

# Training Exercises

# Exercise Setup

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

# Exercise Overview

## Basic

1. Burden mode
2. Emfac mode
3. Exhasut Technology Group (TG) fraction
4. Vehicle Kilometer Travelled (VKT)
5. Trips
6. Speed fraction
7. Relative Humidity

## Advance

8. Alternate Base Year
9. Bus retirement
10. Link example

# Basic Exercises

# Exercise #1: Daily Emissions Inventory

- This exercise will generate an average daily emissions inventory for Hong Kong at calendar year 2030 using BURDEN output formats
- Require 1 scenario for calendar year 2030
- Save input file as: **HK\_2030\_Burden.inp**

# Exercise #1: Scenario input data

- Geographic Area: **Hong Kong SAR** (default)
- Calendar Years: **2030**
- Alternate Baseline Year: **Inactive** (default)
- Season: **Annual** (default)
- Scenario Title for Reports: **Default Title**
- Model Years: **All** (default)
- Vehicle Classes: **Modify** (default)

# Exercise #1: Scenario input data

– Scenario Type:

**BURDEN – Area Emission Estimates**

– Files and Reports:

1) Detailed Planning Inventory (CSV) (default)

2) MVEI7G (BCD)

3) Detailed Outputs (BDN)

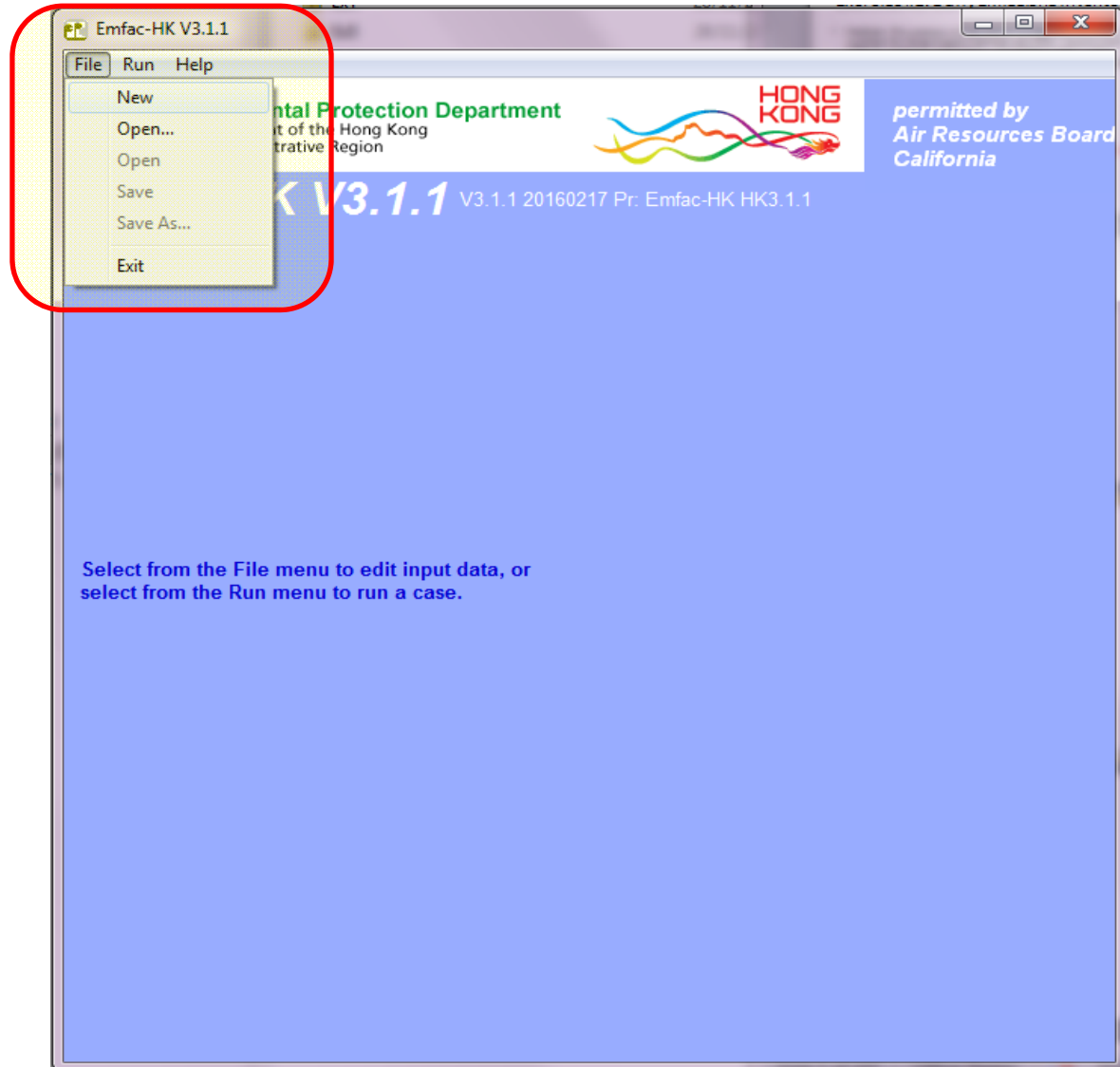
*- check Model Yrs & Tech Groups*

– Output Frequency: **Day** (default)

– Output Particulate: **PM<sub>10</sub>** (default)

– Output Hydrocarbons: **VOC** (default)

# Exercise #1: New File





# Exercise #1: Add New Scenario

The screenshot shows the 'Emfac-HK V3.1.1 -- Editing data' window. The interface includes a menu bar (File, Run, Help), logos for the Environmental Protection Department and Hong Kong, and a header for the Air Resources Board of California. The main area is divided into several sections:

- List of Available Scenarios:** A large empty box on the left.
- Current Scenario Data:** Fields for Number (0 of 0), Name, Calendar Year, Season, and Type.
- Buttons:** 'IM Program Parameters', 'Add New Scenario' (highlighted with a red circle), 'Edit Scenario', 'Delete Scenario', 'Save', 'Save As...', 'Run', 'Finish Editing', and 'Cancel'.
- Regime Size Change Data:** A table with a checked 'Apply Regime Changes' checkbox.

\* Denotes currently active scenario

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 #1: Input 1 Tab

The image shows the 'Emfac-HK V3.1 -- Editing data' window. The main interface is titled 'Input 1' and contains several steps for data entry:

- Step 1 - Geographic Area:** Area Type: SAR, Area: Hong Kong.
- Step 2a - Calendar Year:** A 'Select' button is highlighted with a red box. Below it, 'Calendar year 2030 selected' and 'Scenario Year for Output' are displayed.
- Step 2b - Alternate Base Year:** A 'Select' button is present, with 'Alternate Base Data Year INACTIVE' and an optional note below.
- Step 3 - Season or Month:** A dropdown menu is set to 'Annual'.

At the bottom of the main window, a 'Next >' button is highlighted with a green arrow.

To the right, a 'Calendar Year Selection' dialog box is open. It features two columns: 'Available' and 'Included'. The 'Available' column lists years from 1997 to 2015. The 'Included' column contains the year 2030, which is highlighted with a red box. Navigation buttons (> and <) are between the columns. At the bottom, 'All' buttons and 'OK' and 'Cancel' buttons are present. A green arrow points to the 'OK' button.

# Exercise #1: Input 2 Tab

Emfac-HK V3.1.1 -- 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 V3.1.1** V3.1.1 20160217 Pr. Emfac-HK HK3.1.1

Input 1 Input 2 Mode and Output

Basic scenario data - Select or Enter Scenario Title

Step 4 -- Scenario Title for Reports

Hong Kong SAR Annual CYr 2030 Default Title Default Title

In Emfac Impact Rate reports, titles over 40 characters will be truncated!

