

Training Exercises

Exercise Setup

- Folders for each Exercise
- Save input/output to folders for each Exercise
- Exercises require MS Office 2007 (Excel).

Exercise #1: Daily Emissions Inventory

- Problem: This exercise will generate an average daily emissions inventory for Hong Kong for calendar year 2030. Assume model defaults, except as noted below. I/M programs begin in 2014.
- Purpose: familiarization with emission inventories; using BURDEN output formats
- Scenario input data:
 - Geographic Area: **Hong Kong SAR**
 - Calendar Years: **2030**
 - No Alternate Baseline Year
 - Season: **Annual**
 - Scenario Type: **BURDEN**
 - Output File types: Detailed Planning Inventory (**CSV**), **MVEI7G (BCD)**
 - Output Frequency: **daily**
 - Pollutants: **PM10, VOC**


Exercise #1: Notes


- Requires 1 scenario for calendar year 2030
- Save Input File As: **HK_2030_Burden.inp**

Exercise #1: Input 1 Tab

Emfac-HK V3.1 -- Editing data

File Run Help

 Environmental Protection Department
The Government of the Hong Kong
Special Administrative Region

 HONG KONG

permitted by
Air Resources Board
California

Emfac-HK V3.1 V3.1 20160104 Pr: Emfac-HK HK3.1

Input 1 | Input 2 | Mode and Output | Tech/IM | Base / Cal. Yr Basis | . | . | .

Basic scenario data - Select Area, Calculation Method, Calendar Year, Alternate Base Year and Season

Step 1 - Geographic Area

Area Type: SAR SAR

SAR Hong Kong

Step 2a - Calendar Year

Select

Calendar year 2030 selected

Scenario Year for Output

Step 2b - Alternate Base Year

Select

Alternate Base Data Year INACTIVE

OPTIONAL: Selecting this option overrides EMFAC-HK default base year.

Step 3 - Season or Month

Annual

Cancel Next > Finish

Calendar Year Selection

Available	Included
1997	2030
1998	
1999	
2000	
2001	
2002	
2003	
2004	
2005	
2006	
2007	
2008	
2009	
2010	
2011	
2012	
2013	
2014	
2015	
...	

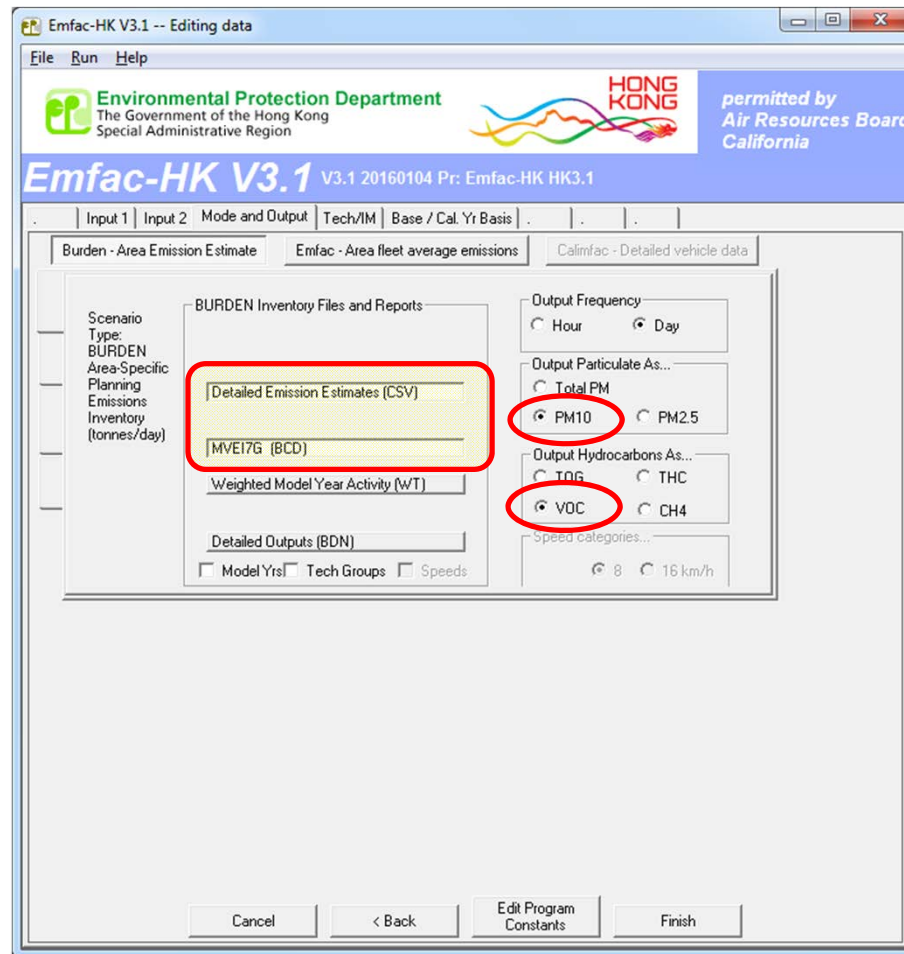
> <

All All

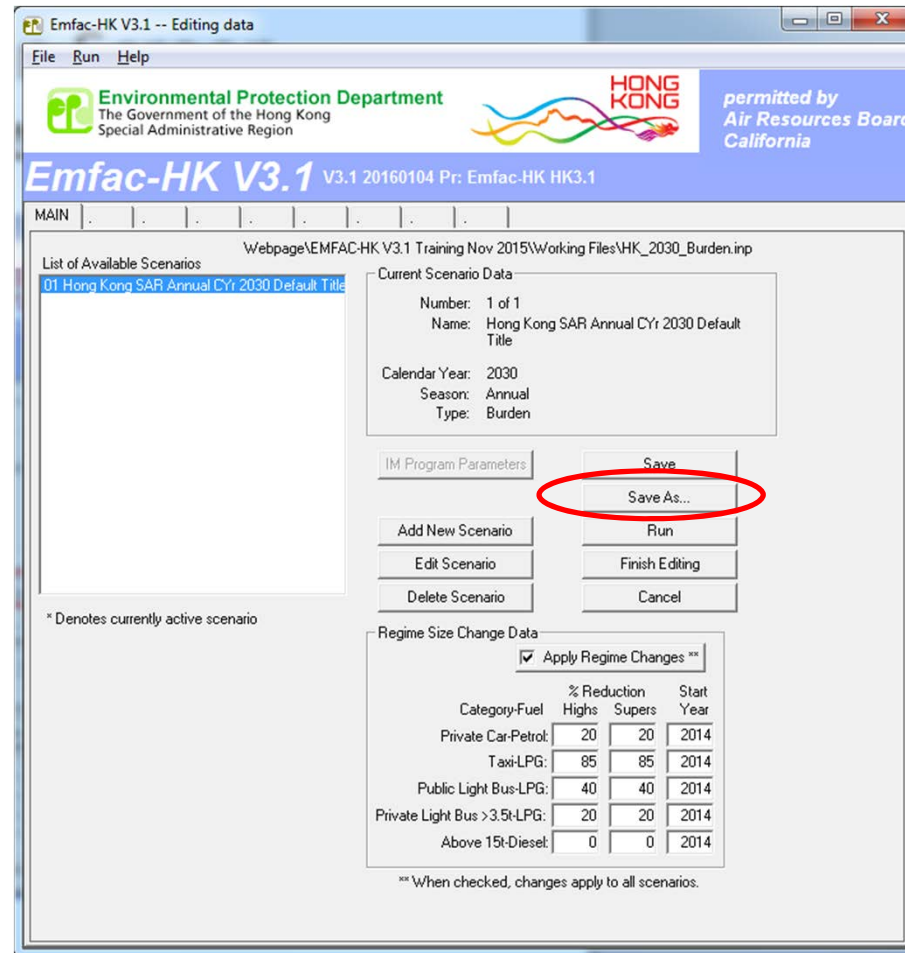
Calendar year 2030 selected

OK Cancel

Exercise #1: Mode and Output Tab



Exercise #1: Main Screen After All Edits Applied



Exercise #1: Output Generated



463 KB	Microsoft Office Exc...	11/3/2015 12:57 AM
25 KB	Microsoft Office Exc...	11/3/2015 12:57 AM
1 KB	INP File	11/2/2015 11:33 PM
1 KB	Text Document	11/3/2015 12:57 AM

Exercise #1: Format of the MVEI7G File with *.BCD.CSV Extension

The screenshot displays a Microsoft Excel spreadsheet with the following data:

CALYR	START MY	END MYR	REGION	SAR	STARTS	POPULATI	VKT	VEH TYPE	VEH TECH	POLLUTAN	PROCESS	EMISSION BASIS
2030	1986	2030	SAR Average	Hong Kong SAR Average	4	3	51	PC	NCAT	CO	Run Exh	0.002494 Day
2030	1986	2030	SAR Average	Hong Kong SAR Average	4	3	51	PC	NCAT	NOx	Run Exh	0.000183 Day
2030	1986	2030	SAR Average	Hong Kong SAR Average	4	3	51	PC	NCAT	PM	Run Exh	0.000001 Day
2030	1986	2030	SAR Average	Hong Kong SAR Average	4	3	51	PC	NCAT	VOC	Run Exh	0.000104 Day
2030	1986	2030	SAR Average	Hong Kong SAR Average	4	3	51	PC	NCAT	CO2	Run Exh	0.010821 Day
2030	1986	2030	SAR Average	Hong Kong SAR Average	4	3	51	PC	NCAT	CO	Start Ex	0.000351 Day
2030	1986	2030	SAR Average	Hong Kong SAR Average	4	3	51	PC	NCAT	NOx	Start Ex	0.000034 Day
2030	1986	2030	SAR Average	Hong Kong SAR Average	4	3	51	PC	NCAT	PM	Start Ex	0 Day
2030	1986	2030	SAR Average	Hong Kong SAR Average	4	3	51	PC	NCAT	VOC	Start Ex	0.000064 Day
2030	1986	2030	SAR Average	Hong Kong SAR Average	4	3	51	PC	NCAT	CO2	Start Ex	0.000884 Day
2030	1986	2030	SAR Average	Hong Kong SAR Average	4	3	51	PC	NCAT	CO	Hot Soak	0 Day
2030	1986	2030	SAR Average	Hong Kong SAR Average	4	3	51	PC	NCAT	NOx	Hot Soak	0 Day
2030	1986	2030	SAR Average	Hong Kong SAR Average	4	3	51	PC	NCAT	PM	Hot Soak	0 Day
2030	1986	2030	SAR Average	Hong Kong SAR Average	4	3	51	PC	NCAT	VOC	Hot Soak	0.00002 Day
2030	1986	2030	SAR Average	Hong Kong SAR Average	4	3	51	PC	NCAT	CO2	Hot Soak	0 Day
2030	1986	2030	SAR Average	Hong Kong SAR Average	4	3	51	PC	NCAT	CO	Running	0 Day
2030	1986	2030	SAR Average	Hong Kong SAR Average	4	3	51	PC	NCAT	NOx	Running	0 Day
2030	1986	2030	SAR Average	Hong Kong SAR Average	4	3	51	PC	NCAT	PM	Running	0 Day
2030	1986	2030	SAR Average	Hong Kong SAR Average	4	3	51	PC	NCAT	VOC	Running	0.000094 Day
2030	1986	2030	SAR Average	Hong Kong SAR Average	4	3	51	PC	NCAT	CO2	Running	0 Day
2030	1986	2030	SAR Average	Hong Kong SAR Average	4	3	51	PC	NCAT	CO	PD Rest	0 Day
2030	1986	2030	SAR Average	Hong Kong SAR Average	4	3	51	PC	NCAT	NOx	PD Rest	0 Day
2030	1986	2030	SAR Average	Hong Kong SAR Average	4	3	51	PC	NCAT	PM	PD Rest	0 Day
2030	1986	2030	SAR Average	Hong Kong SAR Average	4	3	51	PC	NCAT	VOC	PD Rest	0.000036 Day
2030	1986	2030	SAR Average	Hong Kong SAR Average	4	3	51	PC	NCAT	CO2	PD Rest	0 Day
2030	1986	2030	SAR Average	Hong Kong SAR Average	4	3	51	PC	NCAT	CO	MD Rest	0 Day
2030	1986	2030	SAR Average	Hong Kong SAR Average	4	3	51	PC	NCAT	NOx	MD Rest	0 Day
2030	1986	2030	SAR Average	Hong Kong SAR Average	4	3	51	PC	NCAT	PM	MD Rest	0 Day
2030	1986	2030	SAR Average	Hong Kong SAR Average	4	3	51	PC	NCAT	VOC	MD Rest	0.000002 Day
2030	1986	2030	SAR Average	Hong Kong SAR Average	4	3	51	PC	NCAT	CO2	MD Rest	0 Day
2030	1986	2030	SAR Average	Hong Kong SAR Average	4	3	51	PC	NCAT	CO	Resting	0 Day
2030	1986	2030	SAR Average	Hong Kong SAR Average	4	3	51	PC	NCAT	NOx	Resting	0 Day
2030	1986	2030	SAR Average	Hong Kong SAR Average	4	3	51	PC	NCAT	PM	Resting	0 Day
2030	1986	2030	SAR Average	Hong Kong SAR Average	4	3	51	PC	NCAT	VOC	Resting	0.000039 Day
2030	1986	2030	SAR Average	Hong Kong SAR Average	4	3	51	PC	NCAT	CO2	Resting	0 Day
2030	1986	2030	SAR Average	Hong Kong SAR Average	4	3	51	PC	NCAT	CO	PD Diurn	0 Day

Exercise #1a: Processing BCD Output

- Problem: using BCD output from Exercise #1, determine total NO_x running exhaust emissions for 2030.
- Purpose: post processing of BCD output, single year scenario
- Hints:
 - Import *.BCD.CSV directly into spreadsheet
 - Use data filters
 - pollutant (NO_x), process (“Run Exh”)
 - Copy filtered results to a separate tab in spreadsheet for analysis

Exercise #1a: Solution

Microsoft Excel screenshot showing a spreadsheet titled "Ex1a.xlsx". The spreadsheet displays "EMFAC-HK V3.1 Filtered Results" with columns for CALYR, START MYR, END MYR, REGION, SAR, STARTS, POPULATION, VKT, VEH TYPE, VEH TECH, POLLUTANT, PROCESS, EMISSIONS, and BASIS. The data is organized into rows, with the final row (row 31) highlighted in yellow.

CALYR	START MYR	END MYR	REGION	SAR	STARTS	POPULATION	VKT	VEH TYPE	VEH TECH	POLLUTANT	PROCESS	EMISSIONS	BASIS
2030	1986	2030	SAR Average	Hong Kong SAR Average	4	3	51	PC	NCAT	NOx	Run Exh	0.000183	Day
2030	1986	2030	SAR Average	Hong Kong SAR Average	1176000	783921	21887210	PC	CAT	NOx	Run Exh	0.227139	Day
2030	1986	2030	SAR Average	Hong Kong SAR Average	9170	6113	171471	PC	DSL	NOx	Run Exh	0.003731	Day
2030	1986	2030	SAR Average	Hong Kong SAR Average	72779	18193	7665956	TAXI	LPG	NOx	Run Exh	1.941897	Day
2030	1986	2030	SAR Average	Hong Kong SAR Average	1	0	14	LGV3	NCAT	NOx	Run Exh	0.00005	Day
2030	1986	2030	SAR Average	Hong Kong SAR Average	7	2	96	LGV3	CAT	NOx	Run Exh	0.000148	Day
2030	1986	2030	SAR Average	Hong Kong SAR Average	4011	1003	74275	LGV3	DSL	NOx	Run Exh	0.028923	Day
2030	1986	2030	SAR Average	Hong Kong SAR Average	1	0	7	LGV4	NCAT	NOx	Run Exh	0.000025	Day
2030	1986	2030	SAR Average	Hong Kong SAR Average	4230	1057	67122	LGV4	CAT	NOx	Run Exh	0.001887	Day
2030	1986	2030	SAR Average	Hong Kong SAR Average	215287	53816	3549671	LGV4	DSL	NOx	Run Exh	1.442728	Day
2030	1986	2030	SAR Average	Hong Kong SAR Average	106611	26653	2547737	LGV6	DSL	NOx	Run Exh	0.973116	Day
2030	1986	2030	SAR Average	Hong Kong SAR Average	50919	12731	1055561	HGV7	DSL	NOx	Run Exh	1.012759	Day
2030	1986	2030	SAR Average	Hong Kong SAR Average	137375	34347	2849234	HGV8	DSL	NOx	Run Exh	2.498596	Day
2030	1986	2030	SAR Average	Hong Kong SAR Average	6491	1623	485981	PLB	DSL	NOx	Run Exh	0.505804	Day
2030	1986	2030	SAR Average	Hong Kong SAR Average	10891	2723	815425	PLB	LPG	NOx	Run Exh	0.450059	Day
2030	1986	2030	SAR Average	Hong Kong SAR Average	1768	632	60388	PV4	CAT	NOx	Run Exh	0.002693	Day
2030	1986	2030	SAR Average	Hong Kong SAR Average	1132	404	41023	PV4	DSL	NOx	Run Exh	0.031824	Day
2030	1986	2030	SAR Average	Hong Kong SAR Average	7	2	106	PV5	CAT	NOx	Run Exh	0.000052	Day
2030	1986	2030	SAR Average	Hong Kong SAR Average	6551	2340	183584	PV5	DSL	NOx	Run Exh	0.182131	Day
2030	1986	2030	SAR Average	Hong Kong SAR Average	1869	668	49542	PV5	LPG	NOx	Run Exh	0.017966	Day
2030	1986	2030	SAR Average	Hong Kong SAR Average	11729	2932	347715	NFB6	DSL	NOx	Run Exh	0.661266	Day
2030	1986	2030	SAR Average	Hong Kong SAR Average	8217	2054	239204	NFB7	DSL	NOx	Run Exh	0.247604	Day
2030	1986	2030	SAR Average	Hong Kong SAR Average	11833	2958	343951	NFB8	DSL	NOx	Run Exh	0.214364	Day
2030	1986	2030	SAR Average	Hong Kong SAR Average	4140	388	72384	FBSD	DSL	NOx	Run Exh	0.060772	Day
2030	1986	2030	SAR Average	Hong Kong SAR Average	57633	5403	1265799	FBDD	DSL	NOx	Run Exh	2.737143	Day
2030	1986	2030	SAR Average	Hong Kong SAR Average	14684	2447	25492	MC	NCAT	NOx	Run Exh	0.015576	Day
2030	1986	2030	SAR Average	Hong Kong SAR Average	409348	68218	1292455	MC	CAT	NOx	Run Exh	0.364088	Day
2030	1986	2030	SAR Average	Hong Kong SAR Average	2322688	1030631	45091454	ALL	ALL	NOx	Run Exh	13.622524	Day

Exercise #1b: Processing Text/CSV Output

- Problem: using Text/CSV output from Exercise #1, determine total NO_x running exhaust emissions for 2030.
- Post processing of Text/CSV output

