Determining Air Pollution Sources

Emission Inventory

To assess air quality for the next plan, DEQ develops a baseline air pollutant emission inventory (EI) to determine the primary sources of air pollution. A baseline EI provides the most current and comprehensive data on emissions within an air-shed. The inventory also serves as a foundation for measuring progress in emissions reductions.

In developing emission inventories, current EPA guidance recommends that the EPA National Emission Inventory (NEI) be used as a starting point for the baseline EI, and that the inventory be as comprehensive as possible. DEQ gathers emissions estimates for industry, on-road vehicles, non-road vehicles and equipment and stationary area sources. As in past baseline inventories when there are data gaps, DEQ will also rely on custom calculations, expert judgment, survey results, emissions modeling and consultation with EPA staff to generate emissions estimates. Once the inventory is as comprehensive and accurate as possible, DEQ will input the data into an air quality model in order to estimate pollutant levels.

Estimating Pollutant Levels: Modeling

Air quality modeling predicts estimates of current and future pollutant concentrations using emissions data provided in the inventory of emissions from sources described above. For this type of analysis, base year concentrations representing current conditions are estimated from modeled and monitored data. Modeling can then predict future year concentrations using estimated future emissions. Modeling can also be used to demonstrate the effectiveness of various control strategies. In this role, modeling use emissions from various control strategies to predict their concentrations for comparison to concentrations from uncontrolled emissions.

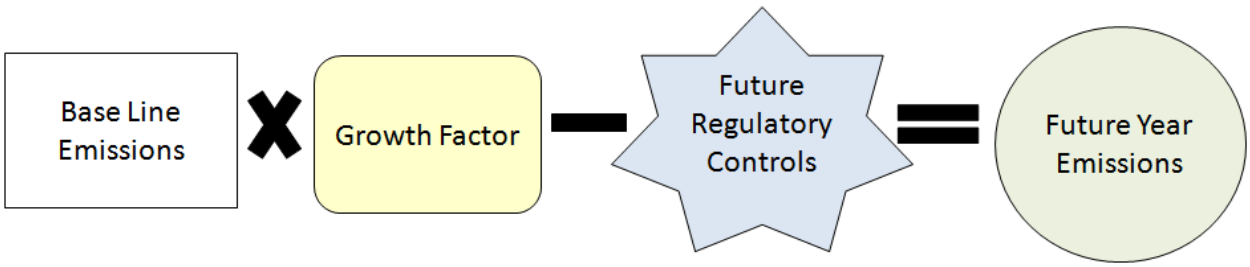
The use of air-quality models requires substantial effort and time. Modeling efforts are often preceded by analysis of all available air quality, emissions, and meteorological data. Some of the significant issues regarding air quality modeling:

1. selecting appropriate models
2. determining the geographic area to be covered by the modeling
3. selecting the meteorology for the analysis, including such factors as wind direction, air stability, temperature, solar radiation, and other variables

Initial model results usually inform further modeling efforts. It is an iterative process that leads to the goal of characterizing and understanding the distribution of current pollutant concentrations, and predicting the concentrations and distribution of future conditions. As part of this process alternative control strategies can be evaluated. For example, DEQ can use modeling together with other supporting analyses to assess the effectiveness of different proposed control strategies.

Projection of Emissions Estimates

To evaluate future air quality, DEQ analyses the impact of current strategies and rules on future emissions. DEQ estimates future emissions by applying growth factors to current or baseline emissions and subtracts any emissions that might be controlled by federal and state regulations. The figure below shows the elements of a future year emissions inventory projection.

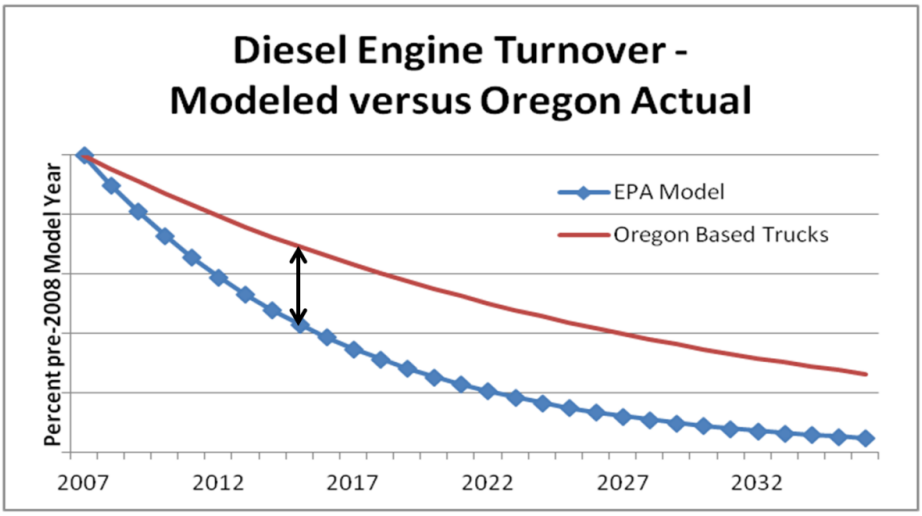


For population-based emissions, DEQ will project base year emissions using growth factors developed by the Portland State University Population Research Center. To project emissions from other source categories in a given air-shed, DEQ will likely use economic and employment forecast data developed by federally designated metropolitan planning organizations for that metropolitan area. As part of the projection process, DEQ can assess the effect of existing and future controls and strategies. In addition to current controls, DEQ can account for the impact of existing programs that have been implemented since the last plan.

For more specific information about the emission inventory and modeling work associated with the Portland Air Toxics Solutions study, see the final report here, http://www.deq.state.or.us/aq/planning/patsReport.htm.

Model Uncertainty

The models used in the PATS study were evaluated for their appropriatenessAny model presents itself with limitations as to uncertainty, for instance in model design or uncertainty associated with input parameters. In particular the model used in PATS, MOBILE 6.2, to estimate mobile source emissions is a robust model developed by EPA, representing the standard tool for emission calculation from mobile sources used by public agencies and private researchers. The model undergoes continuous development as new information and feedback is realized. In fact, since the PATS study EPA has upgraded the mobile source estimation tool to a completely different platform, known as MOVES 2014a, that now incorporates estimations for on-road and non-road sources. The MOVES model results in higher estimates of diesel particulate emissions than what were calculated using MOBILE 6, suggesting the PATs results underestimate diesel PM when forecasting.



Another datum leading to uncertainty in the PATs results is the assumptions underlying fleet turnover to lower emitting vehicles and equipment. EPA has assumed a default in the model for 10 percent of the fleet, both on-road and non-road, to turnover to newer, lower emitting vehicles and equipment. Oregon registration data for medium and heavy duty trucks has indicated lower turnover rates, between 4 and 6 percent per year. The PATS study relied on the EPA defaults for fleet turnover, again suggesting

the model underestimated emissions by overestimating the proportion of vehicles operating with lower emitting engines.