Step 5 - Model Years

All model years selected

All Modify

Step 6 - Vehicle Classes

MODIFIED: All vehicle classes selected

All Modify

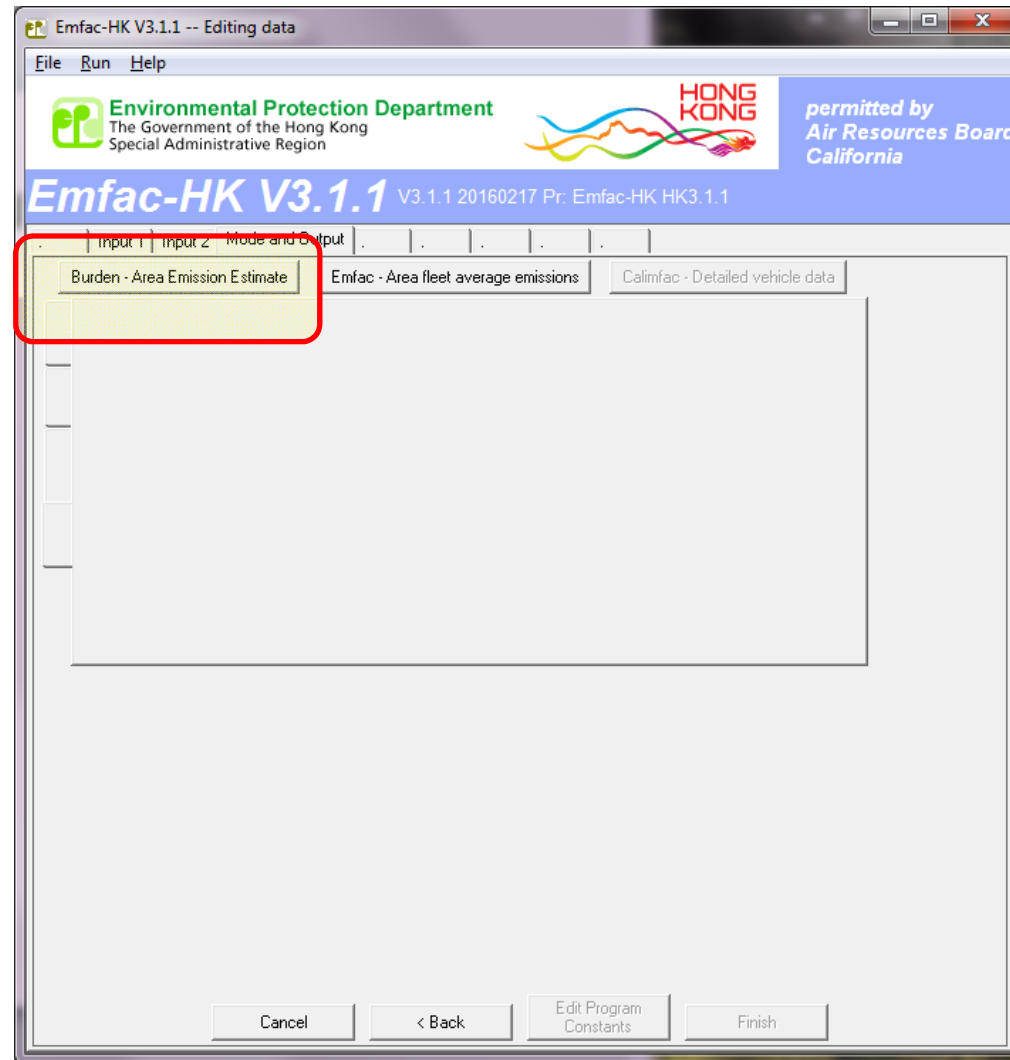
Step 7 - I/M Program Schedule

Standard I/M schedules

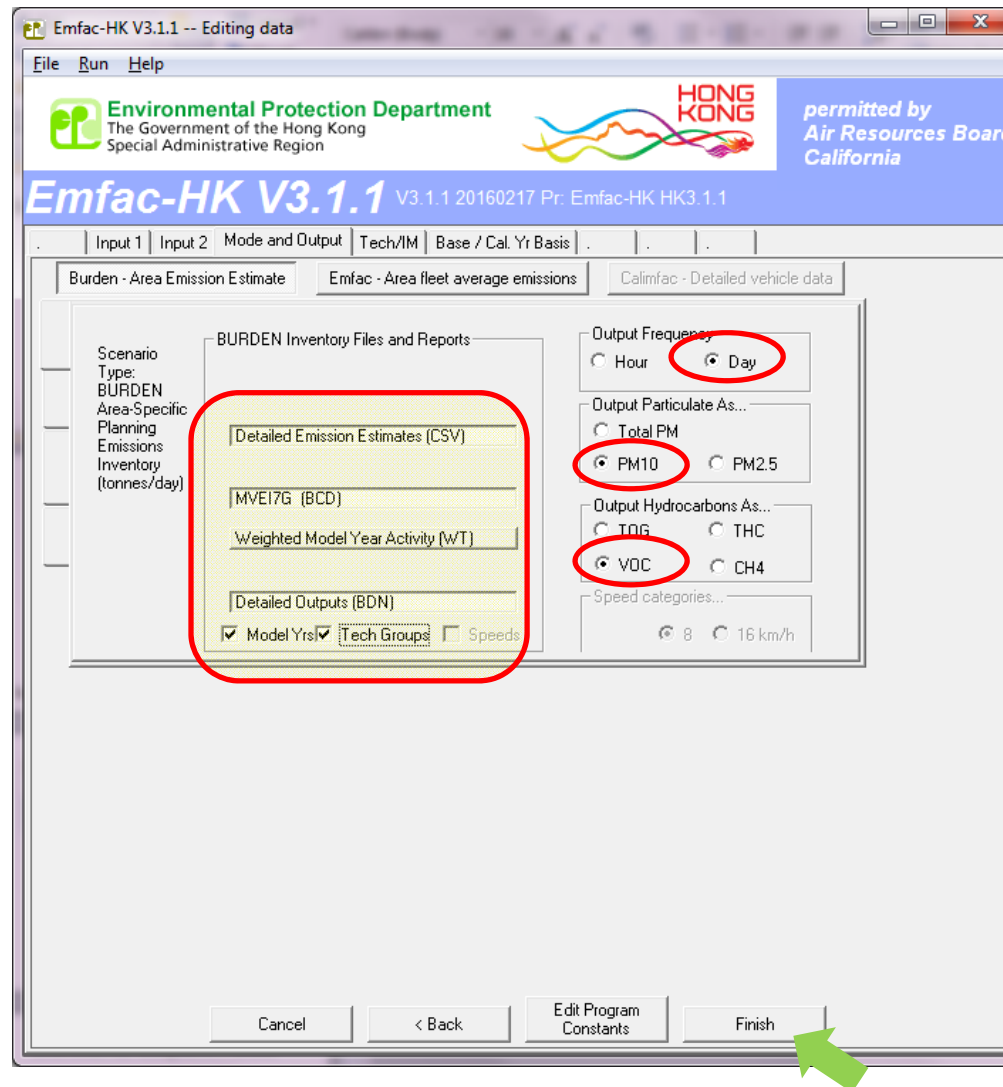
Default Modify

Cancel < Back Next > Finish

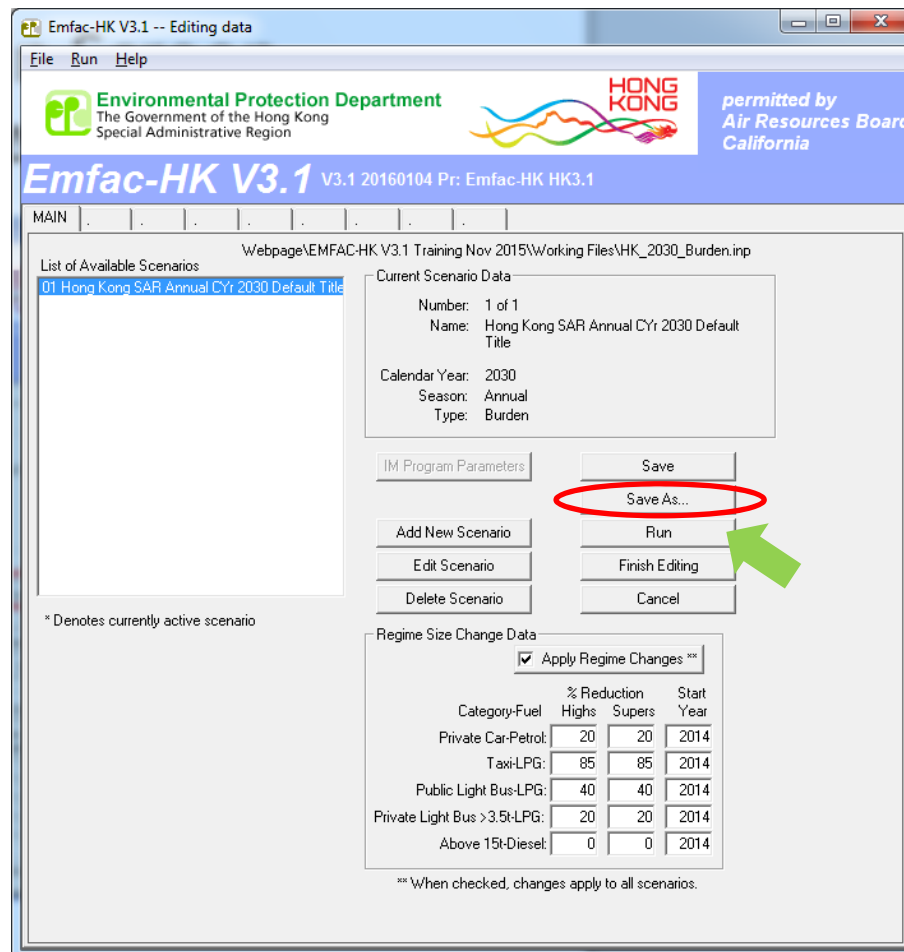
# Exercise #1: Mode and Output Tab



# Exercise #1: Mode and Output Tab

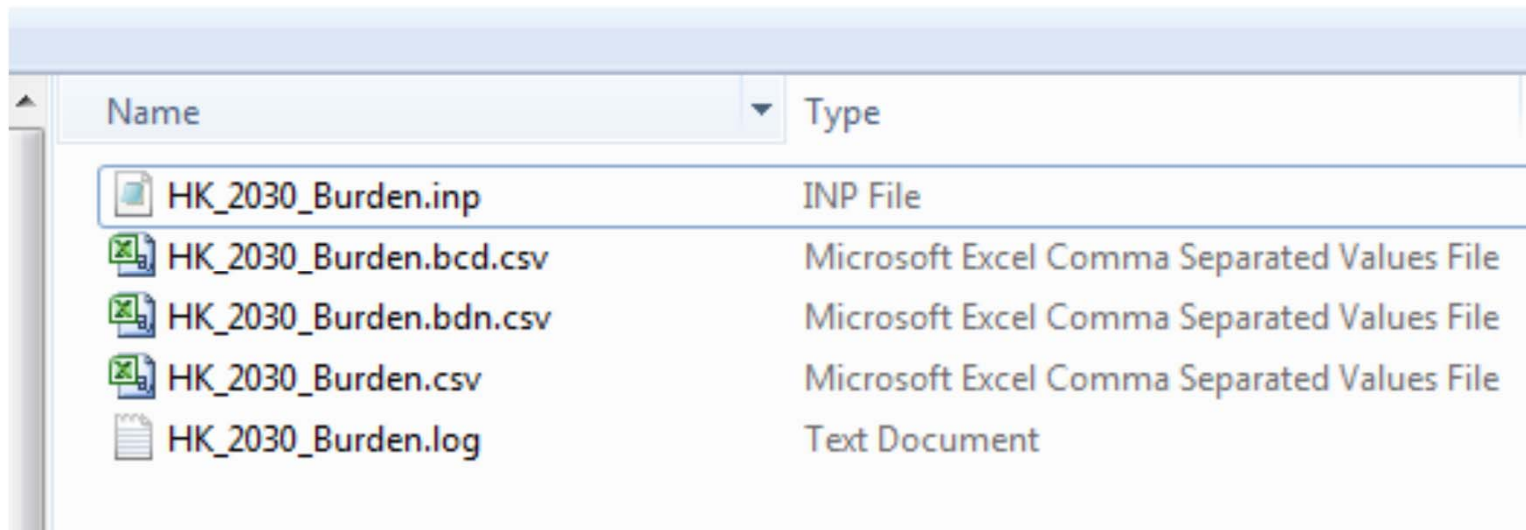







# Exercise #1: Main Screen



- Save input file as: **HK\_2030\_Burden.inp** and **Run**

# Exercise #1: Output in Folder



Name	Type
 HK_2030_Burden.inp	INP File
 HK_2030_Burden.bcd.csv	Microsoft Excel Comma Separated Values File
 HK_2030_Burden.bdn.csv	Microsoft Excel Comma Separated Values File
 HK_2030_Burden.csv	Microsoft Excel Comma Separated Values File
 HK_2030_Burden.log	Text Document

# Exercise #1: HK\_2030\_Burden.csv

The screenshot shows an Excel spreadsheet with the following content:

**Title :** Hong Kong SAR Annual Cyr 2030 Default Title

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

**Run Date :** 2016/01/07 17:14:00

**Scen Year:** 2030 -- All model years in the range 1986 to 2030 selected

**Season :** Annual

**Area :** Hong Kong SAR

**I/M Stat :** HK I/M CY2013+ program in effect

**Emissions:** Tonnes Per Day

	PC-NCAT	PC-CAT	PC-DSL	PC-LPG	PC-TOT	TAXI-NCA	TAXI-CAT	TAXI-DSL	TAXI-LPG	TAXI-TOT	LGV<=2.5t	LGV<=2.5t	LGV<=2.5t	LGV<=2.5t	LGV2.5-3.!	LGV2.5-3.!	LGV2.5-3.!	LGV2.5-3.!	LGV>3.5t	LGV>3.5t	LGV>3.5t	LGV>3.5t	HGV<=15t	HGV<=15t	HGV<=15t		
11 Vehicles	3	789921	6113	0	790037	0	0	0	18193	18193	0	2	1003	0	1057	53816	0	54874	0	0	26653	0	26653	0	0	12731	
12 VKT	51	21887210	171471	0	22058732	0	0	0	7665956	7665956	14	96	74275	0	74385	7	67122	3549671	0	3616800	0	0	2547737	0	2547737	0	1055561
13 Trips	4	1176000	9170	0	1185170	0	0	0	72779	72779	1	7	4011	0	4019	1	4230	215287	0	219517	0	0	106611	0	106611	0	50919
14 VOC Emissions																											
15 Run Exh	0.0001	0.12492	0.0012	0	0.12623	0	0	0	0.07566	0.07566	0.00003	0.00011	0.00111	0	0.00125	0.00001	0.00451	0.05417	0	0.0587	0	0	0.02994	0	0.02994	0	0.05446
16 Start Ex	0.00006	0.10289	0	0	0.10295	0	0	0	0.03817	0.03817	0.00002	0.00006	0	0	0.00008	0.00001	0.00129	0	0	0.0013	0	0	0	0	0	0	0
17																											
18																											
19 Diurnal	0.00003	0.30098	0	0	0.30102	0	0	0	0	0	0.00001	0	0	0	0.00001	0	0.00067	0	0	0.00067	0	0	0	0	0	0	0
20 Hot Soak	0.00002	0.19374	0	0	0.19376	0	0	0	0	0	0.00001	0.00001	0	0	0.00002	0	0.00136	0	0	0.00136	0	0	0	0	0	0	0
21 Running	0.00009	0.29932	0	0	0.29942	0	0	0	0	0	0.00004	0.00002	0	0	0.00007	0.00001	0.00433	0	0	0.00434	0	0	0	0	0	0	0
22 Resting	0.00004	0.5113	0	0	0.51134	0	0	0	0	0	0.00001	0	0	0	0.00001	0	0.00105	0	0	0.00105	0	0	0	0	0	0	0
23																											
24 Carbon Monoxide Emissions																											
25 Run Exh	0.00249	7.13954	0.02765	0	7.16969	0	0	0	6.74331	6.74331	0.00078	0.00241	0.01835	0	0.02154	0.00039	0.35674	0.87361	0	1.23074	0	0	1.03304	0	1.03304	0	0.96331
26 Start Ex	0.00035	3.4702	0	0	3.47055	0	0	0	0.16319	0.16319	0.00011	0.00049	0	0	0.00059	0.00006	0.05858	0	0	0.05864	0	0	0	0	0	0	0
27																											
28 Oxides of Nitrogen Emissions																											
29 Run Exh	0.00018	0.22714	0.00373	0	0.23105	0	0	0	1.9419	1.9419	0.00005	0.00015	0.02892	0	0.02912	0.00002	0.00189	1.44273	0	1.44464	0	0	0.97312	0	0.97312	0	1.01276
30 Start Ex	0.00003	0.04407	0	0	0.0441	0	0	0	0.05401	0.05401	0	0.00002	0	0	0.00002	0	0.00067	0	0	0.00067	0	0	0	0	0	0	0
31																											
32 Carbon Dioxide Emissions (000)																											
33 Run Exh	0.00001	4.67686	0.04005	0	4.71693	0	0	0	1.77352	1.77352	0	0.00002	0.01928	0	0.0193	0	0.01223	0.92154	0	0.93377	0	0	1.04423	0	1.04423	0	0.52734
34 Start Ex	0	0.08617	0	0	0.08617	0	0	0	0.00572	0.00572	0	0	0	0	0	0	0.00031	0.00572	0	0.00031	0	0	0	0	0	0	0
35																											
36 PM10 Emissions																											
37 Run Exh	0	0.06649	0.00047	0	0.06696	0	0	0	0	0	0	0.00067	0	0	0.00067	0	0.00024	0.04303	0	0.04327	0	0	0.04405	0	0.04405	0	0.02888
38 Start Ex	0	0.00231	0	0	0.00231	0	0	0	0	0	0	0	0	0	0	0	0.00001	0	0	0.00001	0	0	0	0	0	0	0



# Exercise #1: HK\_2030\_Burden.bcd.csv

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

A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
1	CALYR	START MYR	END MYR	REGION	SAR	STARTS	POPULATI	VKT	VEH TYPE	VEH TECH	POLLUTAN	PROCESS	EMISSION	BASIS
2	2030	1986	2030	SAR Average	Hong Kong SAR Average	4	3	51	PC	NCAT	CO	Run Exh	0.002494	Day
3	2030	1986	2030	SAR Average	Hong Kong SAR Average	4	3	51	PC	NCAT	NOx	Run Exh	0.000183	Day
4	2030	1986	2030	SAR Average	Hong Kong SAR Average	4	3	51	PC	NCAT	PM	Run Exh	0.000001	Day
5	2030	1986	2030	SAR Average	Hong Kong SAR Average	4	3	51	PC	NCAT	VOC	Run Exh	0.000104	Day
6	2030	1986	2030	SAR Average	Hong Kong SAR Average	4	3	51	PC	NCAT	CO2	Run Exh	0.010821	Day
7	2030	1986	2030	SAR Average	Hong Kong SAR Average	4	3	51	PC	NCAT	CO	Start Ex	0.000351	Day
8	2030	1986	2030	SAR Average	Hong Kong SAR Average	4	3	51	PC	NCAT	NOx	Start Ex	0.000034	Day
9	2030	1986	2030	SAR Average	Hong Kong SAR Average	4	3	51	PC	NCAT	PM	Start Ex	0	Day
10	2030	1986	2030	SAR Average	Hong Kong SAR Average	4	3	51	PC	NCAT	VOC	Start Ex	0.000064	Day
11	2030	1986	2030	SAR Average	Hong Kong SAR Average	4	3	51	PC	NCAT	CO2	Start Ex	0.000884	Day
12	2030	1986	2030	SAR Average	Hong Kong SAR Average	4	3	51	PC	NCAT	CO	Hot Soak	0	Day
13	2030	1986	2030	SAR Average	Hong Kong SAR Average	4	3	51	PC	NCAT	NOx	Hot Soak	0	Day
14	2030	1986	2030	SAR Average	Hong Kong SAR Average	4	3	51	PC	NCAT	PM	Hot Soak	0	Day
15	2030	1986	2030	SAR Average	Hong Kong SAR Average	4	3	51	PC	NCAT	VOC	Hot Soak	0.00002	Day
16	2030	1986	2030	SAR Average	Hong Kong SAR Average	4	3	51	PC	NCAT	CO2	Hot Soak	0	Day
17	2030	1986	2030	SAR Average	Hong Kong SAR Average	4	3	51	PC	NCAT	CO	Running	0	Day
18	2030	1986	2030	SAR Average	Hong Kong SAR Average	4	3	51	PC	NCAT	NOx	Running	0	Day
19	2030	1986	2030	SAR Average	Hong Kong SAR Average	4	3	51	PC	NCAT	PM	Running	0	Day
20	2030	1986	2030	SAR Average	Hong Kong SAR Average	4	3	51	PC	NCAT	VOC	Running	0.000094	Day
21	2030	1986	2030	SAR Average	Hong Kong SAR Average	4	3	51	PC	NCAT	CO2	Running	0	Day
22	2030	1986	2030	SAR Average	Hong Kong SAR Average	4	3	51	PC	NCAT	CO	PD Rest	0	Day
23	2030	1986	2030	SAR Average	Hong Kong SAR Average	4	3	51	PC	NCAT	NOx	PD Rest	0	Day
24	2030	1986	2030	SAR Average	Hong Kong SAR Average	4	3	51	PC	NCAT	PM	PD Rest	0	Day
25	2030	1986	2030	SAR Average	Hong Kong SAR Average	4	3	51	PC	NCAT	VOC	PD Rest	0.000036	Day
26	2030	1986	2030	SAR Average	Hong Kong SAR Average	4	3	51	PC	NCAT	CO2	PD Rest	0	Day
27	2030	1986	2030	SAR Average	Hong Kong SAR Average	4	3	51	PC	NCAT	CO	MD Rest	0	Day
28	2030	1986	2030	SAR Average	Hong Kong SAR Average	4	3	51	PC	NCAT	NOx	MD Rest	0	Day
29	2030	1986	2030	SAR Average	Hong Kong SAR Average	4	3	51	PC	NCAT	PM	MD Rest	0	Day
30	2030	1986	2030	SAR Average	Hong Kong SAR Average	4	3	51	PC	NCAT	VOC	MD Rest	0.000002	Day
31	2030	1986	2030	SAR Average	Hong Kong SAR Average	4	3	51	PC	NCAT	CO2	MD Rest	0	Day
32	2030	1986	2030	SAR Average	Hong Kong SAR Average	4	3	51	PC	NCAT	CO	Resting	0	Day
33	2030	1986	2030	SAR Average	Hong Kong SAR Average	4	3	51	PC	NCAT	NOx	Resting	0	Day
34	2030	1986	2030	SAR Average	Hong Kong SAR Average	4	3	51	PC	NCAT	PM	Resting	0	Day
35	2030	1986	2030	SAR Average	Hong Kong SAR Average	4	3	51	PC	NCAT	VOC	Resting	0.000039	Day
36	2030	1986	2030	SAR Average	Hong Kong SAR Average	4	3	51	PC	NCAT	CO2	Resting	0	Day
37	2030	1986	2030	SAR Average	Hong Kong SAR Average	4	3	51	PC	NCAT	CO	PD Diurn	0	Day

# Exercise #1: HK\_2030\_Burden.bdn.csv

HK\_2030\_Burden.bdn.csv - Microsoft Excel

File Home Insert Page Layout Formulas Data Review View Add-Ins Acrobat Team

Clipboard Font Alignment Number Styles Cells Editing

A1 # Title :