Exercise #1b: Processing Text/CSV Output

HK_2030_Burden.csv - Microsoft Excel

CD29 13.62252

	BR	BS	BT	BU	BV	BW	BX	BY	BZ	CA	CB	CC	CD
1 Title : Hong Kong SAR Annual Cyr 2030 Default Title													
2 Version : Emfac-HK V3.1 V3.1 20160104 Pr: Emfac-HK HK3.1													
3 Run Date : 2016/01/07 17:14:00													
4 Scen Year: 2030 -- All model years in the range 1986 to 2030 selected													
5 Season : Annual													
6 Area : Hong Kong SAR													
7 I/M Stat : HK I/M CY2013+ program in effect													
8 Emissions: Tonnes Per Day													
9													
10													
	FBSD-LPG	FBSD-TOT	FBDD-NCAT	FBDD-CAT	FBDD-DSL	FBDD-LPG	FBDD-TOT	MC-NCAT	MC-CAT	MC-DSL	MC-LPG	MC-TOT	ALL-TOT
11 Vehicles	0	388	0	0	5403	0	5403	2447	68218	0	0	70665	1030630
12 VKT	0	72384	0	0	1265799	0	1265799	25492	1292455	0	0	1317947	45091452
13 Trips	0	4140	0	0	57633	0	57633	14684	409348	0	0	424033	2322690
14 VOC Emissions													
15 Run Exh	0	0.01074	0	0	0.07503	0	0.07503	0.07161	0.2916	0	0	0.36321	1.69422
16 Start Ex	0	0	0	0	0	0	0	0.04048	0.15995	0	0	0.20042	0.37622
17													
18													
19 Diurnal	0	0	0	0	0	0	0	0.10322	0.17689	0	0	0.28011	0.58213
20 Hot Soak	0	0	0	0	0	0	0	0.2853	0.16545	0	0	0.45075	0.64633
21 Running	0	0	0	0	0	0	0	1.46785	0.41615	0	0	1.88401	2.18922
22 Resting	0	0	0	0	0	0	0	0.13957	0.17517	0	0	0.31474	0.82765
23													
24 Carbon Monoxide Emissions													
25 Run Exh	0	0.16886	0	0	2.41637	0	2.41637	0.63442	3.61199	0	0	4.24641	48.4395
26 Start Ex	0	0	0	0	0	0	0	0.13904	1.27459	0	0	1.41364	5.52489
27													
28 Oxides of Nitrogen Emissions													
29 Run Exh	0	0.06077	0	0	2.73714	0	2.73714	0.01558	0.36409	0	0	0.37966	13.62252
30 Start Ex	0	0	0	0	0	0	0	0.00537	0.07087	0	0	0.07625	0.2141
31													
32 Carbon Dioxide Emissions (000)													
33 Run Exh	0	0.06838	0	0	1.56388	0	1.56388	0.00234	0.16709	0	0	0.16943	14.75557
34 Start Ex	0	0	0	0	0	0	0	0.00087	0.01255	0	0	0.01341	0.10679
35													
36 PM10 Emissions													
37 Run Exh	0	0.00423	0	0	0.1779	0	0.1779	0.00087	0.00272	0	0	0.00359	0.57027

Exercise #1c: Determine Fleet-Average Emissions

- Problem: using spreadsheet results obtained in Exercise #1a, determine the *fleet-average* NO_x emission factor (gram/km) for all vehicles for 2030.
- Purpose: Convert emission rate to an emission factor
- Steps
 - Divide EMISSIONS Column by VKT Column
 - Sum over all vehicle classes to get composite.
 - Convert units to obtain grams/km

Exercise #1c: Solution

Ex1.xlsx - Microsoft Excel

M10 0.000025

1	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
1	EMFAC-HK V3.1 Filtered Results															
2	CALYR	START MYR	END MYR	REGION	SAR	STARTS	POPULATION	VKT	VEH TYPE	VEH TECH	POLLUTANT	PROCESS	EMISSIONS	BASIS	EMISSION FACTOR (g/km)	
3	2030	1986	2030	SAR Average	Hong Kong SAR Average	4	3	51	PC	NCAT	NOx	Run Exh	0.000183	Day	3.5882	
4	2030	1986	2030	SAR Average	Hong Kong SAR Average	1176000	783921	21887210	PC	CAT	NOx	Run Exh	0.227139	Day	0.0104	
5	2030	1986	2030	SAR Average	Hong Kong SAR Average	9170	6113	171471	PC	DSL	NOx	Run Exh	0.003731	Day	0.0218	
6	2030	1986	2030	SAR Average	Hong Kong SAR Average	72779	18193	7665956	TAXI	LPG	NOx	Run Exh	1.941897	Day	0.2533	
7	2030	1986	2030	SAR Average	Hong Kong SAR Average	1	0	14	LGV3	NCAT	NOx	Run Exh	0.00005	Day	3.5714	
8	2030	1986	2030	SAR Average	Hong Kong SAR Average	7	2	96	LGV3	CAT	NOx	Run Exh	0.000148	Day	1.5417	
9	2030	1986	2030	SAR Average	Hong Kong SAR Average	4011	1003	74275	LGV3	DSL	NOx	Run Exh	0.028923	Day	0.3894	
10	2030	1986	2030	SAR Average	Hong Kong SAR Average	1	0	7	LGV4	NCAT	NOx	Run Exh	0.000025	Day	3.5714	
11	2030	1986	2030	SAR Average	Hong Kong SAR Average	4230	1057	67122	LGV4	CAT	NOx	Run Exh	0.001887	Day	0.0281	
12	2030	1986	2030	SAR Average	Hong Kong SAR Average	215287	53816	3549671	LGV4	DSL	NOx	Run Exh	1.442728	Day	0.4064	
13	2030	1986	2030	SAR Average	Hong Kong SAR Average	106611	26653	2547737	LGV6	DSL	NOx	Run Exh	0.973116	Day	0.3820	
14	2030	1986	2030	SAR Average	Hong Kong SAR Average	50919	12731	1055561	HGV7	DSL	NOx	Run Exh	1.012759	Day	0.9595	
15	2030	1986	2030	SAR Average	Hong Kong SAR Average	137375	34347	2849234	HGV8	DSL	NOx	Run Exh	2.498596	Day	0.8769	
16	2030	1986	2030	SAR Average	Hong Kong SAR Average	6491	1623	485981	PLB	DSL	NOx	Run Exh	0.505804	Day	1.0408	
17	2030	1986	2030	SAR Average	Hong Kong SAR Average	10891	2723	815425	PLB	LPG	NOx	Run Exh	0.450059	Day	0.5519	
18	2030	1986	2030	SAR Average	Hong Kong SAR Average	1768	632	60388	PV4	CAT	NOx	Run Exh	0.002693	Day	0.0446	
19	2030	1986	2030	SAR Average	Hong Kong SAR Average	1132	404	41023	PV4	DSL	NOx	Run Exh	0.031824	Day	0.7758	
20	2030	1986	2030	SAR Average	Hong Kong SAR Average	7	2	106	PV5	CAT	NOx	Run Exh	0.000052	Day	0.4906	
21	2030	1986	2030	SAR Average	Hong Kong SAR Average	6551	2340	183584	PV5	DSL	NOx	Run Exh	0.182131	Day	0.9921	
22	2030	1986	2030	SAR Average	Hong Kong SAR Average	1869	668	49542	PV5	LPG	NOx	Run Exh	0.017966	Day	0.3626	
23	2030	1986	2030	SAR Average	Hong Kong SAR Average	11729	2932	347715	NFB6	DSL	NOx	Run Exh	0.661266	Day	1.9017	
24	2030	1986	2030	SAR Average	Hong Kong SAR Average	8217	2054	239204	NFB7	DSL	NOx	Run Exh	0.247604	Day	1.0351	
25	2030	1986	2030	SAR Average	Hong Kong SAR Average	11833	2958	343951	NFB8	DSL	NOx	Run Exh	0.214364	Day	0.6232	
26	2030	1986	2030	SAR Average	Hong Kong SAR Average	4140	388	72384	FBSD	DSL	NOx	Run Exh	0.060772	Day	0.8396	
27	2030	1986	2030	SAR Average	Hong Kong SAR Average	57633	5403	1265799	FBDD	DSL	NOx	Run Exh	2.737143	Day	2.1624	
28	2030	1986	2030	SAR Average	Hong Kong SAR Average	14684	2447	25492	MC	NCAT	NOx	Run Exh	0.015576	Day	0.6110	
29	2030	1986	2030	SAR Average	Hong Kong SAR Average	409348	68218	1292455	MC	CAT	NOx	Run Exh	0.364088	Day	0.2817	
30																
31	2030	1986	2030	SAR Average	Hong Kong SAR Average	2322688	1030631	45091454	ALL	ALL	NOx	Run Exh	13.622524	Day	0.3021	
32																

Sheet1 Sheet2 Sheet3

Ready 100%

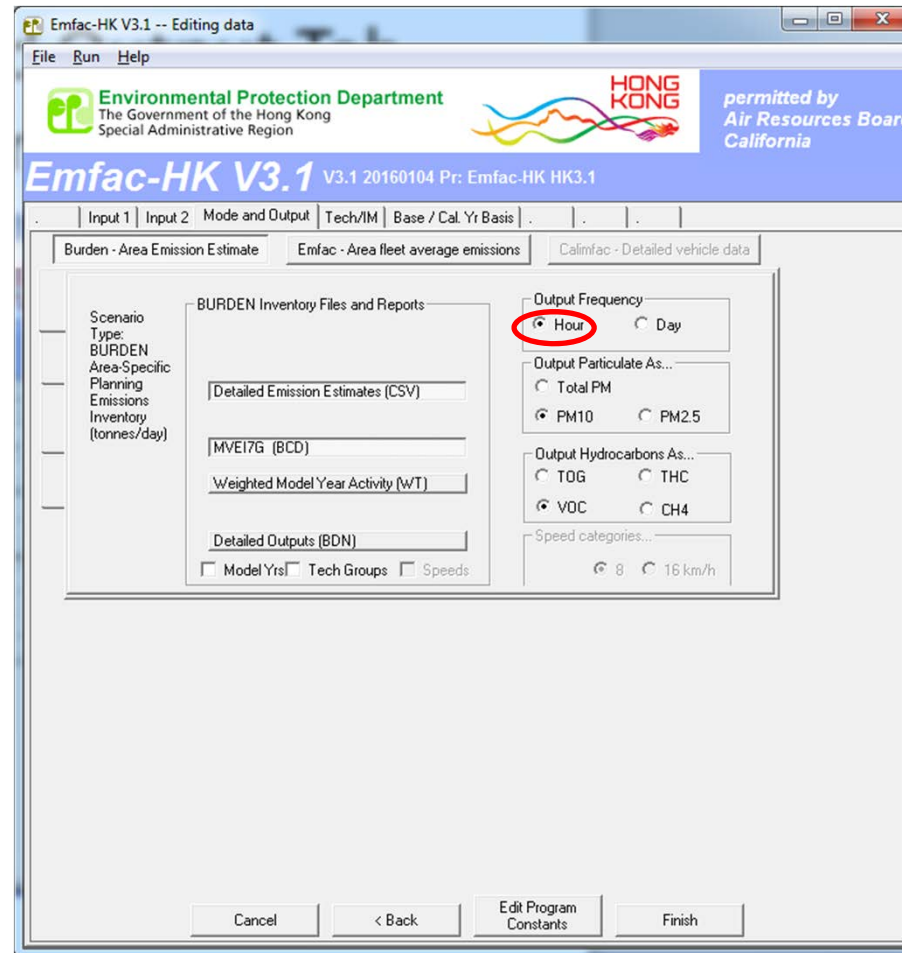
Exercise #2: Hourly Emissions Inventory

- Problem: Repeat Exercise #1, except generate an hourly emissions estimates for Hong Kong for calendar year 2030 only.
- Context: This output is useful to ambient air quality modelers who are interested in hourly emission estimates.
- Scenario data:
 - Geographic Area: Hong Kong SAR
 - Calendar Years: 2030
 - Season: Annual
 - Scenario Type: BURDEN
 - Output File types: Text (CSV), BCD
 - Output Frequency: hourly
 - Pollutants: PM10, VOC
- Purpose: generating/processing BURDEN hourly output formats

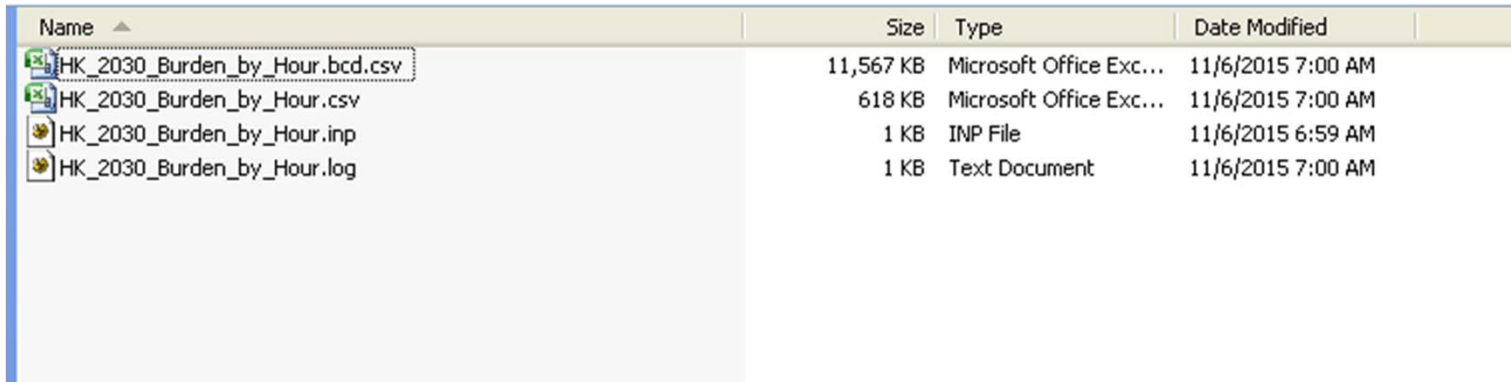
Exercise #2: Hourly Emissions Estimates

- Problem: Repeat Exercise #1, except generate an hourly emissions inventory for Hong Kong for calendar year 2030 only.
- Purpose: generating/processing BURDEN hourly output formats
- Context: This output is useful to ambient air quality modelers who are interested in hourly emission inventories.
- In this run the Burden inventories are calculated on an hourly basis, and then aggregated to show an inventory for the entire day. The hourly inventories are mainly based on disaggregating daily activity to an hourly basis. The data provide default diurnal distribution of hourly trip starts, and vehicle kilometers travelled.

Exercise #2: Mode and Output Tab – Hourly Output Frequency



Exercise #2: Output Generated



A screenshot of a Windows File Explorer window displaying a list of files. The window has a header bar with columns for Name, Size, Type, and Date Modified. The files listed are:

Name	Size	Type	Date Modified
HK_2030_Burden_by_Hour.bcd.csv	11,567 KB	Microsoft Office Exc...	11/6/2015 7:00 AM
HK_2030_Burden_by_Hour.csv	618 KB	Microsoft Office Exc...	11/6/2015 7:00 AM
HK_2030_Burden_by_Hour.inp	1 KB	INP File	11/6/2015 6:59 AM
HK_2030_Burden_by_Hour.log	1 KB	Text Document	11/6/2015 7:00 AM

Exercise #2a: Hourly Emission Rate

- Problem: using BCD output from Exercise #2, determine total **NOx running exhaust emission rates by hour** for 2030. What is the peak emission rate, and which hour?
- Purpose: determine peak hourly emission rates using hourly BCD output.
- Steps
 - Open *.BCD.CSV (allows BCD file to be directly loaded into spreadsheets)
 - Use data filters
 - pollutant (NOx), process (“Run Exh”)
 - Copy filtered results to a separate tab in spreadsheet for analysis
 - Sort by **BASIS, VEH TYPE**
 - Perform a group subtotal by **BASIS**
 - Collapse Subtotal Group #2 to see values by hour

Exercise #2a: Solution

The screenshot shows a Microsoft Excel spreadsheet with the following data:

	1	END MYF	REGION	SAR	STARTS	POPULATIO	VKT	VEH TYP	VEH TECI	POLLUTAN	PROCESS	EMISSION	BASIS
29												13.622524	Day Total
54												0.244008	Hr00 Total
79												0.151201	Hr01 Total
104												0.113175	Hr02 Total
129												0.093751	Hr03 Total
154												0.099813	Hr04 Total
180												0.162832	Hr05 Total
207												0.367508	Hr06 Total
235												0.731032	Hr07 Total
263												1.128095	Hr08 Total
291												1.120608	Hr09 Total
319												0.765532	Hr10 Total
347												0.725073	Hr11 Total
375												0.678431	Hr12 Total
403												0.696309	Hr13 Total
431												0.729148	Hr14 Total
459												0.745938	Hr15 Total
487												0.756602	Hr16 Total
515												1.080809	Hr17 Total
543												0.920634	Hr18 Total
571												0.742978	Hr19 Total
599												0.436227	Hr20 Total
627												0.402697	Hr21 Total

Exercise #3: EMFAC Mode

- Problem: Generate emission factors for 25 °C and 40% RH for calendar year 2030 using the EMFAC mode.
- Context: In Emfac mode the model calculates emission factors either in grams per hour or grams per kilometer for each temperature, relative humidity and average speed combination specified by the user.
- fleet-average emission factors (grams/km or g/mile) are useful in roadway modeling

Exercise #3: EMFAC Mode

- Scenario data:
 - Geographic Area: Hong Kong SAR
 - Calendar Years: 2030
 - No Alternate Baseline Year
 - Season: Annual
 - Scenario Type: EMFAC
 - Output File types: Impact Rate Detail (RTL)
 - Temperatures: 25 °C
 - Relative Humidity: 40%
 - Pollutants: PM10, VOC
- Purpose: generating/processing EMFAC formats

Exercise #3: Input 1 Tab (populated)

Emfac-HK V3.1 -- Editing data

File Run Help

Environmental Protection Department
The Government of the Hong Kong
Special Administrative Region

HONG KONG

permitted by
Air Resources Board
California

Emfac-HK V3.1 V3.1 20160104 Pr: Emfac-HK HK3.1

Input 1 | Input 2 | Mode and Output | Tech/IM | Base / Cal. Yr Basis | . | . | .

Basic scenario data - Select Area, Calculation Method, Calendar Year, Alternate Base Year and Season

Step 1 - Geographic Area

Area Type: SAR

SAR

SAR

Hong Kong

Step 2a - Calendar Year

Select

Calendar year 2030
selected

Scenario Year for Output

Step 2b - Alternate Base Year

Select

Alternate Base Data
Year INACTIVE

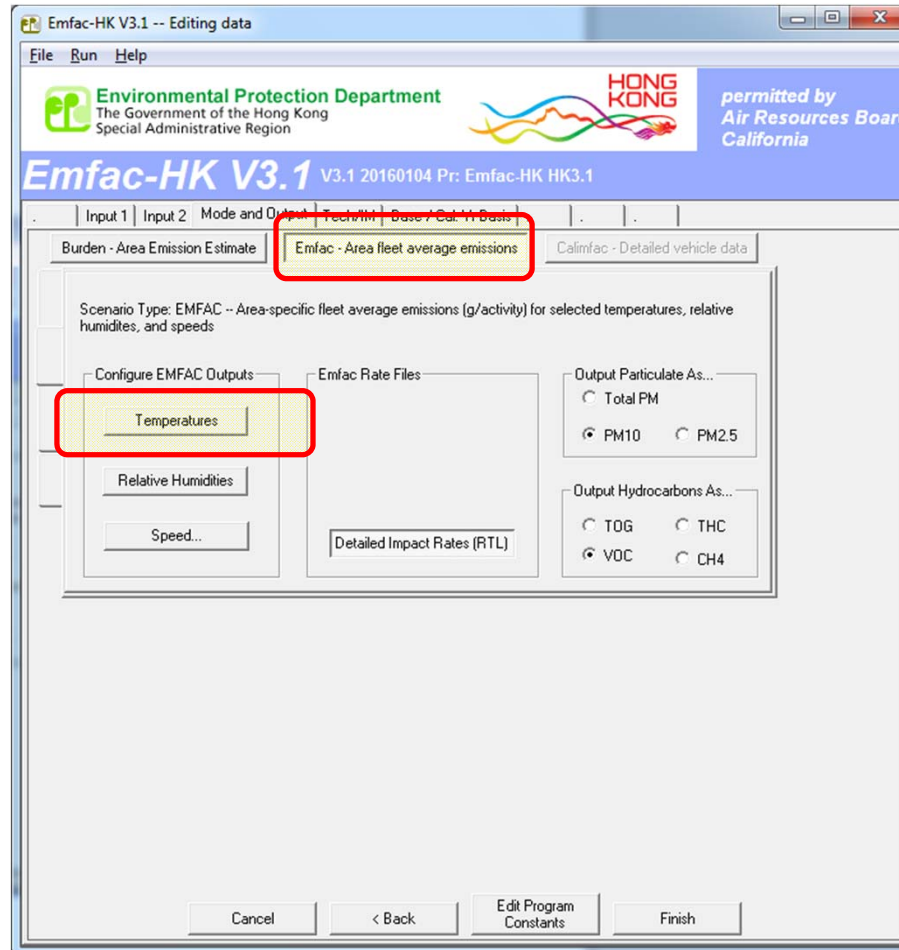
OPTIONAL: Selecting this
option overrides EMFAC-HK
default base year.

