2006 -2016)

    - Emissions of GHG, NOx, PM2.5 on all roads (2006-2016)

    - Total kilometers travelled and emissions per year for the City of Toronto (2006-2016)

- This allows city to calculate multi-year GHG emissions inventory

What else can you do with this tool?

- Having spatially refined traffic and emissions information open doors for the development of exposure surfaces for traffic-related air pollution – for example distribution of ultra-fine particles, black carbon and etc.
- We can identify better population exposure (using Transportation Tomorrow Survey (TTS) to track people how they move in the city in order to accumulate the 24h exposure)
- We can highlight these exposures from a health perspective
- We can identify factors that influence daily exposure while being outside (depending on neighborhood, activities, and trips taken)

Conclusion:

- We developed a tool that makes use of the extensive traffic data collected in Toronto to generate emissions estimates at the level of individual roads as well as over multiple years.
- This tool enables agencies to maintain an up to date transportation emissions profile that is more accurate than common data that is used (vehicle ownership and gas sales).
- Travel demand models are better suited for scenario and policy analysis.

Discussion/Questions:

1. How transferable is this tool among different jurisdictions? It is transferable if you have the data for that particular municipality traffic volume.
2. Different municipalities use different data: example vehicle owner information and estimation of how much travel per year, or taking national average amounts. Have you compared those types of inventories with the work that you have done? Yes. The motivation was to come up with robust emission inventory.
3. How different are the GHG emissions between the two models? Gas sales, downscaling national numbers, and vehicle ownership is rife with assumptions. Travel demand model cannot capture everything that goes on the road. Modelling transportation uses more robust data and allows for more sophistication in analysis.

Discussion/Questions:

4. What are the possibilities for this method to inform the policy (provincial, municipal) in terms of translation between inventories and policies. We really try to better enable this form of emission inventories – informed policy starts with having a good idea of what and how are the GHG emissions are generated. The strength of this model is to show where there is a larger problem in terms of special distribution and exposure. And over time you will be able to see patterns and learn from that or prioritize areas for interventions.

Discussion/Questions:

5. How do you move from home exposure to daily exposure? We took the data that is in the TTS data (which is a survey of travel patterns – people report on all the trips; activities they are taking in a day; it is conducted every 5 years; it covers GTHA area). We linked all these activities and intercepted that with the air pollution data. That is how we aggregate for the 24h exposure.

6. Moving from inventory stage to scenarios. How do we see the two playing together?

- It is a key question. The inventory can highlight a problem, which is the first part in creating a policy. You need to know the problem (what and where it is) and then to develop policy.

7. Can you take your findings and assess future exposure based on climatic changes and new developments – such as the switched from fossil fuel to EVs? Is that moving into the scenario planning?

- Yes, it is. And we are doing that. Looking at exposures and public health as of result of this exposure.