1	# Title :	Hong Kong SAR Annual CYr 2030 Default Title															
2	# Version :	Emfac-HK V3.1.1 V3.1.1 20160217 Pr: Emfac-HK HK3.1.1															
3	# Run Date :	#####															
4	# Scenario :	2030 -- All model years in the range 1986 to 2030 selected															
5	# Season :	Annual															
6	# Area :	Hong Kong															
7	# I/M Stat :	HK I/M CY2013+ program in effect															
8	# Emission :	Tonnes Per Period															
9	RecType	ScenNum	CalYr	Area	Veh	MdlYr	Tech	Period	Pop	VKT	Trips	VOC_RUN	VOC_STRE	VOC_DIUF	VOC_HTS	VOC_RUN	VOC_R
10	TG	1	2030	Hong Kong	PC	1985	Ex001	Day	0	0	0	0	0	0	0	0	0
11	TG	1	2030	Hong Kong	PC	1985	Ex171	Day	0	0	0	0	0	0	0	0	0
12	TG	1	2030	Hong Kong	PC	1985	Ex172	Day	0	0	0	0	0	0	0	0	0
13	TG	1	2030	Hong Kong	PC	1985	Ev001	Day	0	0	0	0	0	0	0	0	0
14	MY	1	2030	Hong Kong	PC	1985	GAS	Day	0	0	0	0	0	0	0	0	0
15	MY	1	2030	Hong Kong	PC	1985	DSL	Day	0	0	0	0	0	0	0	0	0
16	MY	1	2030	Hong Kong	PC	1985	LPG	Day	0	0	0	0	0	0	0	0	0
17	MY	1	2030	Hong Kong	PC	1985	TOT	Day	0	0	0	0	0	0	0	0	0
18	TG	1	2030	Hong Kong	PC	1986	Ex001	Day	0.19513	3.313592	0.292725	6.75E-06	4.19E-06	0	0	0	0
19	TG	1	2030	Hong Kong	PC	1986	Ex171	Day	3.83E-02	0.650886	5.75E-02	3.89E-07	0	0	0	0	0
20	TG	1	2030	Hong Kong	PC	1986	Ex172	Day	1.74E-03	2.96E-02	2.61E-03	7.07E-09	0	0	0	0	0
21	TG	1	2030	Hong Kong	PC	1986	Ev001	Day	0.19513	3.313592	0.292725	0	0	2.22E-06	1.36E-06	6.26E-06	2.58E-06
22	MY	1	2030	Hong Kong	PC	1986	GAS	Day	0.19513	3.313592	0.292725	6.75E-06	4.19E-06	2.22E-06	1.36E-06	6.26E-06	2.58E-06
23	MY	1	2030	Hong Kong	PC	1986	DSL	Day	4.01E-02	0.68047	6.01E-02	3.96E-07	0	0	0	0	0
24	MY	1	2030	Hong Kong	PC	1986	LPG	Day	0	0	0	0	0	0	0	0	0
25	MY	1	2030	Hong Kong	PC	1986	TOT	Day	0.235202	3.994063	0.352838	7.14E-06	4.19E-06	2.22E-06	1.36E-06	6.26E-06	2.58E-06
26	TG	1	2030	Hong Kong	PC	1987	Ex001	Day	0.20096	3.429411	0.301471	6.98E-06	4.31E-06	0	0	0	0
27	TG	1	2030	Hong Kong	PC	1987	Ex171	Day	3.24E-02	0.552193	4.85E-02	3.30E-07	0	0	0	0	0
28	TG	1	2030	Hong Kong	PC	1987	Ex172	Day	1.02E-02	0.174377	1.53E-02	4.17E-08	0	0	0	0	0
29	TG	1	2030	Hong Kong	PC	1987	Ev001	Day	0.20096	3.429411	0.301471	0	0	2.28E-06	1.40E-06	6.44E-06	2.66E-06

HK\_2030\_Burden.bdn

Ready

## Exercise #1a:

Determine total NO<sub>x</sub> exhaust emissions from **CSV** output

- Hints:
  - Open CSV output file by Excel
  - Locate row “Run Exh” and “Start Ex” under “Oxides of Nitrogen Emissions”
  - Locate column “ALL-TOT”

# Exercise #1a: Solution

HK\_2030\_Burden.csv - Microsoft Excel

File Home Insert Page Layout Formulas Data Review View Add-Ins Acrobat Team

Clipboard Font Alignment Number Styles Cells Editing

CD29 13.8869

	BT	BU	BV	BW	BX	BY	BZ	CA	CB	CC	CD	CE	CF	CG
1 Title : Hong Kong SAR Annual C														
2 Version : Emfac-HK V3.1.1 V3.1.														
3 Run Date : 2017/01/11 11:52:50														
4 Scen Year: 2030 -- All model yea														
5 Season : Annual														
6 Area : Hong Kong SAR														
7 I/M Stat : HK I/M CY2013+ progra														
8 Emissions: Tonnes Per Day														
9 *****														
10	FBDD-NC	FBDD-CAT	FBDD-DSL	FBDD-LPG	FBDD-TOT	MC-NCAT	MC-CAT	MC-DSL	MC-LPG	MC-TOT	ALL-TOT			
23 -----														
24 Carbon Monoxide Emissions														
25 Run Exh	0	0	2.41637	0	2.41637	0.63442	3.61199	0	0	4.24641	45.95568			
26 Start Ex	0	0	0	0	0	0.13904	1.27459	0	0	1.41364	5.0599			
27 -----														
28 Oxides of Nitrogen Emissions														
29 Run Exh	0	0	2.73714	0	2.73714	0.01558	0.36409	0	0	0.37966	13.8869			
30 Start Ex	0	0	0	0	0	0.00537	0.07087	0	0	0.07625	0.21141			
31 -----														
32 Carbon Dioxide Emissions (000)														
33 Run Exh	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	0.00087	0.01255	0	0	0.01341	0.10679			
35 -----														
36 PM10 Emissions														
37 Run Exh	0	0	0.1779	0	0.1779	0.00087	0.00272	0	0	0.00359	0.5752			
38 Start Ex	0	0	0	0	0	0.00035	0.00065	0	0	0.001	0.00332			
39 -----														
40														
41														

Ready | Average: 7.049155 Count: 2 Sum: 14.09831 | 100%

## Exercise #1b:

Determine total NO<sub>x</sub> exhaust emissions from **BCD** output

- Hints:
  - Open BCD output file by Excel
  - Use Filter function on
    - POLLUTANT as “NO<sub>x</sub>”
    - PROCESS as “Run Exh” and “Start Ex”
  - Summation of total NO<sub>x</sub>

# Exercise #1b: Solution

HK\_2030\_Burden.bcd.csv - Microsoft Excel

File Home Insert Page Layout Formulas Data Review View Add-Ins Acrobat Team

Clipboard Font Alignment Number Styles Cells Editing

L3168 Running

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
1	CALYR	START	END M	REGION	SAR	STARTS	POPUL	VKT	VEH TY	VEH TECH	POLLUTANT	PROCESS	EMISSIONS	BASIS	
2618	2030	1986	2030	SAR Avera Hong Kon		0	0	0	FBSD	NCAT	NOx	Running		0 Day	
2658	2030	1986	2030	SAR Avera Hong Kon		0	0	0	FBSD	CAT	NOx	Start Ex		0 Day	
2668	2030	1986	2030	SAR Avera Hong Kon		0	0	0	FBSD	CAT	NOx	Running		0 Day	
2708	2030	1986	2030	SAR Avera Hong Kon		4140	388	72384	FBSD	DSL	NOx	Start Ex		0 Day	
2718	2030	1986	2030	SAR Avera Hong Kon		4140	388	72384	FBSD	DSL	NOx	Running		0 Day	
2758	2030	1986	2030	SAR Avera Hong Kon		0	0	0	FBSD	LPG	NOx	Start Ex		0 Day	
2768	2030	1986	2030	SAR Avera Hong Kon		0	0	0	FBSD	LPG	NOx	Running		0 Day	
2808	2030	1986	2030	SAR Avera Hong Kon		0	0	0	FBDD	NCAT	NOx	Start Ex		0 Day	
2818	2030	1986	2030	SAR Avera Hong Kon		0	0	0	FBDD	NCAT	NOx	Running		0 Day	
2858	2030	1986	2030	SAR Avera Hong Kon		0	0	0	FBDD	CAT	NOx	Start Ex		0 Day	
2868	2030	1986	2030	SAR Avera Hong Kon		0	0	0	FBDD	CAT	NOx	Running		0 Day	
2908	2030	1986	2030	SAR Avera Hong Kon		57633	5403	1265799	FBDD	DSL	NOx	Start Ex		0 Day	
2918	2030	1986	2030	SAR Avera Hong Kon		57633	5403	1265799	FBDD	DSL	NOx	Running		0 Day	
2958	2030	1986	2030	SAR Avera Hong Kon		0	0	0	FBDD	LPG	NOx	Start Ex		0 Day	
2968	2030	1986	2030	SAR Avera Hong Kon		0	0	0	FBDD	LPG	NOx	Running		0 Day	
3008	2030	1986	2030	SAR Avera Hong Kon		14684	2447	25492	MC	NCAT	NOx	Start Ex	0.005372	Day	
3018	2030	1986	2030	SAR Avera Hong Kon		14684	2447	25492	MC	NCAT	NOx	Running		0 Day	
3058	2030	1986	2030	SAR Avera Hong Kon		409348	68218	1292455	MC	CAT	NOx	Start Ex	0.070873	Day	
3068	2030	1986	2030	SAR Avera Hong Kon		409348	68218	1292455	MC	CAT	NOx	Running		0 Day	
3108	2030	1986	2030	SAR Avera Hong Kon		0	0	0	MC	DSL	NOx	Start Ex		0 Day	
3118	2030	1986	2030	SAR Avera Hong Kon		0	0	0	MC	DSL	NOx	Running		0 Day	
3158	2030	1986	2030	SAR Avera Hong Kon		0	0	0	MC	LPG	NOx	Start Ex		0 Day	
3168	2030	1986	2030	SAR Avera Hong Kon		0	0	0	MC	LPG	NOx	Running		0 Day	
3202															
3203												Run Exh	13.886904		
3204												Start Ex	0.211414		
3205															
3206															

HK\_2030\_Burden.bcd

Ready 128 of 3200 records found

## Exercise #1c:

Determine Fleet-Average NO<sub>x</sub> Emissions Factor (grams/km) for all vehicle classes

- Hints:
  - Use BCD output
  - Summation of total VKT and NO<sub>x</sub> (running exhaust)
  - Divide total NO<sub>x</sub> by total VKT
  - Convert units to obtain grams/km