Step 3 - Season or Month

Annual

Cancel Next > Finish

Exercise #3: Mode and Output Tab



Exercise #3: Select/Edit Temps (delete until just 1. set to 25 deg C)

The image shows the Emfac-HK V3.1 software interface. The main window is titled "Emfac-HK V3.1 -- Editing data" and includes logos for the Environmental Protection Department of the Government of the Hong Kong Special Administrative Region and the Air Resources Board of California. The interface has several tabs: "Input 1", "Input 2", "Mode and Output", "Tech/IM", "Base / Cal. Yr Basis", and "Calimfac - Detailed vehicle data". The "Mode and Output" tab is active, showing "Configure EMFAC Outputs" and "Emfac Rate Files" sections. A red box highlights the "Temperatures" button in the "Configure EMFAC Outputs" section. A red arrow points from this button to a secondary dialog box titled "Select/Edit temperature for Emfac calculations".

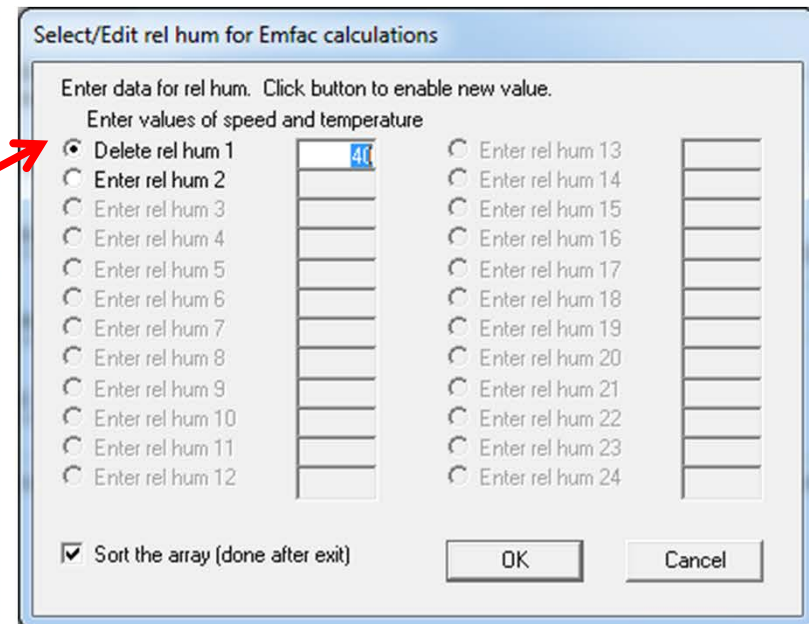
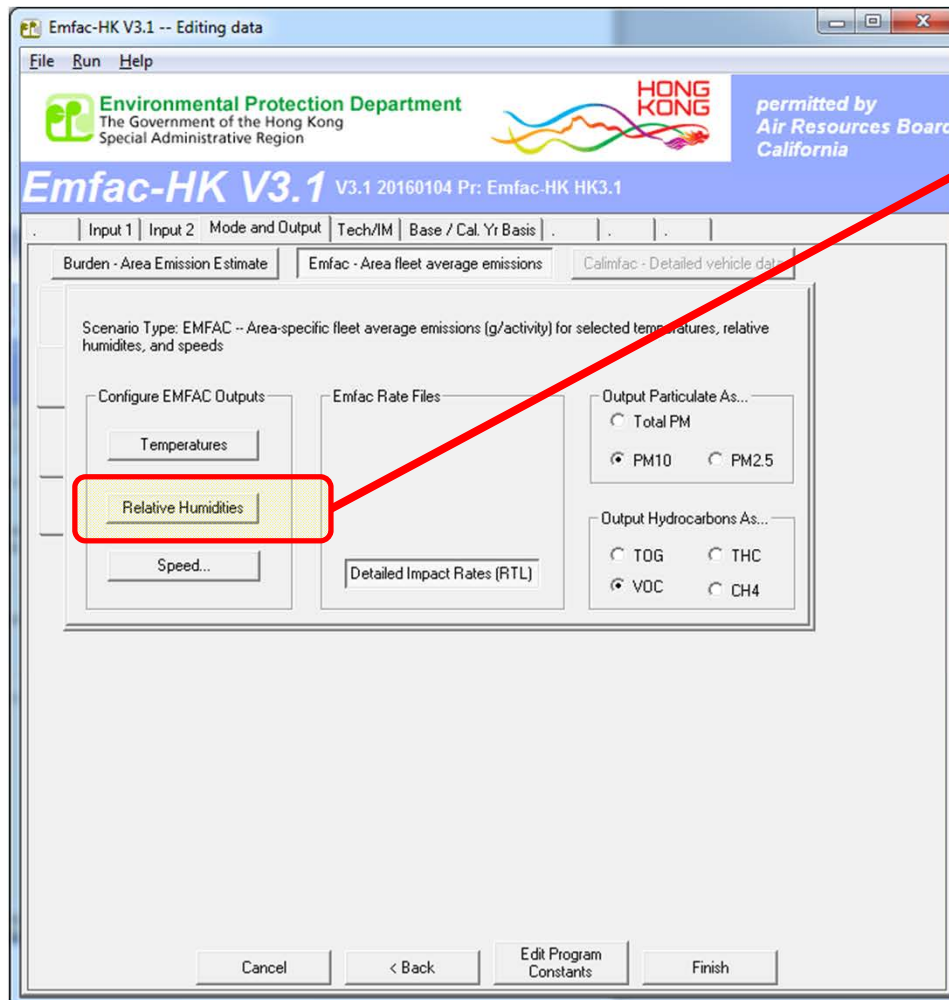
The "Select/Edit temperature for Emfac calculations" dialog box contains the following text and controls:

Enter data for temperature. Click button to enable new value.
Enter values of speed and temperature

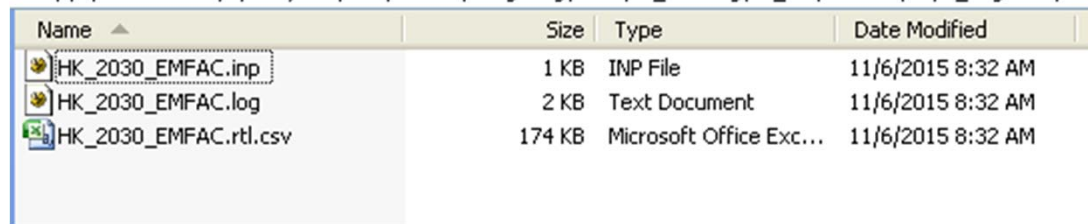
- Delete temperature 1
- Enter temperature 2
- Enter temperature 3
- Enter temperature 4
- Enter temperature 5
- Enter temperature 6
- Enter temperature 7
- Enter temperature 8
- Enter temperature 9
- Enter temperature 10
- Enter temperature 11
- Enter temperature 12
- Enter temperature 13
- Enter temperature 14
- Enter temperature 15
- Enter temperature 16
- Enter temperature 17
- Enter temperature 18
- Enter temperature 19
- Enter temperature 20
- Enter temperature 21
- Enter temperature 22
- Enter temperature 23
- Enter temperature 24

At the bottom of the dialog box, there is a checked checkbox for "Sort the array (done after exit)" and "OK" and "Cancel" buttons.

Exercise #3: Select/Edit RH (delete until just 1. set to 40%)



Exercise #3: Output Generated



Name	Size	Type	Date Modified
HK_2030_EMFAC.inp	1 KB	INP File	11/6/2015 8:32 AM
HK_2030_EMFAC.log	2 KB	Text Document	11/6/2015 8:32 AM
HK_2030_EMFAC.rtl.csv	174 KB	Microsoft Office Exc...	11/6/2015 8:32 AM

Exercise #4: Changing Technology

Group Fractions

- Context: This example evaluates emission changes if the Government introduces a tax incentive program. In this case, introducing Euro V in 2010 for light goods vehicles greater than 3.5 tonnes (vehicle class LGV6).
- The table below shows the accelerate phase-in of Euro V for LGV6
 - Model Year: 2010-2012 40% Euro V
 - Model Year: 2013+ 100%

Exercise #4: Changing TG Fractions

- Scenario data:
 - Geographic Area: **Hong Kong SAR**
 - Calendar Years: **2030**
 - Season: **Annual**
 - Scenario Type: **BURDEN**
 - Output File types: **Detailed Estimates (CSV)**
 - Output Frequency: **daily**
 - Pollutants: **PM10, VOC**
- **Perform a Base Case Run**
- Update TG distribution using data on next slide

Exercise #4: New LGV6 Exhaust TG Fractions to Apply

Exh TG ->	119	132	133
Model Year	Euro IV POC LGV 3.5-5-5t Dsl	Euro IV DPF LGV 3.5-5-5t Dsl	Euro V DPF LGV 3.5-5-5t Dsl
2010	17.435%	42.5646%	40%

Exercise #4: Exhaust TG Modification Tab

Before Edit

Exhaust Technology Fractions

Edit Exhaust Technology Fractions by: 05: Light Goods Vehicles (3.5-5.5t) (LGV6)

Vehicle Class

Model Year: 2010

EXHAUST Technology Groups Total: 99.9996% OK

of Tech Groups: 2

Group	%	Model years, vehicle classes, standards
119	17.435	Euro IV - PDC LGV 3.5-5.5t diesel
132	82.5646	Euro IV - DPF LGV 3.5-5.5t diesel

Return Copy values to other years and

Apply Cancel Done Apply to Others

After Edit

Exhaust Technology Fractions

Edit Exhaust Technology Fractions by: 05: Light Goods Vehicles (3.5-5.5t) (LGV6)

Vehicle Class

Model Year: 2010

EXHAUST Technology Groups Total: 99.9996% OK

of Tech Groups: 3

Group	%	Model years, vehicle classes, standards
119	17.435	Euro IV - PDC LGV 3.5-5.5t diesel
132	42.5646	Euro IV - DPF LGV 3.5-5.5t diesel
133	40.0	Euro V - DPF LGV 3.5-5.5t diesel

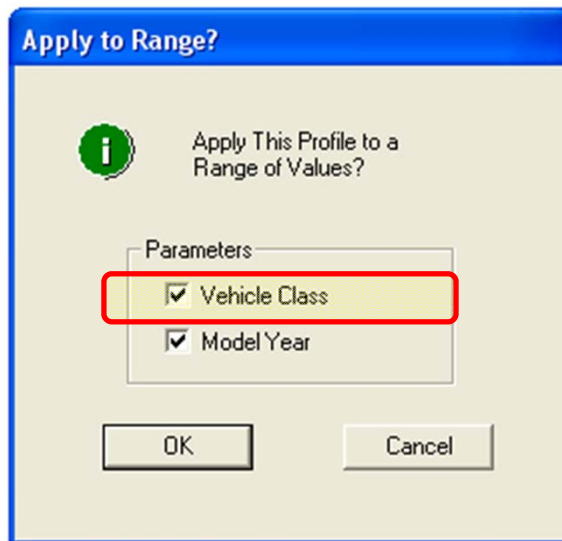
Apply Cancel changes

Apply Cancel Done

“Apply”
before
changing
model year or
veh class or
pressing
“Done”

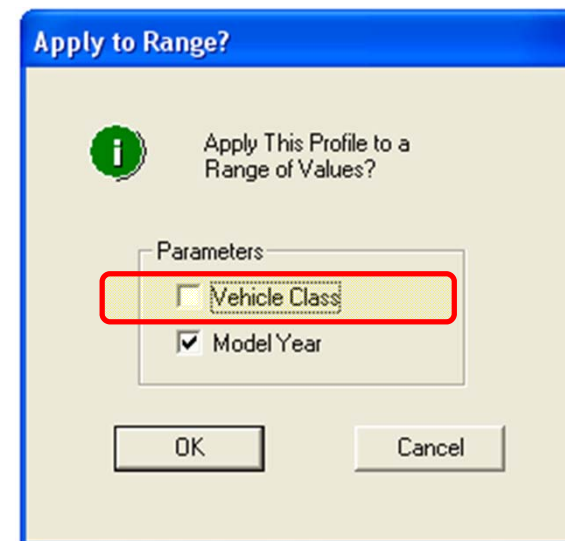
Exercise #4: “Apply to Others – Model Year Only”

Before Edit



The screenshot shows a dialog box titled "Apply to Range?". It contains an information icon and the text "Apply This Profile to a Range of Values?". Below this is a "Parameters" section with two checked checkboxes: "Vehicle Class" and "Model Year". A red rectangle highlights the "Vehicle Class" checkbox. At the bottom are "OK" and "Cancel" buttons.

After Edit

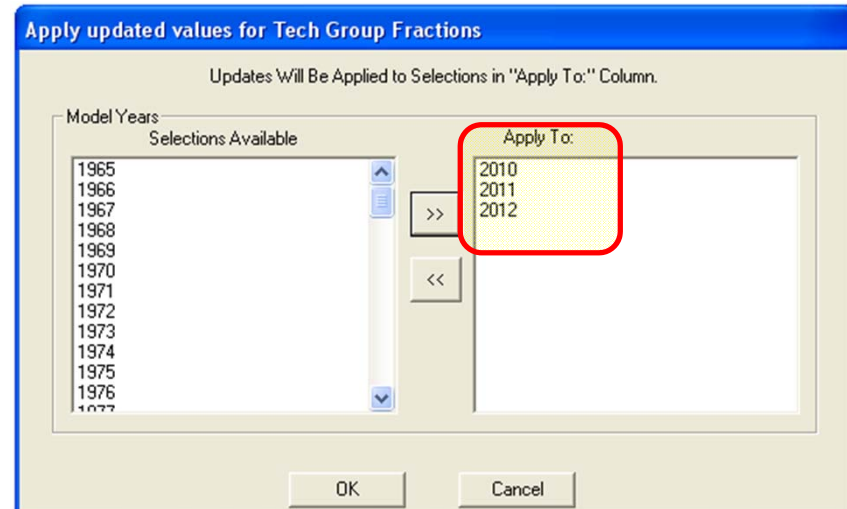
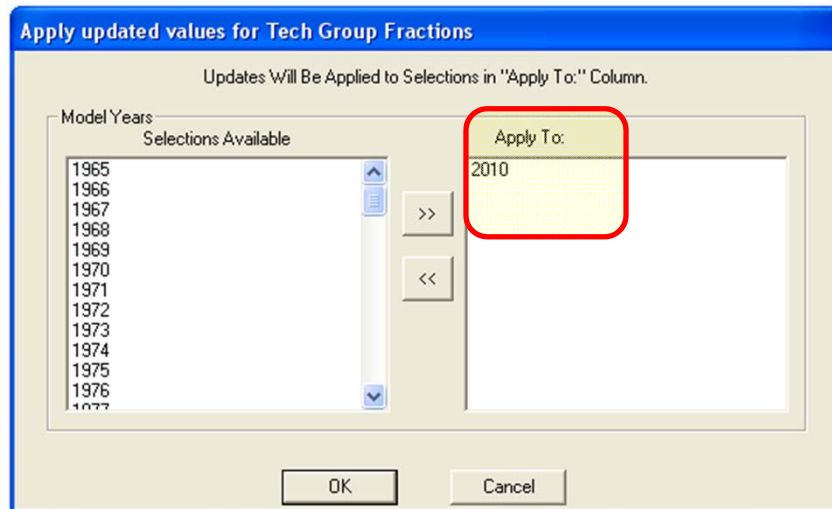


The screenshot shows the same "Apply to Range?" dialog box, but the "Vehicle Class" checkbox is now unchecked. A red rectangle highlights the "Vehicle Class" checkbox. The "Model Year" checkbox remains checked. At the bottom are "OK" and "Cancel" buttons.

Exercise #4: "Apply to Others"

Before Edit

After Edit



Exercise #5: Changing VKT

- Context: EMFAC users involved with planning are frequently asked to estimate emissions for an area, say Kwai Chung, in Hong Kong. The territory-wide VKT by vehicle class and fuel type will not be applicable here resulting in a change in VKT. VKT by class will have to be changed. We take one vehicle class and one fuel type, say petrol private cars, as an example.
- Two ways the user can change VKT:
 - 1) adjust the population to match desired VKT since VKT is calculated from $\text{Population} * \text{Accrual}$ (i.e., “conformity” approach); or,
 - 2) directly alter via the VKT GUI
 - If VKT only is changed, the model alters number of trips/starts in order to match VKT.

