CHAPTER 8

RECENT REFINEMENTS, UNCERTAINTY, AND FUTURE ACTIONS

INTRODUCTION

The District's socioeconomic analysis has evolved over the years. The Socioeconomic Report for the 2003 AQMP identified key areas for recent refinements. Despite the use of a variety of tools and the inclusion of these refinements in assessing the socioeconomic impacts of the 2007 AQMP, the socioeconomic analysis herein could not address all issues. The assessment of some of these issues requires linking information from multiple fields and using data that is currently unavailable. Overcoming these constraints will require interdisciplinary research, data collection, and a combination of approaches. The District plans to continue to work with the Scientific, Technical and Modeling Peer Review Advisory Group (STMPRAG), the Ethnic Community Advisory Group (ECAG), the Local Government and Small Business Assistance Advisory Group (LGSBAAG), and other interested parties to improve its socioeconomic analysis.

Issues that are not addressed in the 2007 AQMP will be pursued for future AQMP revisions. Described below are recent refinements, uncertainty of the current analysis, and recommended actions for the future.

RECENT REFINEMENTS

Recent refinements to the socioeconomic analysis cover the following areas: benefits and costs of clean air, distributional impacts on sub-regions and industries, and impacts on local competitiveness.

Benefits of Clean Air

The Socioeconomic Report of the 2007 AQMP makes significant progress in quantifying health benefit assessments for ozone and $PM_{2.5}$. Concentration-response relationships between health effects and ozone and $PM_{2.5}$ from recent literature were selected and a new health benefit model, BenMAP, was employed to assess population exposure and monetary values of avoided health effects. Sensitivity tests were performed to examine the magnitude of health benefits relative to the California state standards (threshold) as opposed to no concentration (no threshold). Multiple health functions were employed for a single health effect to arrive at a range of avoided cases and associated monetary values.

Except for the material benefit assessment, all other benefit assessments were performed either at the air quality grid level or the sub-region level which is in sharp contrast to a more aggregated approach where air quality data at the county or basinwide level was utilized. The sub-county geography provides finer details on clean air benefits at the community level.

Costs of Clean Air

Thirty-three short-term control measures in the 2007 AQMP (representing 47 percent of the total intended emission reductions) were quantified with costs. For the 95 percent of emission reductions from short-term measures or quantified measures in the 2007 AQMP, the cost estimation approach began at the facility level for point sources and at the air quality modeling grid level for area, on-road, and off-road sources. In order to facilitate the process, each facility was associated with an industry designation. The designation was switched from the Standard Industrial Classification (SIC) code to the North American Industrial Classification System (NAICS) via the Dun & Bradstreet facility data base, District inspectors' reports, internet, and telephone contacts with the facilities in the 2002 emission inventory. The cost assessment for SCAG transportation control measures was performed at the sub-region level. The approach adopted here directly links costs to emission sources and thus reduces the uncertainty in cost allocation.

Distributional Impacts

The REMI model, which is used for assessing direct and indirect impacts on various entities on the local economy, has been refined from a county-based geography to a sub-county geography. The division into 19 sub-regions is to further align costs of control measures, benefits of clean air, and macroeconomic impacts at a smaller geographic level. The linkage between emissions, ambient concentration of pollutants, and published and projected socioeconomic data provides a baseline socioeconomic profile for affected sources as well as a foundation to assess socioeconomic impacts of emission reductions on the local economy. This effort also represents integration of several disciplines in terms of data alignment. For example, emission and pollutant concentration data is compiled more towards natural geography than the socioeconomic data which is displayed according to political boundaries.

The 5-percent sample of housing units and people in these units from Public Use Micro data Sample (PUMS) files in the 2000 Census was used to calculate the race and ethnicity distribution of workforce in the four-county area. This was performed by major industry. The distribution was then overlaid on job impacts of the Plan to assess job impacts by race and ethnicity.