# Exercise #1c: Solution

HK\_2030\_Burden.bcd.csv - Microsoft Excel

File Home Insert Page Layout Formulas Data Review View Add-Ins Acrobat Team

Clipboard Font Alignment Number Styles Cells Editing

J3203

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
1	CALYR	START	END M	REGION	SAR	STARTS	POPUL	VKT	VEH TY	VEH TE	POLLUT	PROCES	EMISSI	BASIS	
1903	2030	1986	2030	SAR Avera	Hong Kon	6551	2340	183584	PV5	DSL	NOx	Run Exh	0.182131	Day	
1953	2030	1986	2030	SAR Avera	Hong Kon	1869	668	49542	PV5	LPG	NOx	Run Exh	0.016829	Day	
2003	2030	1986	2030	SAR Avera	Hong Kon	0	0	0	NFB6	NCAT	NOx	Run Exh	0	Day	
2053	2030	1986	2030	SAR Avera	Hong Kon	0	0	0	NFB6	CAT	NOx	Run Exh	0	Day	
2103	2030	1986	2030	SAR Avera	Hong Kon	11729	2932	347715	NFB6	DSL	NOx	Run Exh	0.661266	Day	
2153	2030	1986	2030	SAR Avera	Hong Kon	0	0	0	NFB6	LPG	NOx	Run Exh	0	Day	
2203	2030	1986	2030	SAR Avera	Hong Kon	0	0	0	NFB7	NCAT	NOx	Run Exh	0	Day	
2253	2030	1986	2030	SAR Avera	Hong Kon	0	0	0	NFB7	CAT	NOx	Run Exh	0	Day	
2303	2030	1986	2030	SAR Avera	Hong Kon	8217	2054	239204	NFB7	DSL	NOx	Run Exh	0.247604	Day	
2353	2030	1986	2030	SAR Avera	Hong Kon	0	0	0	NFB7	LPG	NOx	Run Exh	0	Day	
2403	2030	1986	2030	SAR Avera	Hong Kon	0	0	0	NFB8	NCAT	NOx	Run Exh	0	Day	
2453	2030	1986	2030	SAR Avera	Hong Kon	0	0	0	NFB8	CAT	NOx	Run Exh	0	Day	
2503	2030	1986	2030	SAR Avera	Hong Kon	11833	2958	343951	NFB8	DSL	NOx	Run Exh	0.214364	Day	
2553	2030	1986	2030	SAR Avera	Hong Kon	0	0	0	NFB8	LPG	NOx	Run Exh	0	Day	
2603	2030	1986	2030	SAR Avera	Hong Kon	0	0	0	FBSD	NCAT	NOx	Run Exh	0	Day	
2653	2030	1986	2030	SAR Avera	Hong Kon	0	0	0	FBSD	CAT	NOx	Run Exh	0	Day	
2703	2030	1986	2030	SAR Avera	Hong Kon	4140	388	72384	FBSD	DSL	NOx	Run Exh	0.059235	Day	
2753	2030	1986	2030	SAR Avera	Hong Kon	0	0	0	FBSD	LPG	NOx	Run Exh	0	Day	
2803	2030	1986	2030	SAR Avera	Hong Kon	0	0	0	FBDD	NCAT	NOx	Run Exh	0	Day	
2853	2030	1986	2030	SAR Avera	Hong Kon	0	0	0	FBDD	CAT	NOx	Run Exh	0	Day	
2903	2030	1986	2030	SAR Avera	Hong Kon	57633	5403	1265799	FBDD	DSL	NOx	Run Exh	2.737143	Day	
2953	2030	1986	2030	SAR Avera	Hong Kon	0	0	0	FBDD	LPG	NOx	Run Exh	0	Day	
3003	2030	1986	2030	SAR Avera	Hong Kon	14684	2447	25492	MC	NCAT	NOx	Run Exh	0.015576	Day	
3053	2030	1986	2030	SAR Avera	Hong Kon	409348	68218	1292455	MC	CAT	NOx	Run Exh	0.364088	Day	
3103	2030	1986	2030	SAR Avera	Hong Kon	0	0	0	MC	DSL	NOx	Run Exh	0	Day	
3153	2030	1986	2030	SAR Avera	Hong Kon	0	0	0	MC	LPG	NOx	Run Exh	0	Day	
3202															
3203													13.8869		
3204													45091453		
3205													0.307972		
3206															

Ready Filter Mode Average: 15030489.06 Count: 6 Sum: 45091467.19 100%



## Exercise #2: EMFAC Mode

- This exercise will generate fleet-average emission factors (grams/hour or grams/km) for temperature 25°C and relative humidity 40% at calendar year 2030.
- Temperature, relative humidity and average speed combination as specified by the user.

## Exercise #2: Scenario input data

- Geographic Area: **Hong Kong SAR** (default)
- Calendar Years: **2030**
- Alternate Baseline Year: **Inactive** (default)
- Season: **Annual** (default)
- Scenario Title for Reports: **Default Title**
- Model Years: **All** (default)
- Vehicle Classes: **Modify** (default)

# Exercise #2: Scenario input data

– Scenario Type:

**EMFAC** – Area fleet average emissions

– Files and Reports:

**Detailed Impact Rates (RTL)** (default)

– Output Particulate: **PM<sub>10</sub>** (default)

– Output Hydrocarbons: **VOC** (default)

– Temperatures: **25°C**

– Relative Humidity: **40%**

# Exercise #2: 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

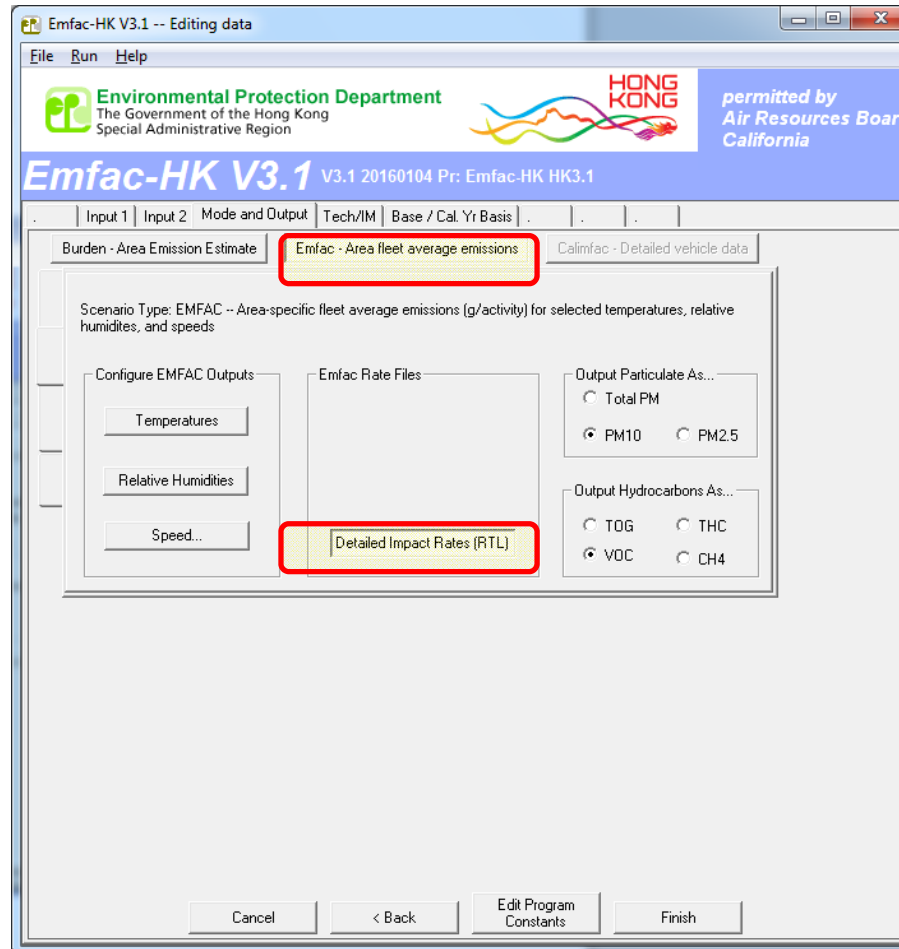
OPTIONAL: Selecting this  
option overrides EMFAC-HK  
default base year.

Step 3 - Season or Month

Annual

Cancel Next > Finish

# Exercise #2: Mode and Output Tab



# Exercise #2: Select/Edit Temperature (delete until just 1. set to 25°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 and the Air Resources Board. The "Configure EMFAC Outputs" section has a "Temperatures" button highlighted with a red box. A red arrow points from this button to a dialog box titled "Select/Edit temperature for Emfac calculations".

The dialog box contains the following text and controls:

- Enter data for temperature. Click button to enable new value.
- Enter values of speed and temperature
- Radio buttons for "Delete temperature 1" (selected), "Enter temperature 2" through "Enter temperature 12", "Enter temperature 13" through "Enter temperature 24".
- A checkbox for "Sort the array (done after exit)".
- "OK" and "Cancel" buttons.

The "Delete temperature 1" radio button is selected, and the "Enter temperature 2" input field contains the value "25".

# Exercise #2: Select/Edit RH (delete until just 1. set to 40%)

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 and the Air Resources Board. The "Relative Humidities" button in the "Configure EMFAC Outputs" section is highlighted with a red box. A red arrow points from this box to a dialog box titled "Select/Edit rel hum for Emfac calculations".

The dialog box contains the following options and controls:

- Enter data for rel hum. Click button to enable new value.
- Enter values of speed and temperature
- Radio buttons for "Delete rel hum 1" through "Delete rel hum 12".
- Radio buttons for "Enter rel hum 13" through "Enter rel hum 24".
- Input fields for speed and temperature values.
- Check box for "Sort the array (done after exit)".
- Buttons for "OK" and "Cancel".

The "Delete rel hum 1" option is selected, and the value "40" is entered in the temperature input field.

# Exercise #2: Select/Edit Speed (default)

The screenshot 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 and the Air Resources Board. The dialog box, titled 'Select/Edit speed for Emfac calculations', contains the following information:

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

Speed Option	Value	Speed Option	Value
<input checked="" type="radio"/> Delete speed 1	10	<input type="radio"/> Delete speed 13	120
<input type="radio"/> Delete speed 2	10	<input type="radio"/> Delete speed 14	130
<input type="radio"/> Delete speed 3	20	<input type="radio"/> Enter speed 15	
<input type="radio"/> Delete speed 4	30	<input type="radio"/> Enter speed 16	
<input type="radio"/> Delete speed 5	40	<input type="radio"/> Enter speed 17	
<input type="radio"/> Delete speed 6	50	<input type="radio"/> Enter speed 18	
<input type="radio"/> Delete speed 7	60	<input type="radio"/> Enter speed 19	
<input type="radio"/> Delete speed 8	70	<input type="radio"/> Enter speed 20	
<input type="radio"/> Delete speed 9	80	<input type="radio"/> Enter speed 21	
<input type="radio"/> Delete speed 10	90	<input type="radio"/> Enter speed 22	
<input type="radio"/> Delete speed 11	100	<input type="radio"/> Enter speed 23	
<input type="radio"/> Delete speed 12	110	<input type="radio"/> Enter speed 24	

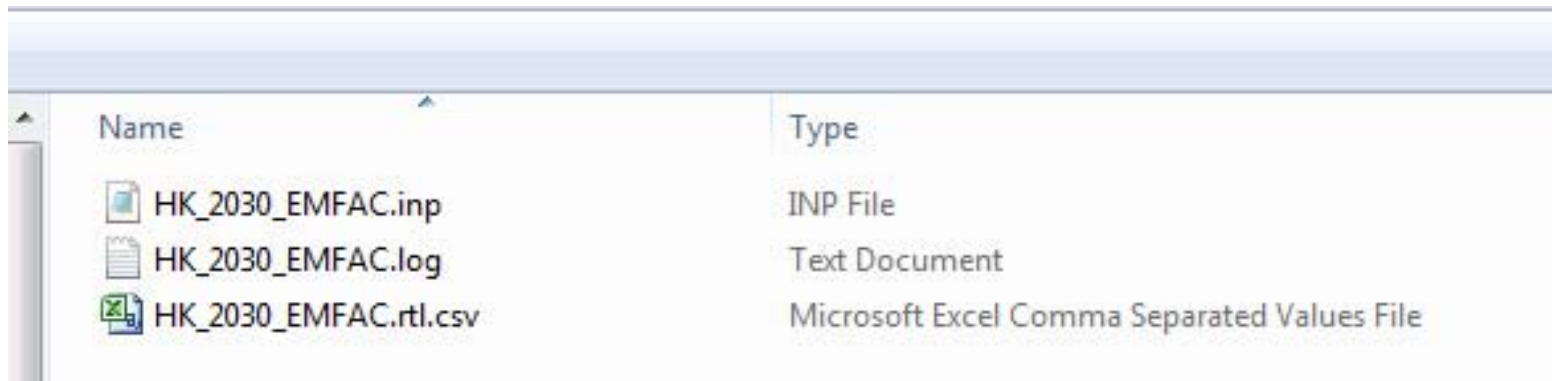
\* Idling (0 km/hr) is not displayed in the output file  
 Sort the array (done after exit)