Exercise #5: Changing VKT

- Problem: Determine emissions in 2030 for petrol private cars (Vehicle Class 1) given a *forecasted* VKT of 1,609,000 km/day.
- This Exercise will be conducted in three phases:
 - 5: “base” case
 - 5a: “conformity” adjustment
 - 5b: direct VKT adjustment

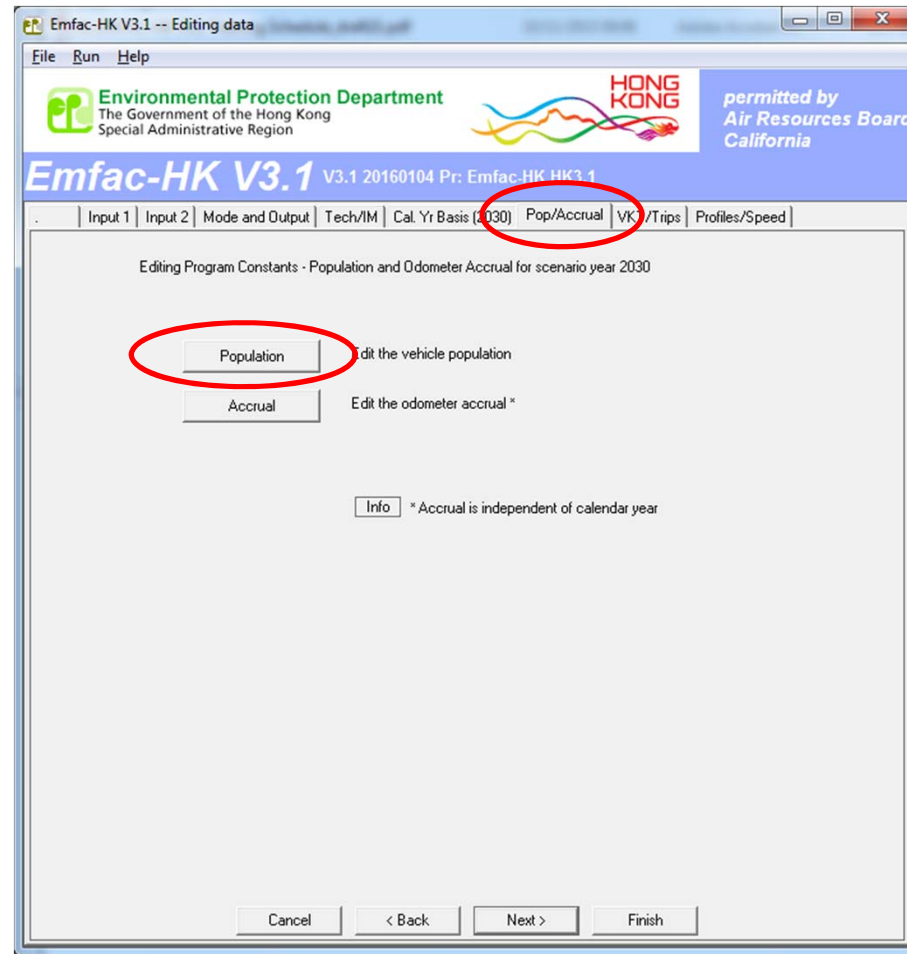
Exercise #5a: Changing VKT ("Conformity" Approach)

- Scenario data:
 - Geographic Area: **Hong Kong SAR**
 - Calendar Years: **2030**
 - Season: **Annual**
 - Scenario Type: **BURDEN**
 - Output File types: **Text (CSV), BCD**
 - Output Frequency: **hourly**
 - Pollutants: **PM₁₀, VOC**
- VKT for private cars = **1,609,000 km/day**
- Use "conformity" approach: adjust population to match desired VKT

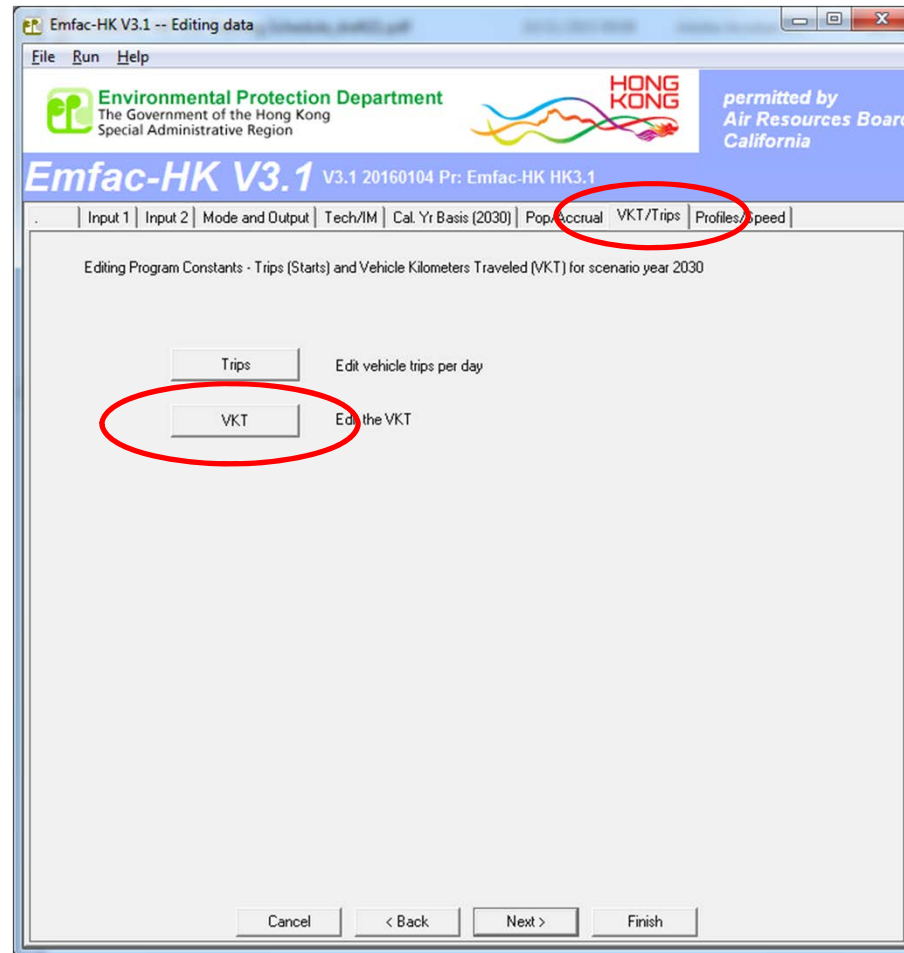
Exercise #5a: Notes

- Determine Population Adjustment to Match VKT
 - Find “base” population and VKT for vehicle class and fuel for 2030.
 - Enter scenario data in Input 1 screen
 - Edit Program Constants
 - Click “Population” key in Tab Pop/Accrual Screen
 - Select *By Vehicle and Fuel*:
 - PC petrol population? (Vehicle Class 1, Fuel=1):
 - Advance to VKT Screen
 - Tab *By Vehicle and Fuel*:
 - PC VKT (Vehicle Class=1, Fuel=1)?:
 - Determine VKT adjustment factor?
- Multiply population by VKT adjustment factor:

Exercise #5a: Pop/Accrual Tab



Exercise #5a: VKT/Trips Tab



Exercise #5a: Base Case Values

2030 Population by Fuel
783,924 vehicles (gas/petrol)

Editing Cal Pop data for scenario 1: Hong Kong SAR Annual CYr 2030 Default Title

Total Cal Pop for area: Hong Kong SAR

Editing Mode: Editing Cal Pop (registered vehicles with adjustments)

Total Cal Pop | By Vehicle Class | **By Vehicle and Fuel** | By Vehicle/Fuel/Age

Vehicle Class	Fuel (1=Petrol/2=Diesel/3=LPG)		
	1	2	3
01 - Private Cars (PC)	783924.3	6113.0	0.0
02 - Taxi	0.0	0.0	18193.0
03 - Light Goods Vehicles<=2.5t	1.9	1002.7	0.0
04 - Lt Goods Vehicles 2.5-3.5t	1057.4	53816.4	0.0
05 - Light Goods Vehicles>3.5t	0.0	26652.7	0.0
06 - Medium_Heavy Goods Vehic	0.0	12730.9	0.0
07 - Medium_Heavy Goods Vehicles>1	0.0	34347.2	0.0
08 - Public Light Buses	0.0	1622.9	2723.1
09 - Private Light Bus <=3.5t	631.6	404.4	0.0
10 - Private Light Bus >3.5t	2.4	2340.0	667.6
11 - Non-franchised Bus<=6.4t	0.0	2932.0	0.0
12 - Non-franchised Bus 6.4-15t	0.0	2054.0	0.0
13 - Non-franchised Bus >15t	0.0	2958.0	0.0
14 - Franchised Bus (SD)	0.0	388.0	0.0
15 - Franchised Bus (DD)	0.0	5403.0	0.0
16 - Motorcycles (MC)	70665.1	0.0	0.0
17 - <Placeholder (P1)>	0.0	0.0	0.0
18 - <Placeholder (P2)>	0.0	0.0	0.0
19 - <Placeholder (P3)>	0.0	0.0	0.0
20 - <Placeholder (P4)>	0.0	0.0	0.0
21 - <Placeholder (P5)>	0.0	0.0	0.0

Buttons: Apply, Cancel, Done

2030 VKT by Fuel
21,887,260 km/day (1=gas/petrol)

Editing VKT data for scenario 1: Hong Kong SAR Annual CYr 2030 Default Title

Total VKT for area: Hong Kong SAR

Editing Mode: Editing VKT (vehicle km traveled per weekday)

Total VKT | By Vehicle Class | **By Vehicle and Fuel** | By Vehicle/Fuel/Hour

Vehicle Class	Fuel (1=Petrol/2=Diesel/3=LPG)		
	1	2	3
01 - Private Cars (PC)	21887260.0	171471.0	0.0
02 - Taxi	0.0	0.0	7665955.0
03 - Light Goods Vehicles<=2.5t	109.9	74275.4	0.0
04 - Lt Goods Vehicles 2.5-3.5t	67129.2	3549671.3	0.0
05 - Light Goods Vehicles>3.5t	0.0	2547736.5	0.0
06 - Medium_Heavy Goods Vehic	0.0	1055561.3	0.0
07 - Medium_Heavy Goods Vehicles>1	0.0	2849234.3	0.0
08 - Public Light Buses	0.0	485980.8	815425.1
09 - Private Light Bus <=3.5t	60387.8	41022.6	0.0
10 - Private Light Bus >3.5t	105.6	183583.6	49542.4
11 - Non-franchised Bus<=6.4t	0.0	347714.9	0.0
12 - Non-franchised Bus 6.4-15t	0.0	239203.8	0.0
13 - Non-franchised Bus >15t	0.0	343950.8	0.0
14 - Franchised Bus (SD)	0.0	72384.1	0.0
15 - Franchised Bus (DD)	0.0	1265799.5	0.0
16 - Motorcycles (MC)	1317946.8	0.0	0.0
17 - <Placeholder (P1)>	0.0	0.0	0.0
18 - <Placeholder (P2)>	0.0	0.0	0.0
19 - <Placeholder (P3)>	0.0	0.0	0.0
20 - <Placeholder (P4)>	0.0	0.0	0.0
21 - <Placeholder (P5)>	0.0	0.0	0.0

Buttons: Apply, Cancel, Done

Exercise #5a: VKT Adjustment using Population

- Find “base” population and VKT for vehicle class and fuel (PC petrol) for 2030:
 - Population (2030): 783,924 vehicles
 - VKT (2030 base): 21,887,260 kilometers
- Determine VKT adjustment factor:
 - $1,609,000 / 21,887,260 = 0.0735$
- Multiply population by factor:
 - $783,924 * 0.0735 = 57,629$

Exercise #5a: Population Edits

2030 Population (Base Case)

Editing Cal Pop data for scenario 1: Hong Kong SAR Annual CYr 2030 Default Title

Total Cal Pop for area: Hong Kong SAR

Editing Mode: Editing Cal Pop (registered vehicles with adjustments)

Total Cal Pop | By Vehicle Class | **By Vehicle and Fuel** | By Vehicle/Fuel/Age

Vehicle Class	Fuel (1=Petrol/2=Diesel/3=LPG)			
	1	2	3	
01 - Private Cars (PC)	783924.3	6113.0	0.0	
02 - Taxi	0.0	0.0	18193.0	
03 - Light Goods Vehicles<=2.5t	1.9	1002.7	0.0	
04 - Lt Goods Vehicles 2.5-3.5t	1057.4	53816.4	0.0	
05 - Light Goods Vehicles>3.5t	0.0	26652.7	0.0	
06 - Medium_Heavy Goods Vehic	0.0	12730.9	0.0	
07 - Medium_Heavy Goods Vehicles>1	0.0	34347.2	0.0	
08 - Public Light Buses	0.0	1622.9	2723.1	
09 - Private Light Bus <=3.5t	631.6	404.4	0.0	
10 - Private Light Bus >3.5t	2.4	2340.0	667.6	
11 - Non-franchised Bus<=6.4t	0.0	2932.0	0.0	
12 - Non-franchised Bus 6.4-15t	0.0	2054.0	0.0	
13 - Non-franchised Bus >15t	0.0	2958.0	0.0	
14 - Franchised Bus (SD)	0.0	388.0	0.0	
15 - Franchised Bus (DD)	0.0	5403.0	0.0	
16 - Motorcycles (MC)	70665.1	0.0	0.0	
17 - <Placeholder (P1)>	0.0	0.0	0.0	
18 - <Placeholder (P2)>	0.0	0.0	0.0	
19 - <Placeholder (P3)>	0.0	0.0	0.0	
20 - <Placeholder (P4)>	0.0	0.0	0.0	
21 - <Placeholder (P5)>	0.0	0.0	0.0	

Buttons: Apply, Cancel, Done

2030 Population (Edited for VKT Match)

Editing Cal Pop data for scenario 1: Hong Kong SAR Annual CYr 2030 Default Title

Total Cal Pop for area: Hong Kong SAR

Editing Mode: Editing Cal Pop (registered vehicles with adjustments)

Total Cal Pop | By Vehicle Class | **By Vehicle and Fuel** | By Vehicle/Fuel/Age

Vehicle Class	Fuel (1=Petrol/2=Diesel/3=LPG)			
	1	2	3	
01 - Private Cars (PC)	57628.7	6113.0	0.0	
02 - Taxi	0.0	0.0	18193.0	
03 - Light Goods Vehicles<=2.5t	1.9	1002.7	0.0	
04 - Lt Goods Vehicles 2.5-3.5t	1057.4	53816.4	0.0	
05 - Light Goods Vehicles>3.5t	0.0	26652.7	0.0	
06 - Medium_Heavy Goods Vehic	0.0	12730.9	0.0	
07 - Medium_Heavy Goods Vehicles>1	0.0	34347.2	0.0	
08 - Public Light Buses	0.0	1622.9	2723.1	
09 - Private Light Bus <=3.5t	631.6	404.4	0.0	
10 - Private Light Bus >3.5t	2.4	2340.0	667.6	
11 - Non-franchised Bus<=6.4t	0.0	2932.0	0.0	
12 - Non-franchised Bus 6.4-15t	0.0	2054.0	0.0	
13 - Non-franchised Bus >15t	0.0	2958.0	0.0	
14 - Franchised Bus (SD)	0.0	388.0	0.0	
15 - Franchised Bus (DD)	0.0	5403.0	0.0	
16 - Motorcycles (MC)	70665.1	0.0	0.0	
17 - <Placeholder (P1)>	0.0	0.0	0.0	
18 - <Placeholder (P2)>	0.0	0.0	0.0	
19 - <Placeholder (P3)>	0.0	0.0	0.0	
20 - <Placeholder (P4)>	0.0	0.0	0.0	
21 - <Placeholder (P5)>	0.0	0.0	0.0	

Buttons: Apply, Cancel, Done

Exercise #5a: Verify VKT Adjustment

2030 VKT (Base Case)

Editing VKT data for scenario 1: Hong Kong SAR Annual CYr 2030 Default Title

Total VKT for area: Hong Kong SAR

Editing Mode: Editing VKT (vehicle km traveled per weekday)

Total VKT | By Vehicle Class | **By Vehicle and Fuel** | By Vehicle/Fuel/Hour

Vehicle Class	Fuel (1=Petrol/2=Diesel/3=LPG)		
	1	2	3
01 - Private Cars (PC)	21887260.0	171471.0	0.0
02 - Taxi	0.0	0.0	7665955.0
03 - Light Goods Vehicles<=2.5t	109.9	74275.4	0.0
04 - Lt Goods Vehicles 2.5-3.5t	67129.2	3549671.3	0.0
05 - Light Goods Vehicles>3.5t	0.0	2547736.5	0.0
06 - Medium_Heavy Goods Vehic	0.0	1055561.3	0.0
07 - Medium_Heavy Goods Vehicles>1	0.0	2849234.3	0.0
08 - Public Light Buses	0.0	485980.8	815425.1
09 - Private Light Bus <=3.5t	60387.8	41022.6	0.0
10 - Private Light Bus >3.5t	105.6	183583.6	49542.4
11 - Non-franchised Bus<=6.4t	0.0	347714.9	0.0
12 - Non-franchised Bus 6.4-15t	0.0	239203.8	0.0
13 - Non-franchised Bus >15t	0.0	343950.8	0.0
14 - Franchised Bus (SD)	0.0	72384.1	0.0
15 - Franchised Bus (DD)	0.0	1265799.5	0.0
16 - Motorcycles (MC)	1317946.8	0.0	0.0
17 - <Placeholder (P1)>	0.0	0.0	0.0
18 - <Placeholder (P2)>	0.0	0.0	0.0
19 - <Placeholder (P3)>	0.0	0.0	0.0
20 - <Placeholder (P4)>	0.0	0.0	0.0
21 - <Placeholder (P5)>	0.0	0.0	0.0

Buttons: Apply, Cancel, Done

2030 VKT (After Pop Edit)

Editing VKT data for scenario 1: Hong Kong SAR Annual CYr 2030 Default Title

Total VKT for area: Hong Kong SAR

Editing Mode: Editing VKT (vehicle km traveled per weekday)

Total VKT | By Vehicle Class | **By Vehicle and Fuel** | By Vehicle/Fuel/Hour

Vehicle Class	Fuel (1=Petrol/2=Diesel/3=LPG)		
	1	2	3
01 - Private Cars (PC)	1609000.1	171471.0	0.0
02 - Taxi	0.0	0.0	7665955.0
03 - Light Goods Vehicles<=2.5t	109.9	74275.4	0.0
04 - Lt Goods Vehicles 2.5-3.5t	67129.2	3549671.3	0.0
05 - Light Goods Vehicles>3.5t	0.0	2547736.5	0.0
06 - Medium_Heavy Goods Vehic	0.0	1055561.3	0.0
07 - Medium_Heavy Goods Vehicles>1	0.0	2849234.3	0.0
08 - Public Light Buses	0.0	485980.8	815425.1
09 - Private Light Bus <=3.5t	60387.8	41022.6	0.0
10 - Private Light Bus >3.5t	105.6	183583.6	49542.4
11 - Non-franchised Bus<=6.4t	0.0	347714.9	0.0
12 - Non-franchised Bus 6.4-15t	0.0	239203.8	0.0
13 - Non-franchised Bus >15t	0.0	343950.8	0.0
14 - Franchised Bus (SD)	0.0	72384.1	0.0
15 - Franchised Bus (DD)	0.0	1265799.5	0.0
16 - Motorcycles (MC)	1317946.8	0.0	0.0
17 - <Placeholder (P1)>	0.0	0.0	0.0
18 - <Placeholder (P2)>	0.0	0.0	0.0
19 - <Placeholder (P3)>	0.0	0.0	0.0
20 - <Placeholder (P4)>	0.0	0.0	0.0
21 - <Placeholder (P5)>	0.0	0.0	0.0

Buttons: Apply, Cancel, Done

Exercise #5b: Changing VKT (Directly)

- Problem: Determine emissions in 2030 for petrol private cars (Vehicle Class 1) given a forecasted VKT of 1,609,000 km/day.
- Scenario data:
 - Geographic Area: Hong Kong SAR
 - Calendar Years: 2030
 - Season: Annual
 - Scenario Type: BURDEN
 - Output File types: Text (CSV), BCD
 - Output Frequency: hourly
 - Pollutants: PM₁₀, VOC
- VKT for petrol private cars = 1,609,000 km/day
- Direct entry of new VKT

Exercise #5b: Editing VKT Screen

2030 VKT (Base Case)

Editing VKT data for scenario 1: Hong Kong SAR Annual CYr 2030 Default Title

Total VKT for area: Hong Kong SAR

Editing Mode: Editing VKT (vehicle km traveled per weekday)

Editing Mode: **By Vehicle and Fuel**

Vehicle Class	Fuel (1=Petrol/2=Diesel/3=LPG)		
	1	2	3
01 - Private Cars (PC)	21887260.0	171471.0	0.0
02 - Taxi	0.0	0.0	7665955.0
03 - Light Goods Vehicles<=2.5t	109.9	74275.4	0.0
04 - Lt Goods Vehicles 2.5-3.5t	67129.2	3549671.3	0.0
05 - Light Goods Vehicles>3.5t	0.0	2547736.5	0.0
06 - Medium_Heavy Goods Vehic	0.0	1055561.3	0.0
07 - Medium_Heavy Goods Vehicles>1	0.0	2849234.3	0.0
08 - Public Light Buses	0.0	485980.8	815425.1
09 - Private Light Bus <=3.5t	60387.8	41022.6	0.0
10 - Private Light Bus >3.5t	105.6	183583.6	49542.4
11 - Non-franchised Bus<=6.4t	0.0	347714.9	0.0
12 - Non-franchised Bus 6.4-15t	0.0	239203.8	0.0
13 - Non-franchised Bus >15t	0.0	343950.8	0.0
14 - Franchised Bus (SD)	0.0	72384.1	0.0
15 - Franchised Bus (DD)	0.0	1265799.5	0.0
16 - Motorcycles (MC)	1317946.8	0.0	0.0
17 - <Placeholder (P1)>	0.0	0.0	0.0
18 - <Placeholder (P2)>	0.0	0.0	0.0
19 - <Placeholder (P3)>	0.0	0.0	0.0
20 - <Placeholder (P4)>	0.0	0.0	0.0
21 - <Placeholder (P5)>	0.0	0.0	0.0