Competitiveness

Local firms that sell products in national or international markets have to compete with firms located in less polluted regions or those subject to fewer regulations. The analysis herein focuses on the impacts at the macroeconomic level. During rulemaking, the District has focused more on examining profiles of companies affected by individual rules to supplement the macro-level analysis. The profiles include annual sales of average firms, the total number and size of affected firms, and the number of employees and profit margins of affected firms. This micro-level analysis is possible in those instances where affected companies can be specifically identified and reliability of data on their profile can be verified.

UNCERTAINTY AND CAVEATS

As with any complex analysis, some uncertainty is inherent in the methodology employed. Consequently, caveats need to be applied in interpreting the results. The key areas of uncertainty and caveats in this socioeconomic assessment are in estimating emission reductions, costs, air quality changes, and health benefits, among others.

Data

The analysis herein is performed separately for quantified measures and clean air benefits because the cost of these measures reflects only 47 percent of the total emission reductions while 100 percent of emission reductions were included in the attainment demonstration in air quality models.

The cost analysis for unquantified measures (mostly the long-term measures) was based on the cost of quantified measures (short-term measures) since the former is largely undefined in terms of affected industries, control technologies, and the extent of control, among others. However, since all the long-term measures are in the mobile source category and rely heavily on accelerated fleet turnover, extrapolation from short-term measures, which are dominated by mobile sources and fleet turnover, is reasonable. Should NOx retrofit technologies become more widely available for on-road and off-road applications, the control costs would be significantly lower.

The projected costs of control measures could also differ from the actual costs due to advancement of innovative technologies and unexpected modifications to existing plant structure to accommodate control devices. In the past, the District has worked with the CARB to examine actual costs during rule implementation. To estimate the cost of unquantified measures, a range of cost effectiveness for the quantified measures was used. In addition, achieving the final increment towards attainment might result in higher costs as suggested by the STMPRAG.

The benefit of the Plan was based on the full implementation of emission reductions from all measures but not all benefits can be quantified. The health benefit analysis in this report is limited by the availability of health studies that quantify health effects associated with exposure to various pollutants and their economic valuation. Not all the known adverse health effects caused by air pollution have been quantified. Similarly, not all other clean air benefits such as congestion relief are quantifiable at this time.

Three adult mortality functions for $PM_{2.5}$ and three mortality functions for all ages were selected for the analysis of premature deaths. For the $PM_{2.5}$ mortality analysis, a pooled estimate with weights on each function was used. For the ozone mortality analysis, a central estimate was used. A sensitivity analysis was provided in this report to illustrate the potential range of these estimates.

The rapidly-changing structure of population and workforce in the four-county area makes uncertain the projection of distribution of job impacts among ethnic and racial groups based on the 2000 Census. Estimation of job impacts on unquantified benefits and measures cannot be performed until they are fully quantified relative to their costs.

Air Quality Models

Air quality modeling used the most current estimates of emissions, prognostic meteorological models, multilayered dispersion platforms (i.e., CAMx), and sophisticated chemistry modules. Chapter 1 of Appendix V of the Draft 2007 AQMP provides a summary of the impacts of uncertainty for the various inputs and models used in an air quality simulation. The key areas of uncertainty impacting the estimation of future year health benefits arise from the reliance on extrapolation of the relative response factors (RRFs) derived from the 19 simulated ozone episodic days throughout the year. Using a different set of episode days from alternate periods of the year or varying the number of episodes included would impact the outcome of the analysis. In addition, care needs to be taken in calculating and applying nighttime RRFs. One suggestion is to limit the RRF calculation to daylight hours only while holding nighttime ozone constant with an RRF of 1.0.

For the 2007 AQMP, it was assumed that the spring and summer average response to emission reductions could be representative of the full year. In general, ozone levels observed in fall and winter in the Basin are significantly lower than spring and summer levels and often only nominally exceed background concentrations. Applying the spring and summer average RRFs to the fall and winter ozone concentrations is expected to result in a nominal impact on ozone air quality. Thus, while the use of spring and summer RRFs will introduce uncertainty, the impact should be minimal.

