CO_2 Emission Analysis Method for Project-Level Analysis Using the ARB EMFAC Model and the UCD Mobile Source Air Toxics (MSAT) Spreadsheet

In general, carbon dioxide (CO_2, the primary anthropogenic greenhouse gas) is not suitable for project-level analysis. Its effects are global in nature, and the impacts of any single transportation project – or even a regional group of them – cannot be effectively estimated in terms of global warming effect. CO_2 emissions from project operation, however, can be estimated using EMFAC, and if necessary can be reported in an environmental document in order to distinguish between alternatives. This would be similar in concept to the Level 3 air toxics analysis process under the FHWA Interim Guidance.

The following procedure uses the UCD spreadsheet that was recently developed for air toxics analysis to assist District 7. It has not been validated with the Air Resources Board or any other agency, and should be used only if numeric analysis is immediately required pending development of more complete analysis methods. The procedure has been reviewed by FHWA and appears to generally be consistent with their desired approach if numeric analysis of operational CO_2 is required.

- Download (if you don't have it already) and install the latest UCD MSAT spreadsheet: http://aqp.engr.ucdavis.edu/Documents/UCD_MSAT_Worksheet_11_13_2006.xls
- Download (if you don't have it already) the UCD instructions for use of the spreadsheet: http://aqp.engr.ucdavis.edu/Documents/UCD_MSAT_Report_12_28_2006.pdf
- Download (for information only) the UCD PowerPoint presentation about the spreadsheet: http://aqp.engr.ucdavis.edu/Documents/UCD-MSAT-Handout-PDF-color.pdf

To use the UCD MSAT spreadsheet as a tool for CO_2 estimation:

1) Prepare the UCD spreadsheet for use according to UCD instructions for doing a MSAT analysis – complete the "Project Info" tab.
2) Copy EMFAC output to the spreadsheet according to the spreadsheet instructions. Copy CO_2 data, and place it where you would normally insert the "TOG" data. CO_2 data are found at lines 80-92 of the raw EMFAC data after pasting into the UCD spreadsheet ("Original Data from EMFAC" tab); use this instead of the "TOG" data described in the spreadsheet instructions and found at lines 20-32. Paste it into the "TOG" section of the "Block Data from EMFAC" tab.
3) Choose the composite emission factors in the "CEF" tab from the columns labeled "Hot Stabilized Exhaust TOG" for diesel and non-diesel vehicles and paste into the "Table 1" tab as instructed for MSAT analysis, or choose the "hot stabilized exhaust TOG" values for diesel and non-diesel for the speed closest to the daily average speed. If peak speeds differ substantially from average daily speed and peak periods last for an extended time (several hours or more), it would be more precise to calculate the emissions separately for peak and off-peak periods for each engine type and add them, rather than using the average daily speed.
4) Multiply the chosen composite emission factors by the VMT/day for the chosen analysis year for diesel and non-diesel vehicles on the project. This will produce emissions in grams per day for each group, and for peak and off-peak periods if split between them. The numbers will be very large. Add them for the total project emissions. VMT data can be found in "Project Emissions" tab from the columns labeled "Traffic Activity" ("Diesel VMT" and "Non-diesel VMT").
5) Apply a suitable conversion factor to yield values in the units desired for reporting.

For more detailed analysis procedures related to energy consumption, which is closely related to greenhouse gas production, refer to the Energy and Transportation Systems report at the Caltrans DRI web site. Project-level energy analysis information can also be found in the Caltrans Standard Environmental Reference, Chapter 13. Caltrans' Climate Action Report is also available at the Caltrans web site.