2030 VKT (After VKT Edit)

Editing VKT data for scenario 1: Hong Kong SAR Annual CYr 2030 Default Title

Total VKT for area: Hong Kong SAR

Editing Mode: Editing VKT (vehicle km traveled per weekday)

Editing Mode: **By Vehicle and Fuel**

Vehicle Class	Fuel (1=Petrol/2=Diesel/3=LPG)		
	1	2	3
01 - Private Cars (PC)	1609000.0	171471.0	0.0
02 - Taxi	0.0	0.0	7665955.0
03 - Light Goods Vehicles<=2.5t	109.9	74275.4	0.0
04 - Lt Goods Vehicles 2.5-3.5t	67129.2	3549671.3	0.0
05 - Light Goods Vehicles>3.5t	0.0	2547736.5	0.0
06 - Medium_Heavy Goods Vehic	0.0	1055561.3	0.0
07 - Medium_Heavy Goods Vehicles>1	0.0	2849234.3	0.0
08 - Public Light Buses	0.0	485980.8	815425.1
09 - Private Light Bus <=3.5t	60387.8	41022.6	0.0
10 - Private Light Bus >3.5t	105.6	183583.6	49542.4
11 - Non-franchised Bus<=6.4t	0.0	347714.9	0.0
12 - Non-franchised Bus 6.4-15t	0.0	239203.8	0.0
13 - Non-franchised Bus >15t	0.0	343950.8	0.0
14 - Franchised Bus (SD)	0.0	72384.1	0.0
15 - Franchised Bus (DD)	0.0	1265799.5	0.0
16 - Motorcycles (MC)	1317946.8	0.0	0.0
17 - <Placeholder (P1)>	0.0	0.0	0.0
18 - <Placeholder (P2)>	0.0	0.0	0.0
19 - <Placeholder (P3)>	0.0	0.0	0.0
20 - <Placeholder (P4)>	0.0	0.0	0.0
21 - <Placeholder (P5)>	0.0	0.0	0.0

Exercise #5c: Changing VKT - Comparison of #5a and #5b Output

- Problem: determine difference in NOx running and starting exhaust emissions output from Exercises #5a and #5b for petrol private cars.
- Purpose: examine results from alternate VKT edit approaches
- Extract/compare NOx running and starting exhaust emissions from Text/*.CSV. Use values for the **day**.
 - Note: day is at bottom of CSV after results by hour
 - Note: you'll need to add results for NCAT and CAT

Exercise #5c: Solution

Process	Base	#5a: Pop-adjusted VKT	#5b: VKT direct
Vehicles	783,924	57,629	783,924
VKT	21,887,260	1,609,000	1,609,000
Trips	1,176,004	86,452	1,176,004
NOx Run Exhaust (tonne/day)	0.2273	0.0167	0.0167
Nox Start Exhaust (tonne/day)	0.0441	0.0032	0.0441

Notes:

Results show how the model adjusted trips in Exercise #5a, thus, starting exhaust as well. Running exhaust emissions do not differ.

Exercise #5b shows it is possible to directly input VKT into EMFAC-HK; however, it is generally not recommended to do this independent of vehicle population because of the desire to properly estimate start and evaporative emissions tied to the size of the vehicle fleet.

Exercise #6: Changing Trips

- Context: If Hong Kong institutes a new Transportation Control Measure (TCM) that reduces trips for petrol Private Cars in 2015 to 250,000 trips per day. The planner is then asked to estimate the potential emission reductions from this new TCM. There are two potential methods for doing this analysis and both are examined in this Exercise.
 - 1) Adjust the population to match desired trips (i.e., “conformity” approach);
 - 2) Directly alter via the Trips GUI
 - If VKT only is changed, the model alters number of trips/starts in order to match VKT.
- This Exercise will be conducted in two phases:
 - 6a: “conformity” adjustment
 - 6b: direct trips adjustment

Exercise #6a: Changing Trips ("Conformity" Approach)

- Problem: Determine emissions in 2030 for PC petrol given forecasted trips of 250,000 trips/day.
- Scenario data:
 - Geographic Area: Hong Kong SAR
 - Calendar Years: 2030
 - Season: Annual
 - Scenario Type: BURDEN
 - Output File types: Text (CSV), BCD
 - Output Frequency: day
 - Pollutants: PM₁₀, VOC
- Trips for PC petrol cars = 250,000 trips/day
- Use "conformity" approach: adjust population to match desired trips

Exercise #6a: Notes

- Determine Population Adjustment to Match Trips
 - use “base” population and trips for vehicle class and fuel (PC petrol) for 2030.
 - Enter scenario data in Input 1 screen
 - Edit Program Constants
 - Advance to Population Screen
 - Tab *By Vehicle and Fuel*:
 - PC petrol population? (Vehicle Class 1, Fuel=1):
 - Advance to Trips Screen
 - Tab *By Vehicle and Fuel*:
 - PC petrol trips (Vehicle Class=1, Fuel=1):
 - Determine Trips adjustment factor?
- Multiply population by trips adjustment factor:

Exercise #6a: Base Case Values

2030 Population by Fuel
783,924 vehicles (gas/petrol)

Editing Cal Pop data for scenario 1: Hong Kong SAR Annual Cy 2030 Default Title

Total Cal Pop for area: Hong Kong SAR

Editing Mode: Editing Cal Pop (registered vehicles with adjustments)

Total Cal Pop | By Vehicle Class | **By Vehicle and Fuel** | By Vehicle/Fuel/Age

Vehicle Class	Fuel (1=Petrol/2=Diesel/3=LPG)		
	1	2	3
01 - Private Cars (PC)	783924.3	6113.0	0.0
02 - Taxi	0.0	0.0	18193.0
03 - Light Goods Vehicles<=2.5t	1.9	1002.7	0.0
04 - Lt Goods Vehicles 2.5-3.5t	1057.4	53816.4	0.0
05 - Light Goods Vehicles>3.5t	0.0	26652.7	0.0
06 - Medium_Heavy Goods Vehic	0.0	12730.9	0.0
07 - Medium_Heavy Goods Vehicles>1	0.0	34347.2	0.0
08 - Public Light Buses	0.0	1622.9	2723.1
09 - Private Light Bus <=3.5t	631.6	404.4	0.0
10 - Private Light Bus >3.5t	2.4	2340.0	667.6
11 - Non-franchised Bus<=6.4t	0.0	2932.0	0.0
12 - Non-franchised Bus 6.4-15t	0.0	2054.0	0.0
13 - Non-franchised Bus >15t	0.0	2958.0	0.0
14 - Franchised Bus (SD)	0.0	388.0	0.0
15 - Franchised Bus (DD)	0.0	5403.0	0.0
16 - Motorcycles (MC)	70665.1	0.0	0.0
17 - <Placeholder (P1)>	0.0	0.0	0.0
18 - <Placeholder (P2)>	0.0	0.0	0.0
19 - <Placeholder (P3)>	0.0	0.0	0.0
20 - <Placeholder (P4)>	0.0	0.0	0.0
21 - <Placeholder (P5)>	0.0	0.0	0.0

Buttons: Apply, Cancel, Done

2030 Trips by Fuel
1,176,004 trips (gas/petrol)

Editing Trips-per-Day data for scenario 1: Hong Kong SAR Annual Cy 2030 Default Title

Total Trips-per-Day for area: Hong Kong SAR

Editing Mode: Editing Trips-per-Day (starts per weekday)

Total Trips-per-Day | By Vehicle Class | **By Vehicle and Fuel** | By Vehicle/Fuel/Hour

Vehicle Class	Fuel (1=Petrol/2=Diesel/3=LPG)		
	1	2	3
01 - Private Cars (PC)	1176004.1	9170.4	0.0
02 - Taxi	0.0	0.0	72779.3
03 - Light Goods Vehicles<=2.5t	7.8	4011.3	0.0
04 - Lt Goods Vehicles 2.5-3.5t	4230.2	215287.3	0.0
05 - Light Goods Vehicles>3.5t	0.0	106610.7	0.0
06 - Medium_Heavy Goods Vehic	0.0	50918.7	0.0
07 - Medium_Heavy Goods Vehicles>1	0.0	137375.0	0.0
08 - Public Light Buses	0.0	6491.0	10891.2
09 - Private Light Bus <=3.5t	1768.4	1132.1	0.0
10 - Private Light Bus >3.5t	6.6	6551.4	1869.2
11 - Non-franchised Bus<=6.4t	0.0	11729.2	0.0
12 - Non-franchised Bus 6.4-15t	0.0	8216.8	0.0
13 - Non-franchised Bus >15t	0.0	11833.2	0.0
14 - Franchised Bus (SD)	0.0	4140.4	0.0
15 - Franchised Bus (DD)	0.0	57632.7	0.0
16 - Motorcycles (MC)	424032.8	0.0	0.0
17 - <Placeholder (P1)>	0.0	0.0	0.0
18 - <Placeholder (P2)>	0.0	0.0	0.0
19 - <Placeholder (P3)>	0.0	0.0	0.0
20 - <Placeholder (P4)>	0.0	0.0	0.0
21 - <Placeholder (P5)>	0.0	0.0	0.0

Buttons: Apply, Cancel, Done

Exercise #6a: Trips Adjustment using Population

- Find “base” population and trips for vehicle class and fuel (PC petrol) for 2030:
 - Population (2030): 783,924 vehicles
 - Trips (2030 base): 1,176,004 trips
- Determine Trips adjustment factor:
 - $250,000 / 1,176,004 = 0.2126$
- Multiply population by factor:
 - $783,924 \times 0.2126 = 166,650$ vehicles

Exercise #6a: Population Edits

2030 Population (Base Case)

Editing Cal Pop data for scenario 1: Hong Kong SAR Annual CYr 2030 Default Title

Total Cal Pop for area: Hong Kong SAR

Editing Mode: Editing Cal Pop (registered vehicles with adjustments)

Total Cal Pop | By Vehicle Class | **By Vehicle and Fuel** | By Vehicle/Fuel/Age

Vehicle Class	Fuel (1=Petrol/2=Diesel/3=LPG)		
	1	2	3
01 - Private Cars (PC)	783924.3	6113.0	0.0
02 - Taxi	0.0	0.0	18193.0
03 - Light Goods Vehicles<=2.5t	1.9	1002.7	0.0
04 - Lt Goods Vehicles 2.5-3.5t	1057.4	53816.4	0.0
05 - Light Goods Vehicles>3.5t	0.0	26652.7	0.0
06 - Medium_Heavy Goods Vehic	0.0	12730.9	0.0
07 - Medium_Heavy Goods Vehicles>1	0.0	34347.2	0.0
08 - Public Light Buses	0.0	1622.9	2723.1
09 - Private Light Bus <=3.5t	631.6	404.4	0.0
10 - Private Light Bus >3.5t	2.4	2340.0	667.6
11 - Non-franchised Bus<=6.4t	0.0	2932.0	0.0
12 - Non-franchised Bus 6.4-15t	0.0	2054.0	0.0
13 - Non-franchised Bus >15t	0.0	2958.0	0.0
14 - Franchised Bus (SD)	0.0	388.0	0.0
15 - Franchised Bus (DD)	0.0	5403.0	0.0
16 - Motorcycles (MC)	70665.1	0.0	0.0
17 - <Placeholder (P1)>	0.0	0.0	0.0
18 - <Placeholder (P2)>	0.0	0.0	0.0
19 - <Placeholder (P3)>	0.0	0.0	0.0
20 - <Placeholder (P4)>	0.0	0.0	0.0
21 - <Placeholder (P5)>	0.0	0.0	0.0

Buttons: Apply, Cancel, Done

2030 Population (Edited for Trips Match)

Editing Cal Pop data for scenario 1: Hong Kong SAR Annual CYr 2030 Default Title

Total Cal Pop for area: Hong Kong SAR

Editing Mode: Editing Cal Pop (registered vehicles with adjustments)

Total Cal Pop | By Vehicle Class | **By Vehicle and Fuel** | By Vehicle/Fuel/Age

Vehicle Class	Fuel (1=Petrol/2=Diesel/3=LPG)		
	1	2	3
01 - Private Cars (PC)	166650.0	6113.0	0.0
02 - Taxi	0.0	0.0	18193.0
03 - Light Goods Vehicles<=2.5t	1.9	1002.7	0.0
04 - Lt Goods Vehicles 2.5-3.5t	1057.4	53816.4	0.0
05 - Light Goods Vehicles>3.5t	0.0	26652.7	0.0
06 - Medium_Heavy Goods Vehic	0.0	12730.9	0.0
07 - Medium_Heavy Goods Vehicles>1	0.0	34347.2	0.0
08 - Public Light Buses	0.0	1622.9	2723.1
09 - Private Light Bus <=3.5t	631.6	404.4	0.0
10 - Private Light Bus >3.5t	2.4	2340.0	667.6
11 - Non-franchised Bus<=6.4t	0.0	2932.0	0.0
12 - Non-franchised Bus 6.4-15t	0.0	2054.0	0.0
13 - Non-franchised Bus >15t	0.0	2958.0	0.0
14 - Franchised Bus (SD)	0.0	388.0	0.0
15 - Franchised Bus (DD)	0.0	5403.0	0.0
16 - Motorcycles (MC)	70665.1	0.0	0.0
17 - <Placeholder (P1)>	0.0	0.0	0.0
18 - <Placeholder (P2)>	0.0	0.0	0.0
19 - <Placeholder (P3)>	0.0	0.0	0.0
20 - <Placeholder (P4)>	0.0	0.0	0.0
21 - <Placeholder (P5)>	0.0	0.0	0.0

Buttons: Apply, Cancel, Done

Exercise #6a: Verify Trips Adjustment

2030 Trips (Base Case)

Editing Trips-per-Day data for scenario 1: Hong Kong SAR Annual CYr 2030 Default Title

Total Trips-per-Day for area: Hong Kong SAR

Editing Mode: Editing Trips-per-Day (starts per week/day)

Total Trips-per-Day | By Vehicle Class | **By Vehicle and Fuel** | By Vehicle/Fuel/Hour

Vehicle Class	Fuel (1=Petrol/2=Diesel/3=LPG)		
	1	2	3
01 - Private Cars (PC)	1176004.1	9170.4	0.0
02 - Taxi	0.0	0.0	72779.3
03 - Light Goods Vehicles<=2.5t	7.8	4011.3	0.0
04 - Lt Goods Vehicles 2.5-3.5t	4230.2	215287.3	0.0
05 - Light Goods Vehicles>3.5t	0.0	106610.7	0.0
06 - Medium_Heavy Goods Vehic	0.0	50918.7	0.0
07 - Medium_Heavy Goods Vehicles>1	0.0	137375.0	0.0
08 - Public Light Buses	0.0	6491.0	10891.2
09 - Private Light Bus <=3.5t	1768.4	1132.1	0.0
10 - Private Light Bus >3.5t	6.6	6551.4	1869.2
11 - Non-franchised Bus<=6.4t	0.0	11729.2	0.0
12 - Non-franchised Bus 6.4-15t	0.0	8216.8	0.0
13 - Non-franchised Bus >15t	0.0	11833.2	0.0
14 - Franchised Bus (SD)	0.0	4140.4	0.0
15 - Franchised Bus (DD)	0.0	57632.7	0.0
16 - Motorcycles (MC)	424032.8	0.0	0.0
17 - <Placeholder (P1)>	0.0	0.0	0.0
18 - <Placeholder (P2)>	0.0	0.0	0.0
19 - <Placeholder (P3)>	0.0	0.0	0.0
20 - <Placeholder (P4)>	0.0	0.0	0.0
21 - <Placeholder (P5)>	0.0	0.0	0.0

Buttons: Apply, Cancel, Done

2030 Trips (After Pop Edit)

Editing Trips-per-Day data for scenario 1: Hong Kong SAR Annual CYr 2030 Default Title

Total Trips-per-Day for area: Hong Kong SAR

Editing Mode: Editing Trips-per-Day (starts per week/day)

Total Trips-per-Day | By Vehicle Class | **By Vehicle and Fuel** | By Vehicle/Fuel/Hour

Vehicle Class	Fuel (1=Petrol/2=Diesel/3=LPG)		
	1	2	3
01 - Private Cars (PC)	250000.0	9170.4	0.0
02 - Taxi	0.0	0.0	72779.3
03 - Light Goods Vehicles<=2.5t	7.8	4011.3	0.0
04 - Lt Goods Vehicles 2.5-3.5t	4230.2	215287.3	0.0
05 - Light Goods Vehicles>3.5t	0.0	106610.7	0.0
06 - Medium_Heavy Goods Vehic	0.0	50918.7	0.0
07 - Medium_Heavy Goods Vehicles>1	0.0	137375.0	0.0
08 - Public Light Buses	0.0	6491.0	10891.2
09 - Private Light Bus <=3.5t	1768.4	1132.1	0.0
10 - Private Light Bus >3.5t	6.6	6551.4	1869.2
11 - Non-franchised Bus<=6.4t	0.0	11729.2	0.0
12 - Non-franchised Bus 6.4-15t	0.0	8216.8	0.0
13 - Non-franchised Bus >15t	0.0	11833.2	0.0
14 - Franchised Bus (SD)	0.0	4140.4	0.0
15 - Franchised Bus (DD)	0.0	57632.7	0.0
16 - Motorcycles (MC)	424032.8	0.0	0.0
17 - <Placeholder (P1)>	0.0	0.0	0.0
18 - <Placeholder (P2)>	0.0	0.0	0.0
19 - <Placeholder (P3)>	0.0	0.0	0.0
20 - <Placeholder (P4)>	0.0	0.0	0.0
21 - <Placeholder (P5)>	0.0	0.0	0.0

Buttons: Apply, Cancel, Done

Exercise #6a: VKT Adjustment after Population Adjustment

2030 VKT
(Base Case)

Editing VKT data for scenario 1: Hong Kong SAR Annual CYr 2030 Default Title

Total VKT for area: Hong Kong SAR

Editing Mode: Editing VKT (vehicle km traveled per weekday)

Total VKT | By Vehicle Class | **By Vehicle and Fuel** | By Vehicle/Fuel/Hour

Vehicle Class	Fuel (1=Petrol/2=Diesel/3=LPG)		
	1	2	3
01 - Private Cars (PC)	21887260.0	171471.0	0.0
02 - Taxi	0.0	0.0	7665955.0
03 - Light Goods Vehicles<=2.5t	109.9	74275.4	0.0
04 - Lt Goods Vehicles 2.5-3.5t	67129.2	3549671.3	0.0
05 - Light Goods Vehicles>3.5t	0.0	2547736.5	0.0
06 - Medium_Heavy Goods Vehic	0.0	1055561.3	0.0
07 - Medium_Heavy Goods Vehicles>1	0.0	2849234.3	0.0
08 - Public Light Buses	0.0	485980.8	815425.1
09 - Private Light Bus <=3.5t	60387.8	41022.6	0.0
10 - Private Light Bus >3.5t	105.6	183583.6	49542.4
11 - Non-franchised Bus<=6.4t	0.0	347714.9	0.0
12 - Non-franchised Bus 6.4-15t	0.0	239203.8	0.0
13 - Non-franchised Bus >15t	0.0	343950.8	0.0
14 - Franchised Bus (SD)	0.0	72384.1	0.0
15 - Franchised Bus (DD)	0.0	1265799.5	0.0
16 - Motorcycles (MC)	1317946.8	0.0	0.0
17 - <Placeholder (P1)>	0.0	0.0	0.0
18 - <Placeholder (P2)>	0.0	0.0	0.0
19 - <Placeholder (P3)>	0.0	0.0	0.0
20 - <Placeholder (P4)>	0.0	0.0	0.0
21 - <Placeholder (P5)>	0.0	0.0	0.0