Buttons: OK, Cancel




- Save input file as: **HK\_2030\_Emfac.inp** and **Run**



# Exercise #2: Output Generated



A screenshot of a file explorer window showing a list of files. The window has a light blue header bar. Below the header, there is a table with two columns: 'Name' and 'Type'. The table contains three rows of files:

Name	Type
 HK_2030_EMFAC.inp	INP File
 HK_2030_EMFAC.log	Text Document
 HK_2030_EMFAC.rtl.csv	Microsoft Excel Comma Separated Values File

# Exercise #2: HK\_2030\_EMFAC.rtl.csv

HK\_2030\_EMFAC.rtl.csv - Microsoft Excel

File Home Insert Page Layout Formulas Data Review View Add-Ins Acrobat Team

Clipboard Font Alignment Number Conditional Formatting Styles Cell Styles Insert Delete Format Sort & Filter Find & Select Editing

A1 Title : Hong Kong SAR Annual Cyr 2030 Default Title

1 Title : Hong Kong SAR Annual Cyr 2030 Default Title  
 2 Version : Emfac-HK V3.1.1 V3.1.1 20160217 Pr: Emfac-HK HK3.1.1  
 3 Run Date : 2017/01/11 13:54:35  
 4 Scen Year: 2030 -- All model years in the range 1986 to 2030 selected  
 5 Season : Annual  
 6 Area : Hong Kong

8 Year: 2030 -- Model Years 1986 to 2030 Inclusive -- Annual  
 9 Emfac-HK V3.1.1 Emission Factors: V3.1.1 20160217 Pr: Emfac-HK HK3.1.1

11 SAR Average Hong Kong SAR Average

13 Table 1: Running Exhaust Emissions (grams/km)

15 Pollutant Name: Volatile Org Cpds Temperature: 25C Relative Humidity: 40%

Speed	PC	PC	PC	PC	PC	PC	TAXI	TAXI	TAXI	TAXI	TAXI	LGV3	LGV3	LGV3	LGV3	LGV3	LGV4	LGV4	LGV4	LGV4	LGV4
km/hr	NCAT	CAT	DSL	IPG	ALL	NCAT	CAT	DSL	IPG	ALL	NCAT	CAT	DSL	IPG	ALL	NCAT	CAT	DSL	IPG	ALL	
10	5.5443	0.0183	0.0214	0	0.0183	0	0	0	0.0401	0.0401	6.0628	3.8729	0.0379	0	0.044	6.0547	0.2512	0.0386	0	0.0	
20	3.6914	0.0097	0.0135	0	0.0097	0	0	0	0.0221	0.0221	4.0384	1.9353	0.0284	0	0.0316	4.0329	0.1142	0.0289	0	0.0	
30	2.6336	0.0067	0.01	0	0.0068	0	0	0	0.0143	0.0143	2.8827	1.4477	0.0219	0	0.0243	2.8789	0.0809	0.0223	0	0.0	
40	2.0148	0.0052	0.0079	0	0.0053	0	0	0	0.01	0.01	2.2066	1.2711	0.0176	0	0.0196	2.2036	0.0712	0.0179	0	0.0	
50	1.6544	0.0043	0.0066	0	0.0043	0	0	0	0.0077	0.0077	1.8128	1.1208	0.0145	0	0.0163	1.8103	0.0658	0.0148	0	0.0	
60	1.4595	0.0037	0.0056	0	0.0037	0	0	0	0.0063	0.0063	1.5998	0.9222	0.0124	0	0.0139	1.5976	0.0585	0.0127	0	0.0	
70	1.3844	0.0032	0.005	0	0.0033	0	0	0	0.0057	0.0057	1.5177	0.7278	0.011	0	0.0122	1.5156	0.0496	0.0112	0	0.0	
80	1.4125	0.0029	0.0045	0	0.0029	0	0	0	0.0056	0.0056	1.5485	0.6207	0.0101	0	0.0112	1.5463	0.0428	0.0103	0	0.0	
90	1.55	0.0026	0.0042	0	0.0026	0	0	0	0.0059	0.0059	1.6987	0.7037	0.0096	0	0.0108	1.6964	0.0436	0.0098	0	0.0	
100	1.8281	0.0024	0.004	0	0.0024	0	0	0	0.0068	0.0068	2.0026	1.5679	0.0094	0	0.0118	1.9999	0.0661	0.0096	0	0.0	
110	2.0205	0.0023	0.0039	0	0.0023	0	0	0	0.0075	0.0075	2.2128	3.4421	0.0094	0	0.0143	2.2098	0.0999	0.0096	0	0.0	
120	2.0205	0.0023	0.0039	0	0.0023	0	0	0	0.0075	0.0075	2.2128	3.4421	0.0094	0	0.0143	2.2098	0.0999	0.0096	0	0.0	
130	2.0205	0.0023	0.0039	0	0.0023	0	0	0	0.0075	0.0075	2.2128	3.4421	0.0094	0	0.0143	2.2098	0.0999	0.0096	0	0.0	

35 Pollutant Name: Carbon Monoxide Temperature: 25C Relative Humidity: 40%

Speed	PC	PC	PC	PC	PC	TAXI	TAXI	TAXI	TAXI	TAXI	LGV3	LGV3	LGV3	LGV3	LGV3	LGV4	LGV4	LGV4	LGV4	LGV4
km/hr	NCAT	CAT	DSL	LPG	ALL	NCAT	CAT	DSL	LPG	ALL	NCAT	CAT	DSL	LPG	ALL	NCAT	CAT	DSL	LPG	ALL
10	101.6609	0.4641	0.3019	0	0.4631	0	0	0	2.2793	2.2793	118.6873	78.9386	0.8304	0	0.9532	118.6873	18.0629	0.8272	0	1.1
20	70.2475	0.3694	0.2265	0	0.3684	0	0	0	1.464	1.464	82.0127	42.0147	0.5341	0	0.6027	82.0127	10.3506	0.532	0	0.7
30	52.5796	0.3233	0.1884	0	0.3223	0	0	0	1.1301	1.1301	61.3857	29.9168	0.3685	0	0.4179	61.3858	6.9561	0.3671	0	0.4
40	42.6299	0.2941	0.1652	0	0.2932	0	0	0	0.9404	0.9404	49.7696	24.5653	0.2727	0	0.3133	49.7696	5.2498	0.2717	0	0.3
50	37.4387	0.2734	0.1497	0	0.2725	0	0	0	0.8155	0.8155	43.7091	21.0851	0.2166	0	0.2516	43.7091	4.3278	0.2157	0	0.2
60	35.6154	0.2699	0.1453	0	0.269	0	0	0	0.8155	0.8155	41.5804	18.1336	0.1845	0	0.2153	41.5804	3.8511	0.1838	0	0.2

Ready

# Exercise #3: Changing Technology

## Group Fractions

- This exercise evaluates emission changes in 2030 if the Gov't introduces a tax incentive program by implementing Euro V in 2010 for Light Goods Vehicles  $\geq 3.5$  tonnes (i.e. LGV6).
- Hints:
  - Add 40% Euro V from model year 2010 to 2012 for LGV6

# Exercise #3: Changing TG Fractions

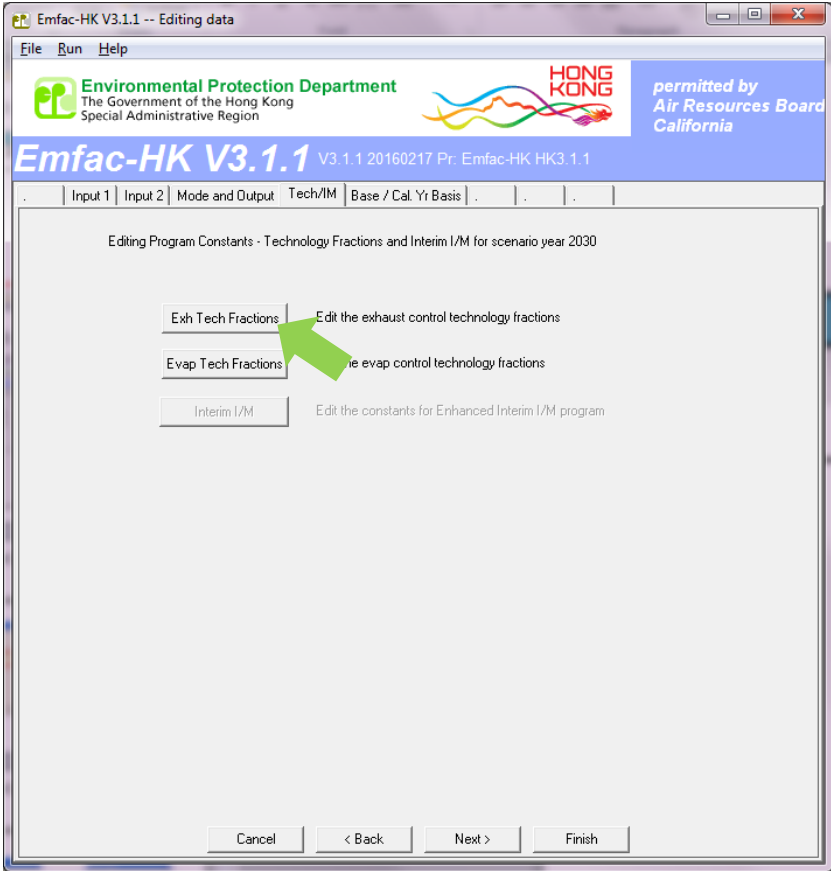
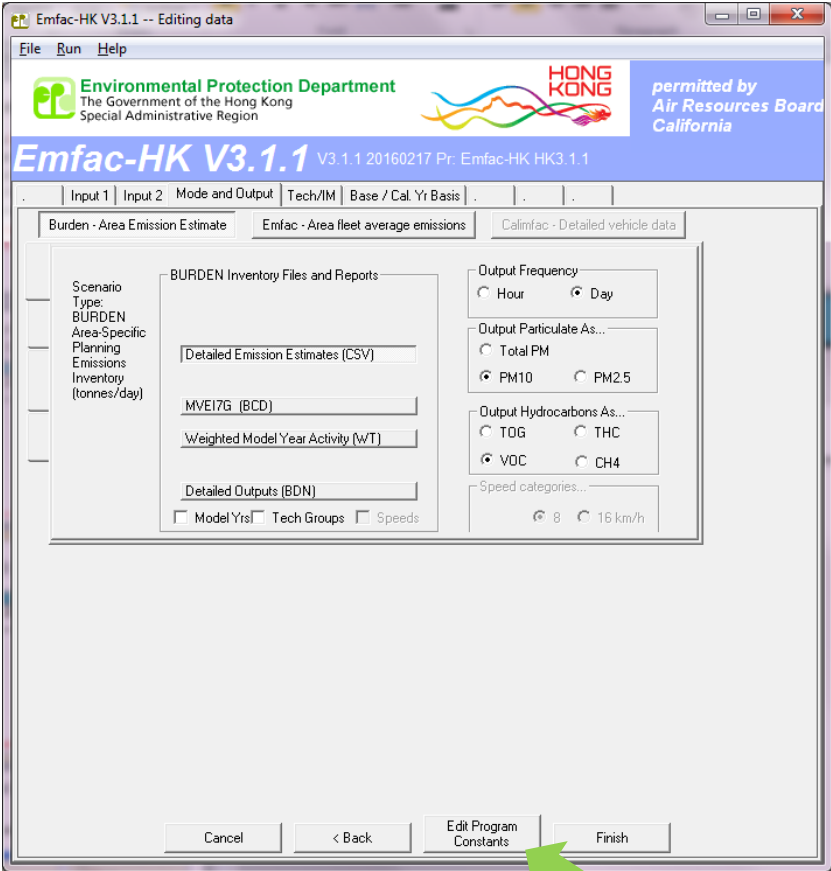
- **Base Case** (similar to Ex1):
  - Calendar Years: **2030**
  - Scenario Type: **BURDEN**
  - Output File types: **MVEI7G (BCD)**
  - Pollutants: **PM10, VOC**
- Create a **new case** with same scenario data and edit TG fraction on LGV6