A second type of uncertainty came from the extrapolation of the 2005 air quality monitoring data to 2,600 5 kilometer by 5 kilometer grids. The air quality modeling which is the basis for the RRF calculation is assessed for the full modeling domain. The response to controls for the socioeconomic analysis is dependent on the 2005 interpolated data. Selection of different interpolation methodologies, such as distance weighting or kriging, will result in similar patterns. However, different interpolation methodologies would not result in exact duplications. The uncertainty associated with the selection of the interpolation methodology would be mostly restricted to the spatial allocation of air quality data between grids in the Basin and has a nominal impact, if any, on regional analyses.

REMI Model

The REMI model, which was used to analyze the impacts of the 2007 AQMP, projects possible impacts on jobs, distribution of jobs, income, cost of production, relative delivered prices, exports, and imports based upon cost data for control measures and the benefit data for each effect of clean air. The projections are based on national and local statistics for a cluster of economic actors such as industries and population by age and cohort. These statistics reflect the net changes of all the events on these actors and cannot be segregated into gross changes of individual events.

Due to data limitations the REMI analysis herein only includes the short-term measures where affected industries, equipment, and/or control technology are specified. As technology evolves and long-term measures become more defined, the analysis would become more inclusive. In addition, during rule development more detailed industry- or facility-specific socioeconomic analysis will be performed to the extent feasible before the District or CARB adopts a regulation.

Because of cleaner air, economic migrants are willing to move into the Basin in exchange for lower earnings (wage and salary) than what the Basin would otherwise be. Currently, there is no systematic approach to evaluating migration of retired persons as they do not belong to the labor force. Therefore, their willingness to pay (and non-wage generated income stream) for avoided morbidity and mortality is not accounted for in the migration functions that were used only for economic migrants in the labor force.

The actual effects of the 2007 AQMP (including unquantified measures and benefits) on regional competitiveness could vary from the projected effects of quantified measures and benefits since the analysis assumes that all control costs are "extra" costs when compared to air pollution control costs in other regions and underestimates the clean air benefits that would increase regional attractiveness. This ignores the fact that competing regions often adopt control measures similar to the District's or at least impose some level of control with additional costs.

FUTURE ENHANCEMENTS

Previous AQMPs have identified actions that would further enhance the ability to quantify and evaluate the benefits and costs of the proposed Plan. This Socioeconomic Report has accomplished several of these actions and identified others for future assessments. Enhancements to this Socioeconomic Report include the conversion to the North American Industrial Classification System and new health benefit assessment for the improvements in $PM_{2.5}$ and ozone.

The STMPRAG, ECAG, and LGSBAAG recommended the following enhancements for future AQMPs:

- Incorporate health benefits resulting from reductions in air toxic pollutants such as diesel particulates;
- Divide the two eastern counties into finer geography;
- Develop methodology to include long-term measures or unquantifiable measures as part of the overall socioeconomic assessments;
- Expand sub-regional analyses to include environmental justice (EJ) areas. These areas may be classified by income or race; and
- Evaluate potential social ramifications of migration and job losses.

Furthermore, future enhancements to health benefit assessments would include the impact of exposure to pollutants on life expectancy, differential impacts on various segments of the population, and identification of significant pollutant thresholds. Refinement of air quality modeling techniques should also be pursued in light of the current analysis of air quality changes as reflected in various concentration-response functions in the health benefit assessment, which is often beyond the SIP planning requirements for attainment demonstration.

The socioeconomic analysis will continue to evolve to reflect changes in regulatory structure such as greater reliance on incentive programs and public financing strategy. Building a time series database would enhance the assessment on specific segments of an industry, facilitate the alignment with published governmental statistics, and strengthen the analysis on competitiveness impacts. To this end, future efforts may include the use of different databases to track existing facilities and new facilities, review of inspectors' reports for annotated information on firm turnover and closure, and identification of start-up companies in high tech disciplines.