Buttons: Apply, Cancel, Done

2030 VKT
(After Pop Edit)

Editing VKT data for scenario 1: Hong Kong SAR Annual CYr 2030 Default Title

Total VKT for area: Hong Kong SAR

Editing Mode: Editing VKT (vehicle km traveled per weekday)

Total VKT | By Vehicle Class | **By Vehicle and Fuel** | By Vehicle/Fuel/Hour

Vehicle Class	Fuel (1=Petrol/2=Diesel/3=LPG)		
	1	2	3
01 - Private Cars (PC)	4652888.0	171471.0	0.0
02 - Taxi	0.0	0.0	7665955.0
03 - Light Goods Vehicles<=2.5t	109.9	74275.4	0.0
04 - Lt Goods Vehicles 2.5-3.5t	67129.2	3549671.3	0.0
05 - Light Goods Vehicles>3.5t	0.0	2547736.5	0.0
06 - Medium_Heavy Goods Vehic	0.0	1055561.3	0.0
07 - Medium_Heavy Goods Vehicles>1	0.0	2849234.3	0.0
08 - Public Light Buses	0.0	485980.8	815425.1
09 - Private Light Bus <=3.5t	60387.8	41022.6	0.0
10 - Private Light Bus >3.5t	105.6	183583.6	49542.4
11 - Non-franchised Bus<=6.4t	0.0	347714.9	0.0
12 - Non-franchised Bus 6.4-15t	0.0	239203.8	0.0
13 - Non-franchised Bus >15t	0.0	343950.8	0.0
14 - Franchised Bus (SD)	0.0	72384.1	0.0
15 - Franchised Bus (DD)	0.0	1265799.5	0.0
16 - Motorcycles (MC)	1317946.8	0.0	0.0
17 - <Placeholder (P1)>	0.0	0.0	0.0
18 - <Placeholder (P2)>	0.0	0.0	0.0
19 - <Placeholder (P3)>	0.0	0.0	0.0
20 - <Placeholder (P4)>	0.0	0.0	0.0
21 - <Placeholder (P5)>	0.0	0.0	0.0

Buttons: Apply, Cancel, Done

Exercise #6b: Changing Trips (Directly)

- Problem: Determine emissions in 2030 for PC petrol (Vehicle Class 1) given a forecast of 250,000 trips/day.
- Scenario data:
 - Geographic Area: Hong Kong SAR
 - Calendar Years: 2030
 - Season: Annual
 - Scenario Type: BURDEN
 - Output File types: Text (CSV), BCD
 - Output Frequency: hourly
 - Pollutants: PM₁₀, VOC
- Trips for PC petrol cars = 250,000
- Direct entry of new trips

Exercise #6b: Editing Trips Screen

2030 Trips (Base Case)

Editing Trips-per-Day data for scenario 1: Hong Kong SAR Annual CYr 2030 Default Title

Total Trips-per-Day for area: Hong Kong SAR

Editing Mode: Editing Trips-per-Day (starts per weekday)

Total Trips-per-Day | By Vehicle Class | **By Vehicle and Fuel** | By Vehicle/Fuel/Hour

Fuel (1=Petrol/2=Diesel/3=LPG)

Vehicle Class	1	2	3
01 - Private Cars (PC)	1176004.1	9170.4	0.0
02 - Taxi	0.0	0.0	72779.3
03 - Light Goods Vehicles<=2.5t	7.8	4011.3	0.0
04 - Lt Goods Vehicles 2.5-3.5t	4230.2	215287.3	0.0
05 - Light Goods Vehicles>3.5t	0.0	106610.7	0.0
06 - Medium_Heavy Goods Vehic	0.0	50918.7	0.0
07 - Medium_Heavy Goods Vehicles>1	0.0	137375.0	0.0
08 - Public Light Buses	0.0	6491.0	10891.2
09 - Private Light Bus <=3.5t	1768.4	1132.1	0.0
10 - Private Light Bus >3.5t	6.6	6551.4	1869.2
11 - Non-franchised Bus<=6.4t	0.0	11729.2	0.0
12 - Non-franchised Bus 6.4-15t	0.0	8216.8	0.0
13 - Non-franchised Bus >15t	0.0	11833.2	0.0
14 - Franchised Bus (SD)	0.0	4140.4	0.0
15 - Franchised Bus (DD)	0.0	57632.7	0.0
16 - Motorcycles (MC)	424032.8	0.0	0.0
17 - <Placeholder (P1)>	0.0	0.0	0.0
18 - <Placeholder (P2)>	0.0	0.0	0.0
19 - <Placeholder (P3)>	0.0	0.0	0.0
20 - <Placeholder (P4)>	0.0	0.0	0.0
21 - <Placeholder (P5)>	0.0	0.0	0.0

Buttons: Apply, Cancel, Done

2030 Trips (After Trips Edit)

Editing Trips-per-Day data for scenario 1: Hong Kong SAR Annual CYr 2030 Default Title

Total Trips-per-Day for area: Hong Kong SAR

Editing Mode: Editing Trips-per-Day (starts per weekday)

Total Trips-per-Day | By Vehicle Class | **By Vehicle and Fuel** | By Vehicle/Fuel/Hour

Fuel (1=Petrol/2=Diesel/3=LPG)

Vehicle Class	1	2	3
01 - Private Cars (PC)	250000.0	9170.4	0.0
02 - Taxi	0.0	0.0	72779.3
03 - Light Goods Vehicles<=2.5t	7.8	4011.3	0.0
04 - Lt Goods Vehicles 2.5-3.5t	4230.2	215287.3	0.0
05 - Light Goods Vehicles>3.5t	0.0	106610.7	0.0
06 - Medium_Heavy Goods Vehic	0.0	50918.7	0.0
07 - Medium_Heavy Goods Vehicles>1	0.0	137375.0	0.0
08 - Public Light Buses	0.0	6491.0	10891.2
09 - Private Light Bus <=3.5t	1768.4	1132.1	0.0
10 - Private Light Bus >3.5t	6.6	6551.4	1869.2
11 - Non-franchised Bus<=6.4t	0.0	11729.2	0.0
12 - Non-franchised Bus 6.4-15t	0.0	8216.8	0.0
13 - Non-franchised Bus >15t	0.0	11833.2	0.0
14 - Franchised Bus (SD)	0.0	4140.4	0.0
15 - Franchised Bus (DD)	0.0	57632.7	0.0
16 - Motorcycles (MC)	424032.8	0.0	0.0
17 - <Placeholder (P1)>	0.0	0.0	0.0
18 - <Placeholder (P2)>	0.0	0.0	0.0
19 - <Placeholder (P3)>	0.0	0.0	0.0
20 - <Placeholder (P4)>	0.0	0.0	0.0
21 - <Placeholder (P5)>	0.0	0.0	0.0

Buttons: Apply, Cancel, Done

Exercise #6c: Changing VKT - Comparison of #6a and #6b Output

- Problem: determine difference in NO_x running and starting exhaust emissions output from Exercises #6a and #6b for PC petrol cars.
- Purpose: examine results from alternate trip edit approaches
- Extract/compare NO_x running and starting exhaust emissions from Test/*.CSV. Use values for the **day**.
 - Note: you'll need to add results for NCAT and CAT

Exercise #6c: Solution

Process	Base	#6a: Pop-adjusted Trips	#6b: Trips direct
Vehicles	783,924	166,650	783,924
VKT	21,887,260	465,2888	21,887,260
Trips	1,176,004	250,000	250,000
NOx Run Exhaust	0.2273	0.0483	0.2273
NOx Start Exhaust	0.0441	0.0094	0.0094

Notes:

Results show how altering trips via population (#6a) also alters VKT; thus, running exhaust is altered, as well. Exercise #6b shows altering trips only reduces starting exhaust.

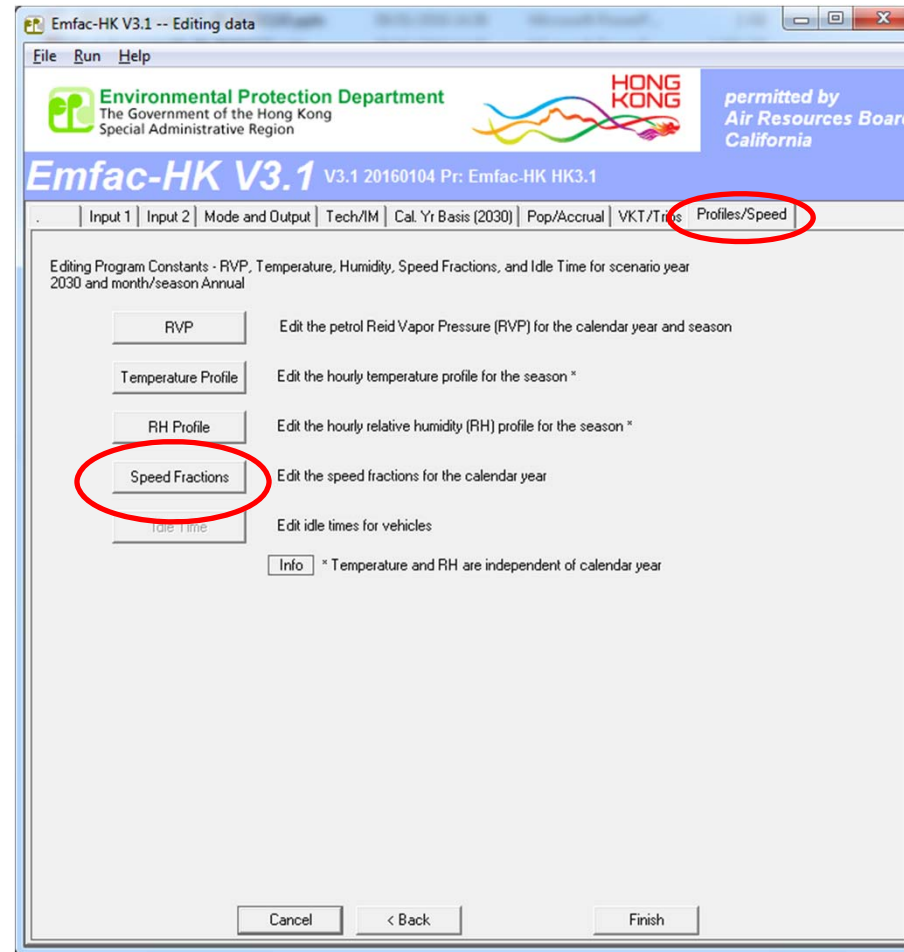
Exercise #7: Speed Distributions

- Hong Kong has developed a TCM, which requires medium and heavy goods vehicles to only travel between midnight (0-hr) and 8 a.m. and from 10 p.m. to midnight. 5% of the VKT occurs at average speed 1-8 km/hr (Speed Bin #1 in GUI); 25% at 24-32 km/hr (Speed Bin #4); 20% at 48-56 km/hr (Speed Bin #7), 25% at 56-64 km/hr (Speed Bin #8), and 25% at 64-72 km/hr (Speed Bin #9).
- What is the effect on NO_x running exhaust emissions from this change?

Exercise #7: Speed Distributions

- Problem: Determine change in emissions in 2015 for HGV7 (Vehicle Class 6) and HGV8 (Vehicle Class 7) given the revised speed distribution below.
- Scenario data:
 - Geographic Area: Hong Kong SAR
 - Calendar Years: 2015
 - Season: Annual
 - Scenario Type: BURDEN
 - Output File types: Text (CSV), BCD
 - Output Frequency: daily
 - Pollutants: PM₁₀, VOC
- Speed Fractions:
 - 5% of the VKT occurs at average speed 1-8 km/hr (Speed Bin #1);
 - 25% at 24-32 km/hr (Speed Bin #4);
 - 20% at 48-56 km/hr (Speed Bin #7);
 - 25% at 56-64 km/hr (Speed Bin #8) and
 - 25% at 64-72 km/hr (Speed Bin #9).

Exercise #7: Profiles/Speed Tab



Exercise #7: Editing Speed Fractions

2015 Speed Fractions (HGV7) Base Case

Speed Fractions by Scenario Year and Vehicle Class

Area: Hong Kong SAR Scenario Year: 2015 Copy with Headings Paste Data Only

Hong Kong SAR

VKT-Weighted Average Basis: 8 KPH 16 KPH Vehicle Class: 06: Heavy Goods Vehicles (5.5-15t)

	hour (1 to 24)							
	1	2	3	4	5	6	7	8
1	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
2	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
3	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
4	0.2682	0.2682	0.2682	0.2682	0.2682	0.2682	0.2682	0.1915
5	0.0374	0.0374	0.0374	0.0374	0.0374	0.0374	0.0374	0.0401
6	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
7	0.3277	0.3277	0.3277	0.3277	0.3277	0.3277	0.3277	0.2579
8	0.0197	0.0197	0.0197	0.0197	0.0197	0.0197	0.0197	0.0310
9	0.3469	0.3469	0.3469	0.3469	0.3469	0.3469	0.3469	0.4795
10	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
11	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
12	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
13	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
14	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
15	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
16	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
17	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
18	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

Total 100 % in each hour

Apply Cancel Done Apply to Others

2015 Speed Fractions (HGV7) About to Copy Edits from Spreadsheet

Speed Fractions by Scenario Year and Vehicle Class

Area: Hong Kong SAR Scenario Year: 2030 Copy with Headings Paste Data Only

Hong Kong SAR

VKT-Weighted Average Basis: 8 KPH 16 KPH Vehicle Class: 06: Heavy Goods Vehicles (5.5-15t)

	Hour (1 to 24)							
	1	2	3	4	5	6	7	8
1	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
2	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
3	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
4	0.2682	0.2682	0.2682	0.2682	0.2682	0.2682	0.2682	0.1915
5	0.0374	0.0374	0.0374	0.0374	0.0374	0.0374	0.0374	0.0401
6	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
7	0.3277	0.3277	0.3277	0.3277	0.3277	0.3277	0.3277	0.2579
8	0.0197	0.0197	0.0197	0.0197	0.0197	0.0197	0.0197	0.0310
9	0.3469	0.3469	0.3469	0.3469	0.3469	0.3469	0.3469	0.4795
10	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
11	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
12	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
13	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
14	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
15	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
16	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
17	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
18	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

Total 100 % in each hour

Apply Cancel Done Apply to Others

Editing speed fractions

Paste 24 hours of speed fractions data?

Yes No

Set the "Basis" tab to "8 KPH" and select the Heavy Goods Vehicles<15t. Then change the VKT speed distribution. Then apply this change to this hour and vehicle class. Then apply this change to other vehicle classes.

Exercise #7: Editing Speed Fractions

2015 Speed Fractions (HGV7) Base Case

Speed Fractions by Scenario Year and Vehicle Class

Area: Hong Kong SAR Scenario Year: 2030 Copy with Headings Paste Data Only

Hong Kong SAR

VKT-Weighted Average Basis: 8 KPH 16 KPH Vehicle Class: 06: Heavy Goods Vehicles (5.5-15)

Speed Bin (8,16,24,...) (1:18)	Hour (1 to 24)							
	1	2	3	4	5	6	7	8
1	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
2	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
3	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
4	0.2682	0.2682	0.2682	0.2682	0.2682	0.2682	0.2682	0.1915
5	0.0374	0.0374	0.0374	0.0374	0.0374	0.0374	0.0374	0.0401
6	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
7	0.3277	0.3277	0.3277	0.3277	0.3277	0.3277	0.3277	0.2579
8	0.0197	0.0197	0.0197	0.0197	0.0197	0.0197	0.0197	0.0310
9	0.3469	0.3469	0.3469	0.3469	0.3469	0.3469	0.3469	0.4795
10	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
11	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
12	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
13	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
14	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
15	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
16	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
17	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
18	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

Total 100 % in each hour Apply Cancel Done Apply to Others

2015 Speed Fractions (HGV7) Edits Applied

Speed Fractions by Scenario Year and Vehicle Class

Area: Hong Kong SAR Scenario Year: 2015 Copy with Headings Paste Data Only

Hong Kong SAR

VKT-Weighted Average Basis: 8 KPH 16 KPH Vehicle Class: 06: Heavy Goods Vehicles (5.5-15)

Speed Bin (8,16,24,...) (1:18)	Hour (1 to 24)							
	1	2	3	4	5	6	7	8
1	0.0500	0.0500	0.0500	0.0500	0.0500	0.0500	0.0500	0.0500
2	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
3	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
4	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500
5	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
6	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
7	0.2000	0.2000	0.2000	0.2000	0.2000	0.2000	0.2000	0.2000
8	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500
9	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500
10	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
11	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
12	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
13	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
14	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
15	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
16	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
17	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
18	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

Total 100 % in each hour Apply Cancel Done Apply to Others

Exercise #7: Apply Speed Fraction Edits to Other Hours

Apply Edit to Another Veh Class

Speed Fractions by Scenario Year and Vehicle Class

Area: Hong Kong SAR Scenario Year: 2030 Copy with Headings Paste Data Only

Hong Kong SAR

VKT-Weighted Average Basis: 8 KPH 16 KPH Vehicle Class: 06: Heavy Goods Vehicles (5.5-15t)

	Hour (1 to 24)							
	1	2	3	4	5	6	7	8
1	0.0500	0.0500	0.0500	0.0500	0.0500	0.0500	0.0500	0.0500
2	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
3	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
4	0.2000	0.2000	0.2000	0.2000	0.2000	0.2000	0.2000	0.2000
5	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
6	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
7	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500
8	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500
9	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500
10	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
11	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
12	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
13	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
14	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
15	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
16	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
17	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
18	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

Speed Bin (8,16,24,...) (1:18)

Apply to Range?

Apply This Profile to a Range of Values?

Parameters

Vehicle Class

OK Cancel

Total 100 % in each hour

Apply Cancel Done **Apply to Others**

Apply Edit to HGV8

Speed Fractions by Scenario Year and Vehicle Class

Area: Hong Kong SAR Scenario Year: 2030 Copy with Headings Paste Data Only

Hong Kong SAR

VKT-Weighted Average Basis: 8 KPH 16 KPH Vehicle Class: 06: Heavy Goods Vehicles (5.5-15t)

	Hour (1 to 24)							
	1	2	3	4	5	6	7	8
1	0.0500	0.0500	0.0500	0.0500	0.0500	0.0500	0.0500	0.0500
2	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
3	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
4	0.2000	0.2000	0.2000	0.2000	0.2000	0.2000	0.2000	0.2000
5	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
6	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
7	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500
8	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500
9	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500
10	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
11	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
12	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
13	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
14	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
15	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
16	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
17	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
18	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

Speed Bin (8,16,24,...) (1:18)

Apply updated values for Speed Fractions

Updates Will Be Applied to Selections in "Apply To:" Column.