# Exercise #3: Update TG fraction on LGV6

Case	Model Year	TG 119 Euro IV – POC	TG 132 Euro IV – DPF	TG 133 Euro V - DPF	Total Fraction
Base	2010	17.435%	82.5646%	-	100%
New	2010-2012	17.435%	42.5646%	40%	100%

- Move 40% from TG132 to TG 133 at 2010
- Apply same fraction to 2011 & 2012

# Exercise #3: Update TG fraction on LGV6



# Exercise #3: Update TG fraction on LGV6

Exhaust Technology Fractions

Edit Exhaust Technology Fractions by

Vehicle Class

Model Year 2030

EXHAUST Technology Groups Total 100

# of Tech Groups 2

Group	%	Model year
29	99.2136	Euro V - VI
177	0.7864	Euro VI PC
1		
1		
1		
1		
1		
1		
1		
1		
1		

01: Private Cars (PC)  
05: Light Goods Vehicles (3.5-5.5t) (LGV6)  
06: Heavy Goods Vehicles (5.5-15t) (HGV7)  
07: Heavy Goods Vehicles (>=15t) (HGV8)  
08: Public Light Buses (PLB)  
09: Private Light Buses (<=3.5t) (PV4)  
10: Private Light Buses (>3.5t) (PV5)  
11: Non-franchised Buses (<6.4t) (NFB6)  
12: Non-franchised Buses (6.4-15t) (NFB7)  
13: Non-franchised Buses (>15t) (NFB8)  
14: Single Deck Franchised Buses (FBSD)  
15: Double Deck Franchised Buses (FBDD)  
16: Motor Cycles (MC)  
17: <Placeholder (P1)>  
18: <Placeholder (P2)>

Return Copy values to other years and

Apply Cancel Done Apply to Others

# Exercise #3: 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 to Others

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



# Exercise #3:

Model Year	TG 119 Euro IV – POC	TG 132 Euro IV – DPF	TG 133 Euro V - DPF	Total Fraction
2010-2012	17.435%	42.5646%	40%	100%

Before Edit

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: 2

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

Apply Cancel Done Copy values to other years and Apply to Others

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

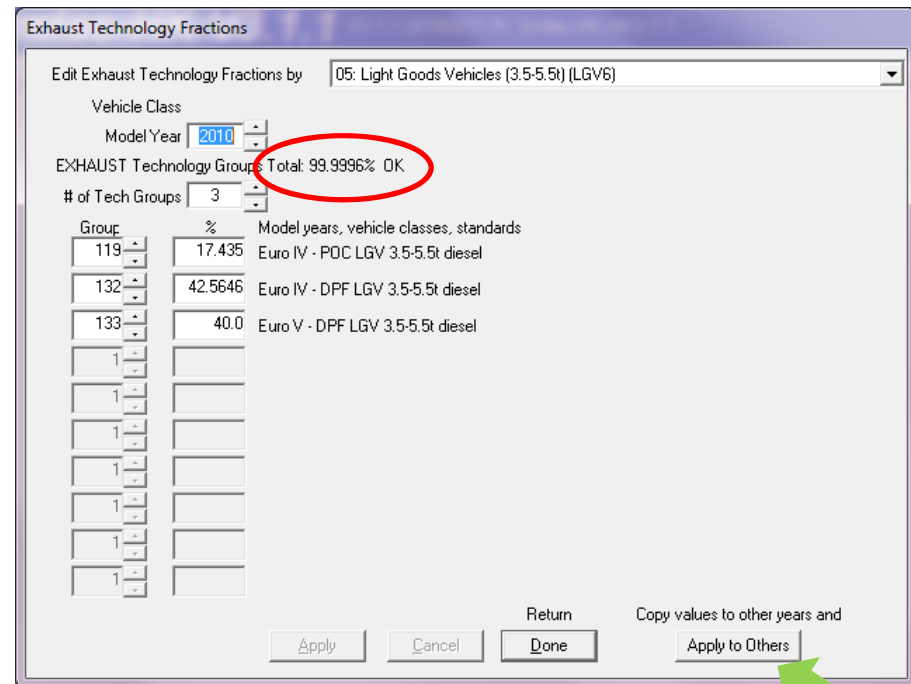
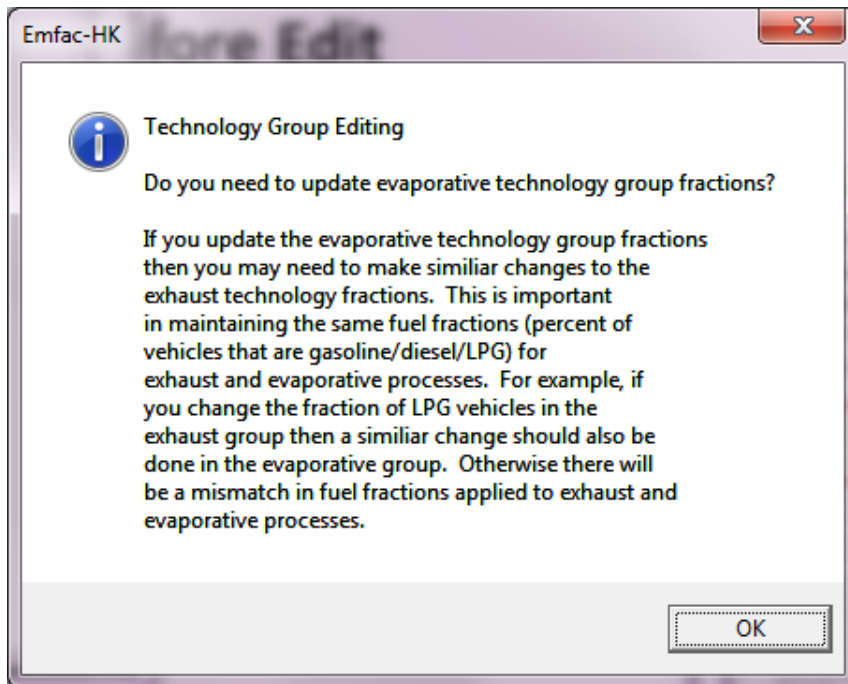
# of Tech Groups: 3

Group	%	Model years, vehicle classes, standards
119	17.435	Euro IV - POC 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 Done Apply to Others

Click "Apply"

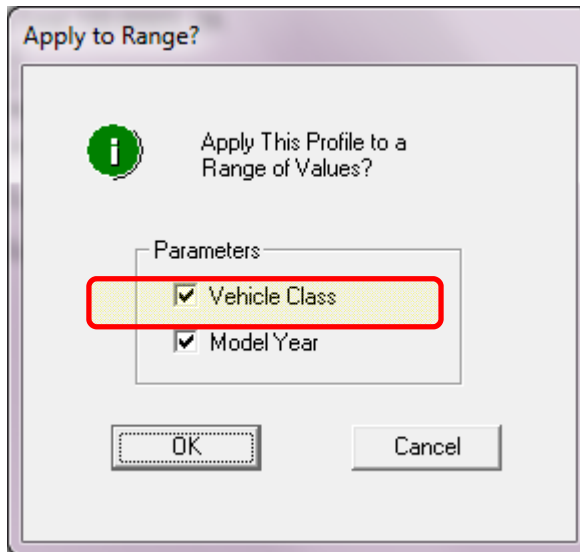
# Exercise #3:



Click "Apply to Others"

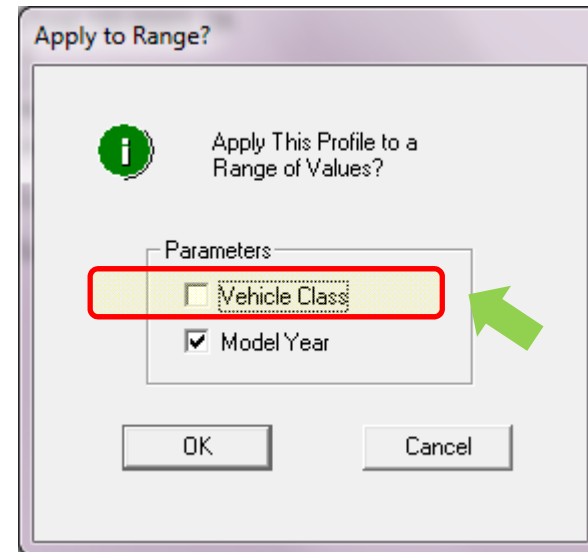
# Exercise #3:

## Before Edit



The dialog box titled "Apply to Range?" 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 rectangular box highlights the "Vehicle Class" checkbox. At the bottom are "OK" and "Cancel" buttons.