Vehicle Classes

Selections Available

- 01: Private Cars (PC)
- 02: Taxi
- 03: Light Goods Vehicles<=2.5t
- 04: Lt Goods Vehicles 2.5-3.5t
- 05: Light Goods Vehicles>3.5t
- 06: Medium & Heavy Goods Vehicles<=
- 07: Medium & Heavy Goods Vehicles>15t
- 08: Public Light Buses
- 09: Private Light Bus <=3.5t
- 10: Private Light Bus >3.5t
- 11: Non-franchised Bus<=6.4t
- 12: Non-franchised Bus 6.4-15t
- 13: Non-franchised Bus >15t
- 14: Franchised Bus (600)

Apply To:

07: Medium & Heavy Goods Vehicles>15t

OK Cancel

Total 100 % in each hour

Apply Cancel Done Apply to Others

Exercise #7: Solution

The screenshot shows Microsoft Excel with the 'Data' ribbon selected. The spreadsheet contains two tables, 'Base' and 'TDM', with the following data:

	CALYR	START MYR	END MYR	REGION	SAR	STARTS	POPULATION	VKT	VEH TYPE	VEH TECH	POLLUTANT	PROCESS	EMISSIONS	BASIS
1	Base													
2	2015	1971	2015	SAR Average	Hong Kong SAR Average	47248	11813	980825	HGV7	DSL	NOx	Run Exh	3.221954	Day
3	2015	1971	2015	SAR Average	Hong Kong SAR Average	127473	31871	2646047	HGV8	DSL	NOx	Run Exh	14.517085	Day
6	TDM													
7	2015	1971	2015	SAR Average	Hong Kong SAR Average	47248	11813	980825	HGV7	DSL	NOx	Run Exh	3.401024	Day
8	2015	1971	2015	SAR Average	Hong Kong SAR Average	127473	31871	2646047	HGV8	DSL	NOx	Run Exh	15.19208	Day

Exercise #8: Changing RH

- Context: This exercise shows how the user can change the relative humidity for an area of concern, say, area near a weather station, P, in 2015. It also provides the users
- Problem: Set up a base run for 2015 calendar year for Hong Kong. Include a second scenario, replacing the annual relative humidity values with the annual values provided on RH.XLS.

Exercise #8: Entering Different Relative Humidity Values


- Scenario data:
 - Scenario #1
 - Geographic Area: Hong Kong SAR
 - Calendar Years: 2015
 - Season: Annual
 - Scenario Type: BURDEN
 - Output File types: Text (CSV), BCD
 - Output Frequency: daily
 - Pollutants: PM₁₀, VOC
 - Scenario #2: Replace annual Relative Humidity Values with values from RH.XLS

Exercise #8: Changing RH

RH Annual (Default)

Diurnal Relative Humidity Profile

Area: Hong Kong SAR
Month: Annual
VKT-Weighted Average of 1 Sub-areas



Hong Kong SAR

Copy with Headings Paste Data Only

Relative Humidity (%)

Hour											
0000	0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100
80.8	81.2	81.6	81.9	82.0	82.1	82.2	81.4	78.6	74.7	71.4	69.1
1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300
67.9	67.2	67.1	67.8	69.3	71.6	74.6	77.2	78.6	79.6	80.2	80.6

Modify Values for Range of Hours


to Constant Value for Range

Apply Cancel Done

RH Annual from RH.XLS

Diurnal Relative Humidity Profile

Area: Hong Kong SAR
Month: Annual
VMT-Weighted Average of 1 Sub-areas



Hong Kong

Copy with Headings Paste Data Only

Relative Humidity (%)

Hour											
0000	0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100
80.6	80.8	81.1	81.2	80.9	81.1	80.2	77.3	74.2	71.1	68.8	67.6
1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300
66.9	67.1	68.2	69.4	72.1	75.2	77.3	78.3	79.1	79.6	80.0	80.3

Modify Values for Range of Hours

to Constant Value for Range

Apply Cancel Done

Exercise #9: Alternate Base Year

This example shows how to choose and edit an alternate base year and data; then, perform a forecast of these data. The example selects an alternate baseline year (Calendar Year 2014); performs a 5% adjustment to the petrol base population; then forecasts the inventory for Calendar Year 2030.

Suggested steps:

- 1) **Run** EMFAC-HK V3.1
- 2) Select "**File**" and click "**New**" from the Menu
- 3) On Tab "MAIN", click "**Add New Scenario**".

Exercise #9: Alternate Base Year

The screenshot shows the 'Emfac-HK V3.1 -- Editing data' window. The interface includes a menu bar (File, Run, Help), logos for the Environmental Protection Department and Hong Kong, and a permit notice from the Air Resources Board California. The main area is titled 'MAIN' and contains a 'List of Available Scenarios' (currently empty), 'Current Scenario Data' (Number: 0 of 0, Name:), and 'Regime Size Change Data'. The 'Add New Scenario' button is circled in red. Below the table is a note: '*** When checked, changes apply to all scenarios.'

Environmental Protection Department
The Government of the Hong Kong
Special Administrative Region

HONG KONG

permitted by
Air Resources Board
California

Emfac-HK V3.1 V3.1 20160104 Pr: Emfac-HK HK3.1

File Run Help

MAIN

List of Available Scenarios

No file or scenario

Current Scenario Data

Number: 0 of 0
Name:

Calendar Year:
Season:
Type:

IM Program Parameters

Save

Save As...

Run

Finish Editing

Cancel

Add New Scenario

Edit Scenario

Delete Scenario

* Denotes currently active scenario

Regime Size Change Data

Apply Regime Changes ***

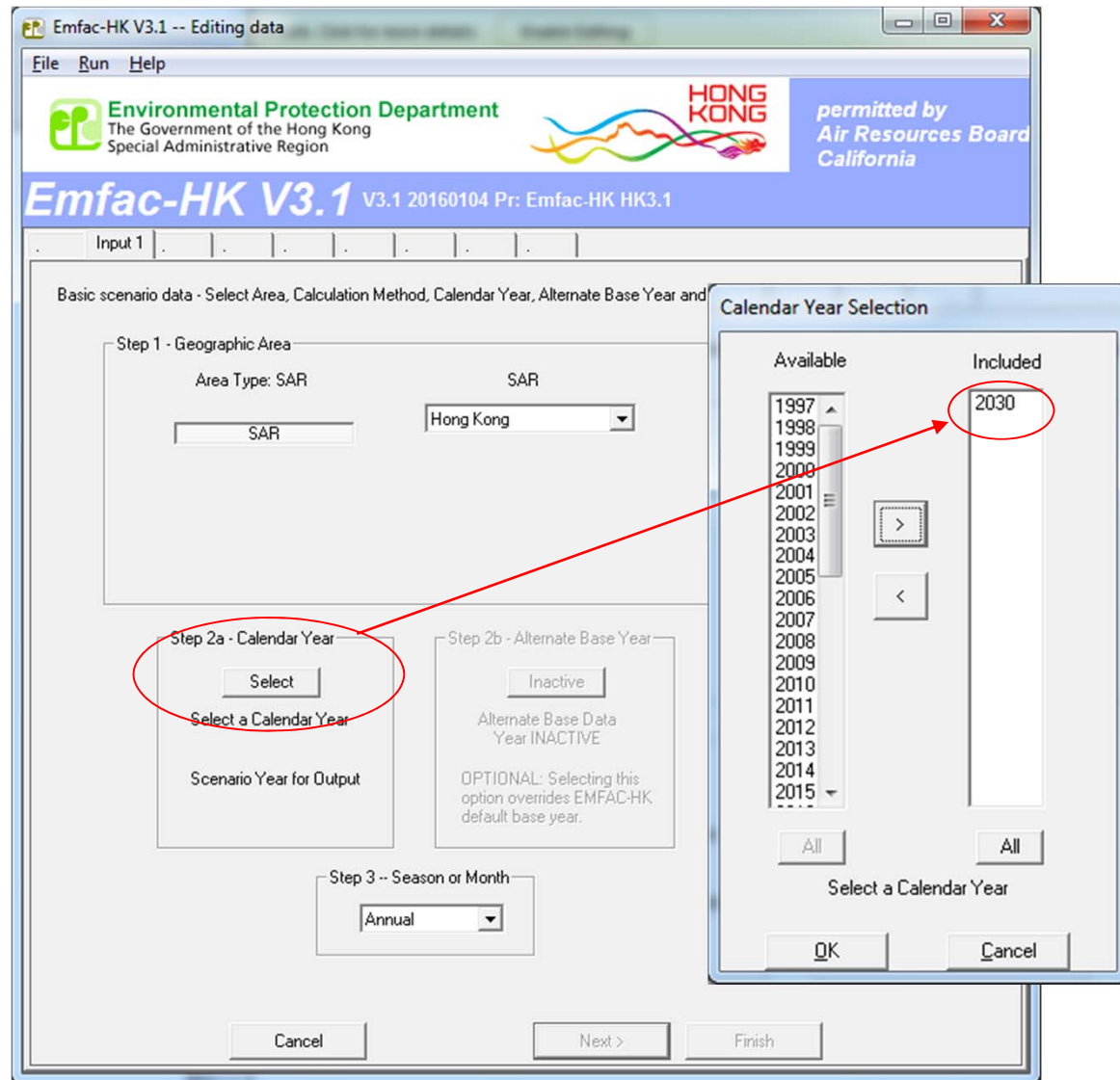
Category-Fuel	% Reduction		Start Year
	Highs	Supers	
Private Car-Petrol:	20	20	2014
Taxi-LPG:	85	85	2014
Public Light Bus-LPG:	40	40	2014
Private Light Bus > 3.5t-LPG:	20	20	2014
Above 15t-Diesel:	0	0	2014

*** When checked, changes apply to all scenarios.

Exercise #9: Alternate Base Year

- 4) On Tab "INPUT1", under *Step 2a - Target Years*, click **"Select"**
- 5) On the "Target Year Selection" screen, click "**2030**" in the *Available* column; then, click ">". The target year 2030 should appear in the "Included" column. Click **"OK"**.

Exercise #9: Alternate Base Year

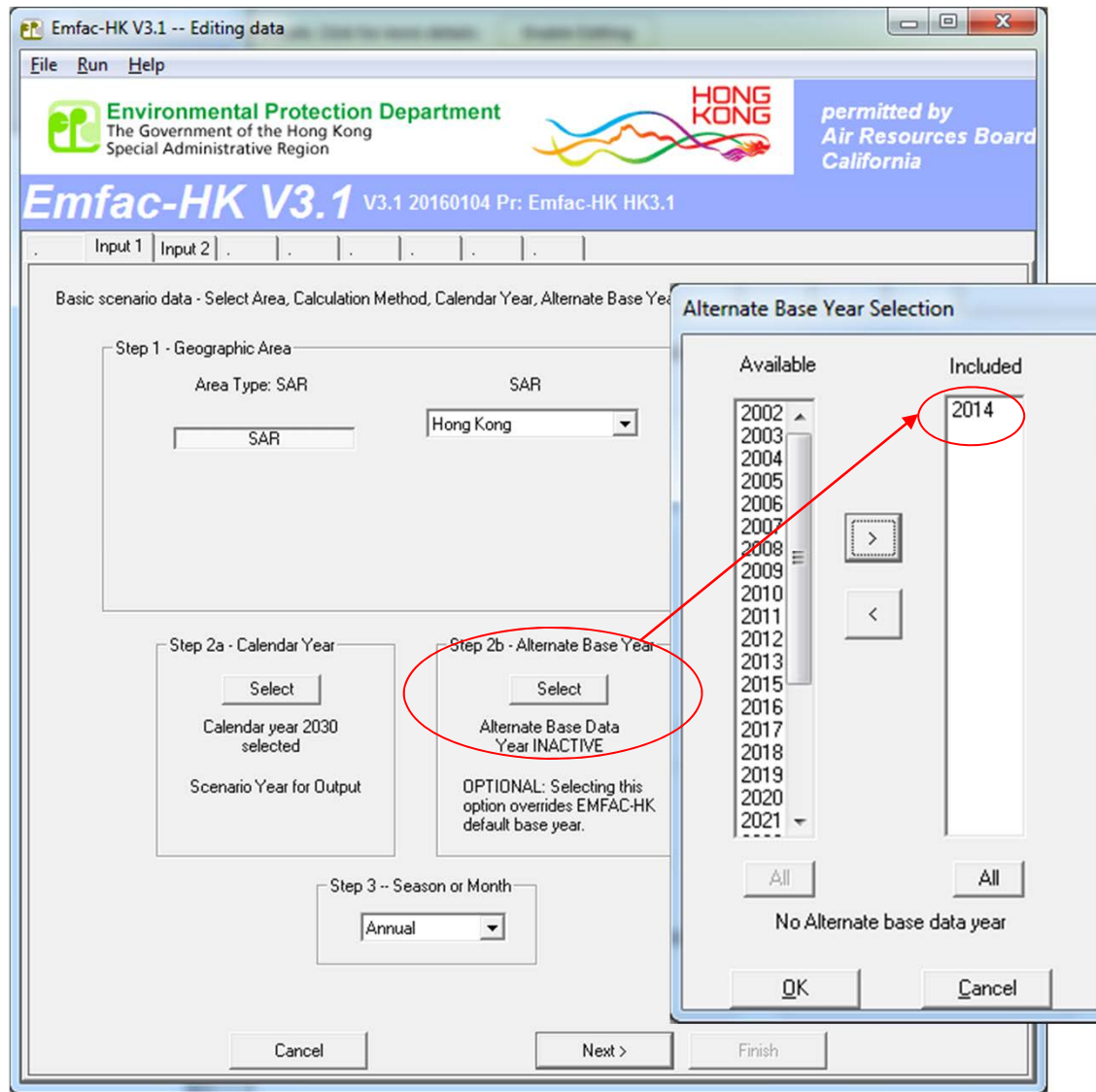


Exercise #9: Alternate Base Year

6) On Tab "INPUT 1", under *Step 2b – Alternate Baseline Yr* is no longer "grayed out". Click "**Select**" and proceed to selecting an alternate baseline year.

7) On the "Alternate Baseline Yr Selection" screen, click "**2014**" in the *Available* column; then, click ">". The alternate baseline year of "2014" should appear in the "Included" column. Click "**OK**".

Exercise #9: Alternate Base Year



Exercise #9: Alternate Base Year

8) The updated *Step 2a – Target Years* and *Step 2b – Alternate Baseline Yr* boxes should now both be updated, as indicated below. At Step 3, keep the *Season or Month* selection as “**Annual**”. Click “**Next**” to proceed to the screen titled *Input 2*.

Emfac-HK V3.1 -- Editing data

File Run Help

Environmental Protection Department
The Government of the Hong Kong
Special Administrative Region

HONG KONG

permitted by
Air Resources Board
California

Emfac-HK V3.1 V3.1 20160104 Pr: Emfac-HK HK3.1

Input 1 Input 2

Basic scenario data - Select Area, Calculation Method, Calendar Year, Alternate Base Year and Season

Step 1 - Geographic Area

Area Type: SAR SAR

SAR Hong Kong

Step 2a - Calendar Year

Select

Calendar year 2030
selected

Scenario Year for Output

Step 2b - Alternate Base Year

ACTIVATED

Alternate Base data
year 2014 selected

OPTIONAL: Selecting this
option overrides EMFAC-HK
default base year.

Step 3 - Season or Month

Annual

Cancel Next > Finish

Exercise #9: Alternate Base Year

9) In *Input 2* screen, click “**Default Title**” to change the *Step 4 - Scenario Title for Reports* to reflect the concerned scenario.

The screenshot shows the 'Emfac-HK V3.1 -- Editing data' window. The interface includes a menu bar (File, Run, Help) and a header with logos for the Environmental Protection Department and HONG KONG, along with a note 'permitted by Air Resources Board California'. The main window title is 'Emfac-HK V3.1 V3.1 20160104 Pr: Emfac-HK HK3.1'. The 'Input 2' tab is selected and circled in red. Below the tab, the 'Basic scenario data - Select or Enter Scenario Title' section is highlighted with a red box. It contains a text field with the text 'Hong Kong SAR Annual CYr 2030 Default Title' and a 'Default Title' button, both circled in red. A warning message below the text field reads: 'In Emfac Impact Rate reports, titles over 40 characters will be truncated!'. Below this, there are three panels: 'Step 5 - Model Years' (All model years selected, All, Modify buttons), 'Step 6 - Vehicle Classes' (MODIFIED: All vehicle classes selected, All, Modify buttons), and 'Step 7 - I/M Program Schedule' (Standard I/M schedules, Default, Modify buttons). At the bottom, there are 'Cancel', '< Back', 'Next >', and 'Finish' buttons.

Exercise #9: Alternate Base Year

15) Click “**Next**” and proceed to the *Mode and Output* screen.

•16) In the *Mode and Output* screen, click on “**Burden – Area Emission Estimate**”. Under *Burden Inventory Files and Reports* click on “**Detailed Emission Estimates (CSV)**” and “**MVEI7G (BCD)**”.

The screenshot shows the Emfac-HK V3.1 software interface. The window title is "Emfac-HK V3.1 -- Editing data". The menu bar includes "File", "Run", and "Help". The header area displays the Environmental Protection Department logo for the Government of the Hong Kong Special Administrative Region, the HONG KONG logo, and a permit from the Air Resources Board California. The main interface has a blue header with "Emfac-HK V3.1" and version information. Below this is a tabbed interface with "Input 1", "Input 2", "Mode and Output", "Tech/IM", "Base / Cal. Yr Basis", and other tabs. The "Mode and Output" tab is active, showing a sub-tab "Burden - Area Emission Estimate". The "BURDEN Inventory Files and Reports" section contains several options: "Detailed Emission Estimates (CSV)", "MVEI7G (BCD)", "Weighted Model Year Activity (WT)", and "Detailed Outputs (BDN)". The "Output Frequency" section has radio buttons for "Hour" and "Day", with "Day" selected. The "Output Particulate As..." section has radio buttons for "Total PM", "PM10", and "PM2.5", with "PM10" selected. The "Output Hydrocarbons As..." section has radio buttons for "TOG", "THC", "VOC", and "CH4", with "VOC" selected. The "Speed categories..." section has radio buttons for "8" and "16 km/h", with "8" selected. At the bottom, there are buttons for "Cancel", "< Back", "Edit Program Constants", and "Finish". The "Edit Program Constants" button is highlighted with a red circle.

Exercise #9: Alternate Base Year

17) Click “**Edit Program Constants**” to advance to the next screen, which is the Tech/IM screen.

18) Click “**Next**” at the *Tech/IM Screen* to advance to the *Base/Targ Yr* screen.

19) We will now perform edits to the Alternate Baseline Data: on the *Base/Targ Yr* Screen click on “**2014 (Alt Baseline Pop)**” to select the alternate baseline data for editing. Once the selection is made, notice that the tab has been relabeled to *Base Yr Basis (2014)*, and the *Population* tab appears on the Tab Strip.

Exercise #9: Alternate Base Year

Emfac-HK V3.1 -- Editing data

File Run Help

Environmental Protection Department
The Government of the Hong Kong
Special Administrative Region

HONG KONG

permitted by
Air Resources Board
California

Emfac-HK V3.1 V3.1 20160104 Pr: Emfac-HK HK3.1

Input 1 | Input 2 | Mode and Output | Tech/IM | **Base Yr Basis (2014)** | **Population** | . | .

Editing - Calendar Year Basis for Activity

Select the calendar year basis for editing activity data:

2014 (Alt. Base Pop)	Active
2030 (Calendar Year)	Options
2014 (Alt. Base Pop)	

Cancel < Back **Next >** Finish

Exercise #9: Alternate Base Year

20) Click “**Next**” to advance to the *Population* edits screen.

21) *Population/Accrual* edit screen: notice the Accrual button is “grayed out”, as it is neither applicable nor editable for the baseline year).

22) Click on the “**Population**” button to advance to the editing screen.

Exercise #9: Alternate Base Year

The screenshot shows the 'Emfac-HK V3.1' software interface. The title bar reads 'Emfac-HK V3.1 -- Editing data'. The menu bar includes 'File', 'Run', and 'Help'. The header area features the 'Environmental Protection Department' logo and text for 'The Government of the Hong Kong Special Administrative Region', the 'HONG KONG' logo, and a note 'permitted by Air Resources Board California'. Below the header, the version and project information 'Emfac-HK V3.1 V3.1 20160104 Pr: Emfac-HK HK3.1' is displayed. The main window has a tabbed interface with 'Input 1', 'Input 2', 'Mode and Output', 'Tech/IM', 'Base Yr Basis (2014)', and 'Population' tabs. The 'Population' tab is active, showing the title 'Editing Program Constants - Population for Alternate Base year 2014'. There are two main options: 'Population' (with the description 'Edit the vehicle population') and 'Accrual' (with the description 'Edit the odometer accrual *'). The 'Accrual' button is grayed out. An 'Info' box contains the text '* Accrual is independent of calendar year'. At the bottom, there are four buttons: 'Cancel', '< Back', 'Next >', and 'Finish'. A callout box with a purple border points to the 'Accrual' button and contains the text: 'Notice the "Accrual" button is grayed out.'

Exercise #9: Alternate Base Year

23) *Editing Baseline Population* screen for Petrol (By Vehicle/Fuel/Age). The default data for 2014 are displayed.

24) Click on “**Vehicle Class 1**”, “**Age 1**” cell (i.e., Row 1, Column 1). Hold mouse down while dragging mouse downward and across to the right until all 45 ages and 21 vehicle classes are highlighted.

25) Select “**Copy with Headings**”.

Exercise #9: Alternate Base Year

Editing Base Pop data for scenario 1: Hong Kong SAR Annual CYr 2030 Default Title

Total Base Pop for area:

Editing Mode:

Total Base Pop | **By Vehicle Class** | By Vehicle and Fuel | By Vehicle/Fuel/Age

		Vehicle Class			
		18	19	20	21
Age	25	0.0	0.0	0.0	0.0
	26	0.0	0.0	0.0	0.0
	27	0.0	0.0	0.0	0.0
	28	0.0	0.0	0.0	0.0
	29	0.0	0.0	0.0	0.0
	30	0.0	0.0	0.0	0.0
	31	0.0	0.0	0.0	0.0
	32	0.0	0.0	0.0	0.0
	33	0.0	0.0	0.0	0.0
	34	0.0	0.0	0.0	0.0
	35	0.0	0.0	0.0	0.0
	36	0.0	0.0	0.0	0.0
	37	0.0	0.0	0.0	0.0
	38	0.0	0.0	0.0	0.0
	39	0.0	0.0	0.0	0.0
	40	0.0	0.0	0.0	0.0
	41	0.0	0.0	0.0	0.0
	42	0.0	0.0	0.0	0.0
43	0.0	0.0	0.0	0.0	
44	0.0	0.0	0.0	0.0	
45	0.0	0.0	0.0	0.0	

Fuel Type:

Exercise #9: Alternate Base Year

- 26) Open a Microsoft Excel blank spreadsheet. Paste data into Cell A1. Paste data again at Cell C24 (a formula will be used to edit this portion of the data)
- 27) Adjust column width of "A", so vehicle class label can be seen.
- 28) At Cell B25, enter the formula "**=B2*1.05**". Copy this formula to the data range (C25:AT45). Values highlighted below in yellow with "blue" text illustrate the formula cells.

Exercise #9: Alternate Base Year

The screenshot shows an Excel spreadsheet with the following structure:

- Columns:** A, B, C, D, E, F, G, H, I, J, K, L, M, N, O, P, Q, R, S, T, U, V, W, X, Y, Z, AA, AB, AC, AD, AE
- Rows:** 1-23 (Vehicle categories), 24-45 (Vehicle categories with highlighted data), 46-55 (Placeholder rows)
- Highlighted Area:** Rows 24-45, Columns C25-AT25 (yellow background)

Age	Age01	Age02	Age03	Age04	Age05	Age06	Age07	Age08	Age09	Age10	Age11	Age12	Age13	Age14	Age15	Age16	Age17	Age18	Age19	Age20	Age21	Age22	Age23	Age24	Age25	Age26	Age27	Age28	Age29	Age30	
24 Hong Kong SAR Perol Base Pop by Vehicle/Age	449111	138852	420179	399877	237127	842212	123473	264837	243822	189998	237772	220648	189978	139832	123515	105488	100988	220996	202288	119215	665992	454471	271874	206122	150618	873897	823221	485246			
25 Private Cars (PC)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
26 Taxi	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
27 Light Goods Vehicles<=2.5t	0	0	2.08835	0	0	0	0	0	1.02720	0	0	0	4.99379	3.95447	1.95488	0.96507	0	0.93869	2.77547	13.68025	4.49809	1.70503	2.63713	3.23344	1.72208	4.27204	2.54668	2.33282	0.840528	0.83746	
28 Light Goods Vehicles 2.5-3.5t	52.44673	75.0762	176.4643	188.7168	84.2976	262.4254	97.3254	341.4876	133.5369	126.7016	68.0248	49.48218	48.93854	67.2256	94.79989	25.90971	11.42401	2.815706	0.925116	1.824038	0.899619	1.778976	0.877904	1.73714	0.861042	0	0	0	0	0	
29 Light Goods Vehicles>3.5t	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
30 Medium & Heavy Goods Vehicle	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
31 Medium & Heavy Goods Vehicle	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
32 Public Light Buses	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
33 Private Light Bus <=3.5t	65.20299	4.038728	106.6023	1.029692	5.113705	90.22211	52.11906	51.38252	5.828805	97.05578	112.5066	47.16038	19.4481	12.93243	18.45841	0	0.984018	0	0	0	0	0	0	0	0	0	0	0	0	0	0
34 Private Light Bus >3.5t	0	0	0	1.029692	0	0	7.016028	0	1.942268	0	0	0	0	1.768009	0.882162	0	0.98745	3.945009	1.970214	0	0	0	0	0	0	0	0	0	0	0	0
35 Non-Franchised Bus<=4.5t	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
36 Non-Franchised Bus 4.5-15t	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
37 Non-Franchised Bus >15t	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
38 Franchised Bus (SO)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
39 Franchised Bus (DO)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
40 Motorcycles (MC)	4435.766	4394.536	3464.727	3227.93	2608.884	2342.383	3239.804	3558.923	3084.185	2890.382	2763.375	2218.732	1691.009	1308.854	988.842	1014.341	834.1915	779.7272	515.4437	349.1049	193.3636	150.0331	85.51889	51.19727	46.66922	49.31443	21.87825	10.92198	6.362266	2.723404	
41 Placeholder (F1)>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
42 Placeholder (F2)>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
43 Placeholder (F3)>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
44 Placeholder (F4)>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
45 Placeholder (F5)>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

29) Highlight C25:AT25 with the mouse (i.e, the “yellow” portion above extending to Age 45), then type “**Ctrl-C**” to copy to the buffer.

30) Return to EMFAC-HK and click “**Paste Data Only**”. Then “**Apply**”. Then “**Done**”

Exercise #9: Alternate Base Year

Editing Base Pop data for scenario 1: Hong Kong SAR Annual CYr 2030 Default Title

Total Base Pop for area

Editing Mode Editing Base Pop (user-entered data)

		Vehicle Class			
		1	2	3	4
Age	1	41843.5	0.0	0.0	52.4
	2	44911.1	0.0	0.0	75.1
	3	43858.5	0.0	2.1	176.5
	4	42001.8	0.0	0.0	188.7
	5	39987.8	0.0	0.0	84.3
	6	27712.9	0.0	0.0	282.4
	7	34322.1	0.0	0.0	97.3
	8	32342.7	0.0	0.0	341.5
	9	26464.0	0.0	1.0	133.5
	10	25150.8	0.0	0.0	126.7
	11	24582.2	0.0	0.0	68.0
	12	18960.0	0.0	0.0	63.5
	13	22777.8	0.0	5.0	48.9
	14	22604.5	0.0	4.0	67.2
	15	18997.9	0.0	2.0	94.8
	16	13383.5	0.0	1.0	25.1
	17	11510.6	0.0	0.0	11.4
	18	10548.9	0.0	0.9	2.8
	19	3310.0	0.0	2.8	0.9
	20	2210.0	0.0	13.7	1.8
	21	2022.9	0.0	4.5	0.9

Fuel Type

Exercise #9: Alternate Base Year

17) Click “Finish”

18) At the MAIN screen, click “Save As” to save and name the input file to an appropriate folder. In this example, the input file was named as “Ex09.inp”.

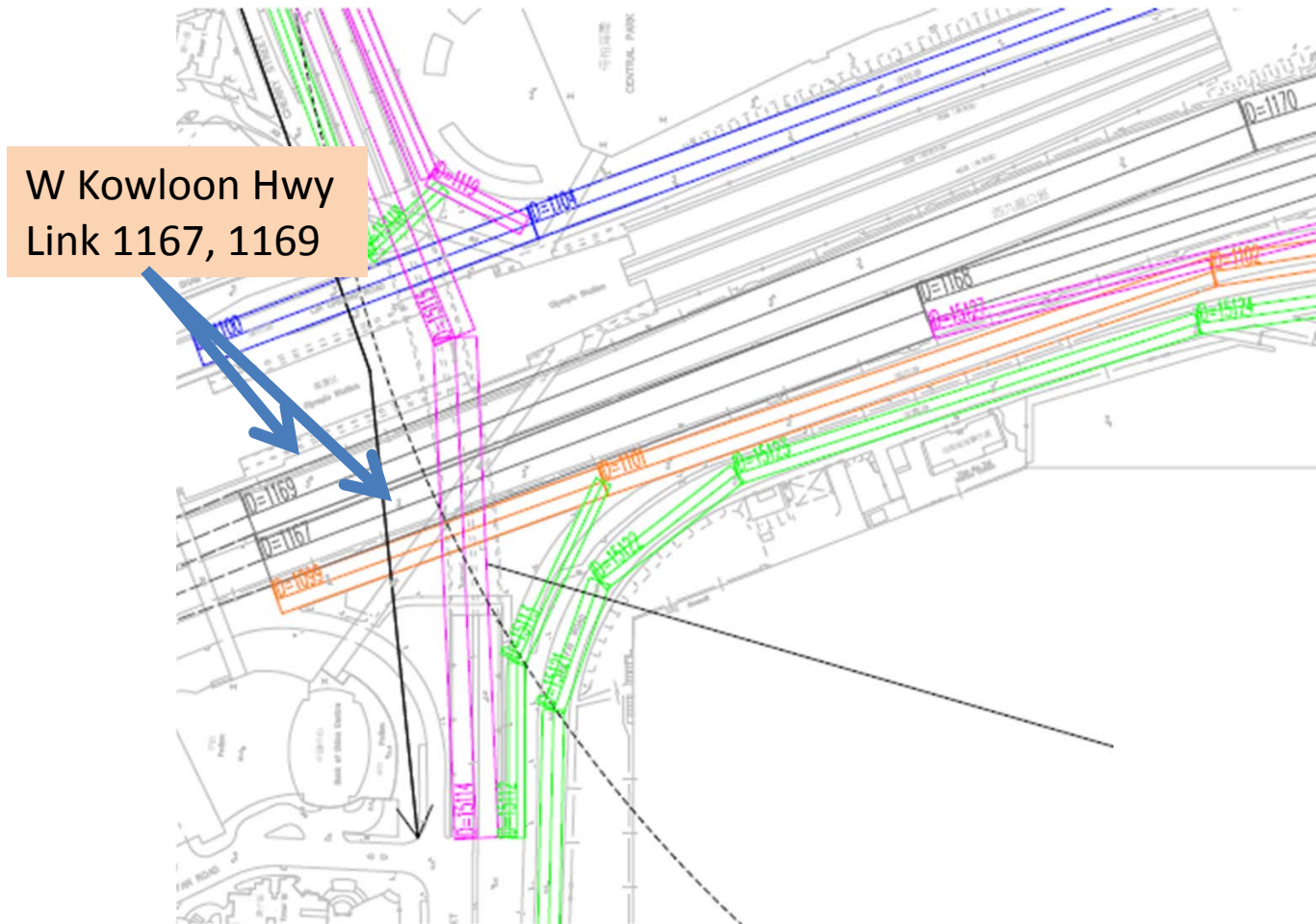
Exercise #10: Future Projections (Accelerated Retirement)

- Context: This example evaluates emission changes if franchised double-deck buses older than 15 years old are retired from the fleet (replaced with newer ones). Compare results in Calendar Year 2013 vs 2020.
- Replacement options:
 - 1: All buses 15+ yrs old replaced with brand new
 - 2: All buses 15+ yrs old replaced with 1-5 yr-old buses.

Exercise #10: Future Projections

- Scenario data:
 - Geographic Area: **Hong Kong SAR**
 - Calendar Years: **2013, 2020**
 - Season: **Annual**
 - Scenario Type: **BURDEN**
 - Output File types: **CSV, BCD**
 - Pollutants: **PM10, VOC**
 - Hint: Copy FBDD populations by age from GUI and implement desired program.

Exercise #11 – HK Expressway



Exercise #11 – HK Expressway Emission Factor

- Problem: Determine the “composite” NO_x running exhaust emission factor (grams/km) for the expressway links below. Additional information for exercise on EX11 spreadsheet.

Road Link	Link ID	Fleet Profile*	Link Length (km)	Peak Traffic Flow (veh/hr)
W Kowloon Hwy NB	1167	EX	0.260	4,117
W Kowloon Hwy SB	1169	EX	0.395	4,842

Exercise #11 – Expressway Fleet Profile

PC	Taxi	LGV3	LGV4	LGV6	HGV7	HGV8	PLB
45.77%	19.46%	0.24%	9.60%	5.69%	1.17%	3.33%	2.50%

PV4	PV5	NFB6	NFB7	NFB8	FBSD	FBDD	MC
0.41%	0.34%	1.34%	0.97%	0.97%	0.05%	3.5%	4.66%

Exercise #11 – Expressway Link (cont.)

- Scenario data:
 - Geographic Area: Hong Kong SAR
 - Calendar Years: 2015
 - Season: Annual
 - Scenario Type: EMFAC
 - Output File types: RTL
 - Pollutants: PM10, VOC
 - Temperature: 1 = 20 deg C
 - Relative Humidity: 1 = 70%
 - Speeds: 100kph, except 70kph for GV > 5.5t, FB, NFB

Exercise #11 – Expressway Link (cont.)

- Number of Runs: only 1 EMFAC-HK run is necessary as the fleet and speed distributions are the same for each link.

Exercise #11 (cont.)

- Steps
 - Setup EMFAC-HK model run
 - Look up emission factors for each vehicle class
 - Fill out Speed Fractions Table
 - NOTE: speeds differ by vehicle class
 - Compute “composite” (i.e., fleet-average) emission factor
 - Develop CALINE4 input parameters

Exercise #12: Build/No-Build

- Context: This example evaluates emission changes if a roadway construction project is not implemented (i.e, build/no-build). Projections are made what traffic will be like on the road if the project is not done.
- Roadway (2015)
 - Assume expressway fleet distribution from Exercise #11
 - 4% reduction in vehicle population
 - Reduce speeds by 10kph to simulate present congestion

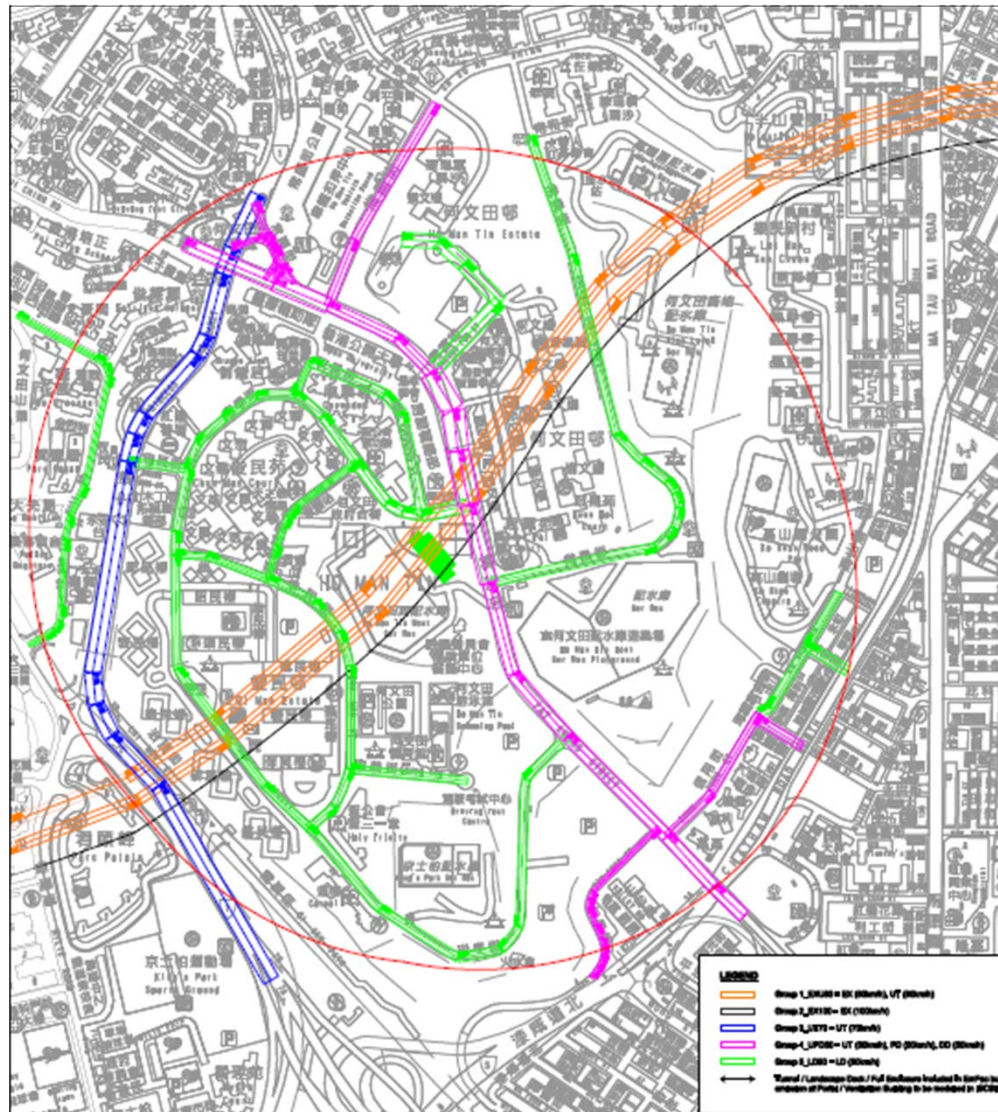
Exercise #12: Build/No-Build

- Scenario data:
 - Geographic Area: **Hong Kong SAR**
 - Calendar Year: **2015**
 - Season: **Annual**
 - Scenario Type: **EMFAC**
 - Output File types: **RTL**
 - Pollutants: **NOx**

Exercise #13: EIA Example

- Project: Extensive new roadway to be built
- Sensitivity Analysis reveals 3 scenario years to evaluate:
 - 2021: commission year
 - 2026: interim year
 - 2036: 15 years after (peak VKT)
- 3 Roadway Groups:
 - EX (100 kph), UT (80 kph), PD (50 kph)
 - no starting emissions assumed

Exercise #13: Road Extent Example



Source: Agreement No. CE 43/2010 (HY) Central Kowloon Route – Design and Construction Estimation of Vehicular Emission for the Study Area and Determination of Worst Assessment Year by EMFAC, Appendix 4.5

Exercise #13 – EIA Example

- Scenario data:
 - Geographic Area: Hong Kong SAR
 - Calendar Years: 2021, 2026, 2036
 - Season: Annual
 - Scenario Type: EMFAC
 - Output File types: RTL
 - Pollutants: NOx
 - Temperature: 1 = 20 deg C
 - Relative Humidity: 1 = 70%
 - Speed Fractions:
 - Roads w/ posted speeds \geq 70kph
 - 100% at 70kph for GV > 5.5t, FB, NFB

Exercise #13: Simplifications

- For simplicity
 - default technology fractions
 - we'll evaluate calendar year 2021 only.
 - Fleet mix distributions for each roadway type provided on spreadsheet

Exercise #13: EIA Example

- Setup EMFAC-HK model runs
- Look up emission factors for each vehicle class for appropriate speed
- Compute “composite” (i.e., fleet-average) NO_x running exhaust emission factor for each roadway type
- Develop CALINE4 input parameters