## After Edit

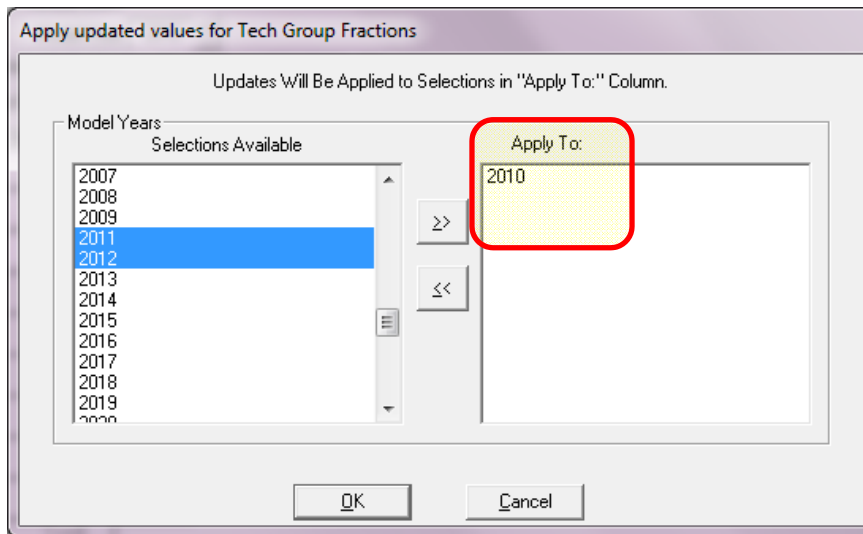


The dialog box titled "Apply to Range?" contains an information icon and the text "Apply This Profile to a Range of Values?". Below this is a "Parameters" section with two checkboxes: "Vehicle Class" (unchecked) and "Model Year" (checked). A red rectangular box highlights the "Vehicle Class" checkbox, and a green arrow points to it from the right. At the bottom are "OK" and "Cancel" buttons.

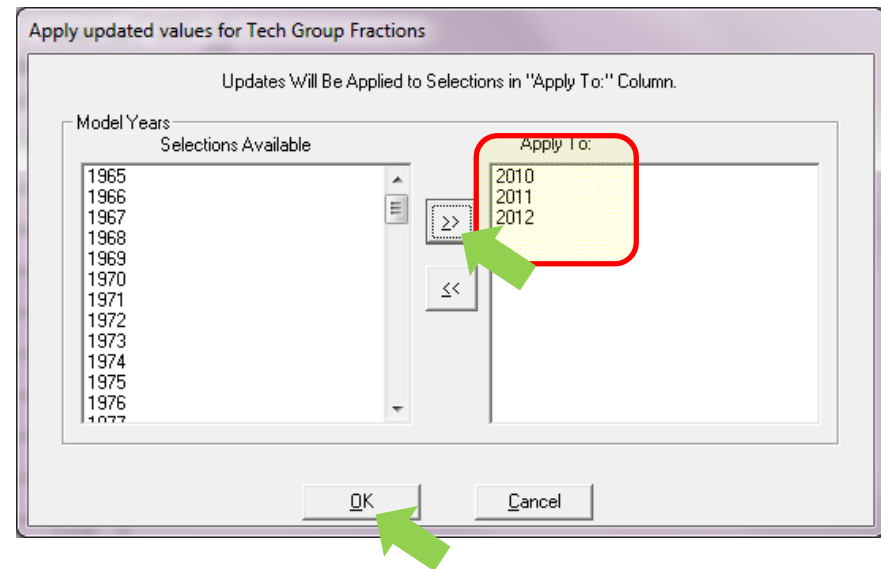
- “Apply to Others – **Model Year Only**”

# Exercise #3:

## Before Edit



## After Edit



- 2010 TG fraction same as 2011 & 2012

# Exercise #3:

Exhaust Technology Fractions

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

Vehicle Class

Model Year 2011

EXHAUST Technology Groups Total: 99.9996% OK

# of Tech Groups 3

Group	%	Model years, vehicle classes, standards
119	17.435	Euro IV - POC 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
1		
1		
1		
1		
1		
1		
1		
1		

Return Copy values to other years and

Apply Cancel Done Apply to Others

Exhaust Technology Fractions

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

Vehicle Class

Model Year 2012


EXHAUST Technology Groups Total: 99.9996% OK

# of Tech Groups 3

Group	%	Model years, vehicle classes, standards
119	17.435	Euro IV - POC 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
1		
1		
1		
1		
1		
1		
1		
1		

Return Copy values to other years and

Apply Cancel Done Apply to Others



- Save input file as: **HK\_2030\_LGV6.inp** and **Run**

# Exercise #3: Solution

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

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
1	CALYR	START	END M	REGION	SAR	STARTS	POPUL	VKT	VEH TY	VEH TE	POLLUT	PROCE	EMISSIONS	BASIS	Case	
903	2030	1986	2030	SAR Avera	Hong Kon	106611	26653	2547737	LGV6	DSL	NOx	Run Exh	0.973116	Day	Base	
4103	2030	1986	2030	SAR Avera	Hong Kon	106611	26653	2547737	LGV6	DSL	NOx	Run Exh	0.962865	Day	New	
6402																
6403													0.010251		Difference	
6404																
6405																

The status bar at the bottom indicates 'Count: 3' and '100%' zoom.

## Exercise #4: Changing Vehicle Kilometer Travelled (VKT)

- This exercise estimates emissions for an area with known VKT of specific vehicle class.
- Two approaches to change VKT:
  - 1) adjust the population to match desired VKT  
(conformity adjustment: model will alter VKT and Trips)
  - 2) directly alter the VKT

# Exercise #4: Changing VKT

- At year 2030, petrol private cars (Vehicle Class 1) has *forecasted* VKT of **1,609,000 km/day**.
- This Exercise will be conducted in three phases:
  - 4 : base case
  - 4a: conformity adjustment
  - 4b: direct VKT adjustment



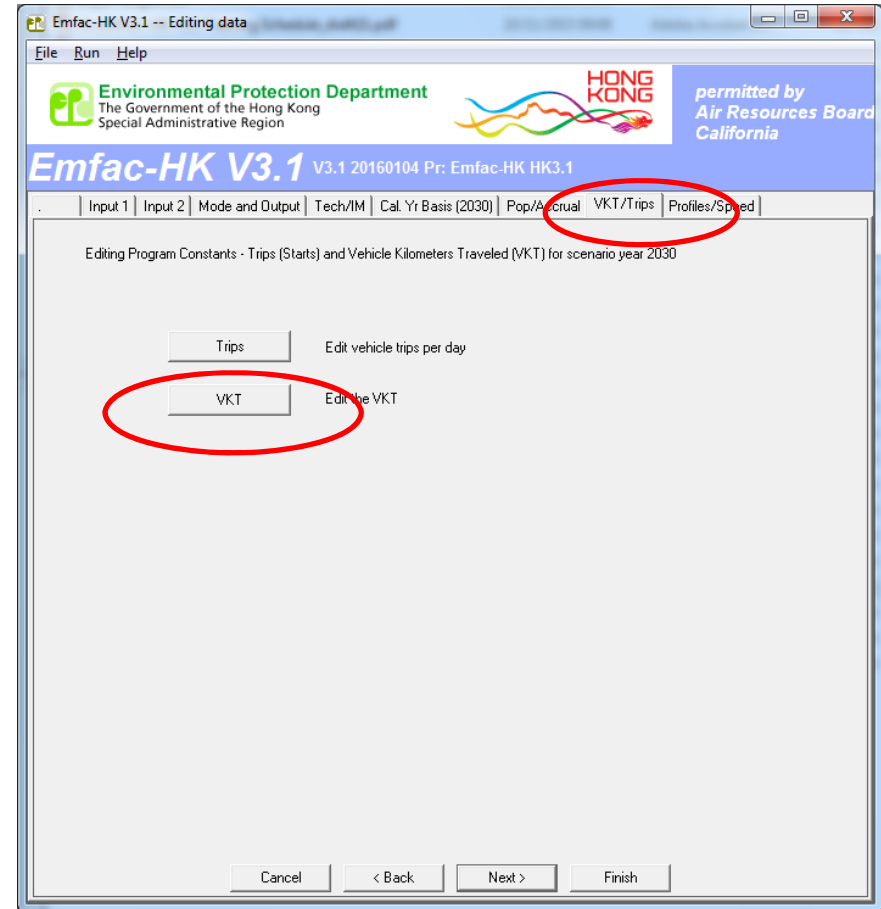
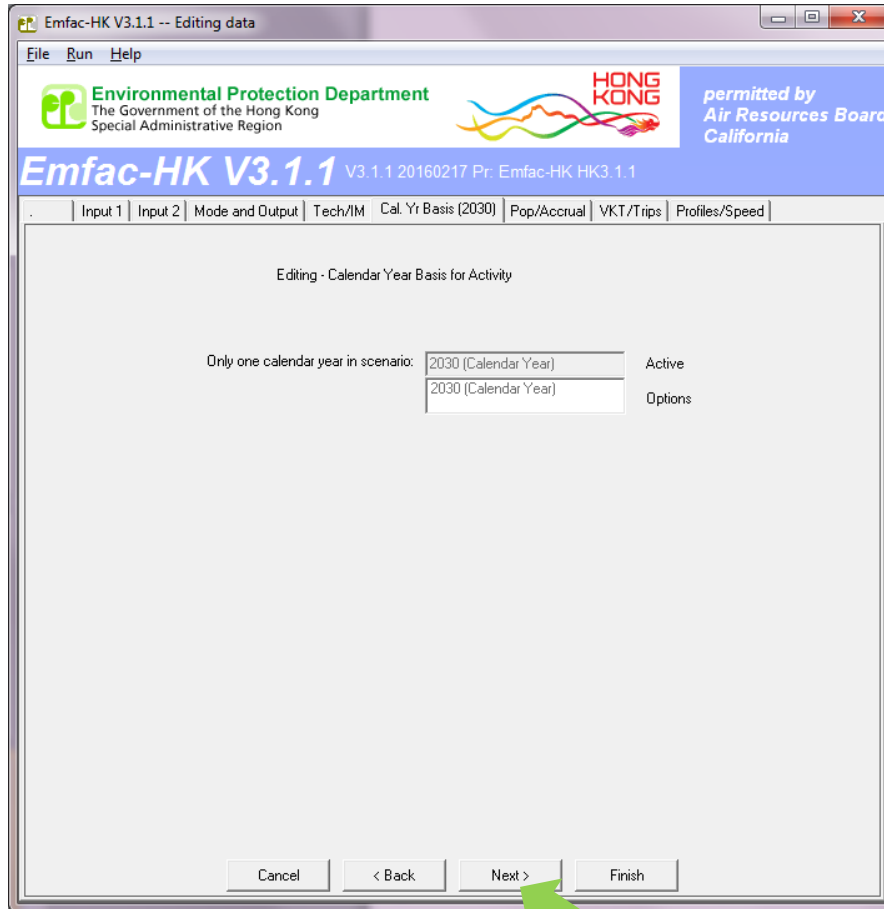
# Exercise # 4: Base Case

- Scenario data:
  - Calendar Years: 2030
  - Scenario Type: BURDEN
  - Output File types: Detailed Estimates (CSV)
  - Output Frequency: Day
  - Pollutants: PM10, VOC

# Exercise # 4a: Conformity Adjustment

- Create a **new case** with same scenario data as base case
- Determine **VKT adjustment factor**
- Multiply **population** by above factor

# Exercise # 4a:



- Click Next until VKT/Trips tab

# Exercise # 4a:

## Total VKT tab

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

Revised Total VKT: 45091452

Previous Total VKT: 45091452

Apply Cancel Done

## By Vehicle and Fuel tab

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

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

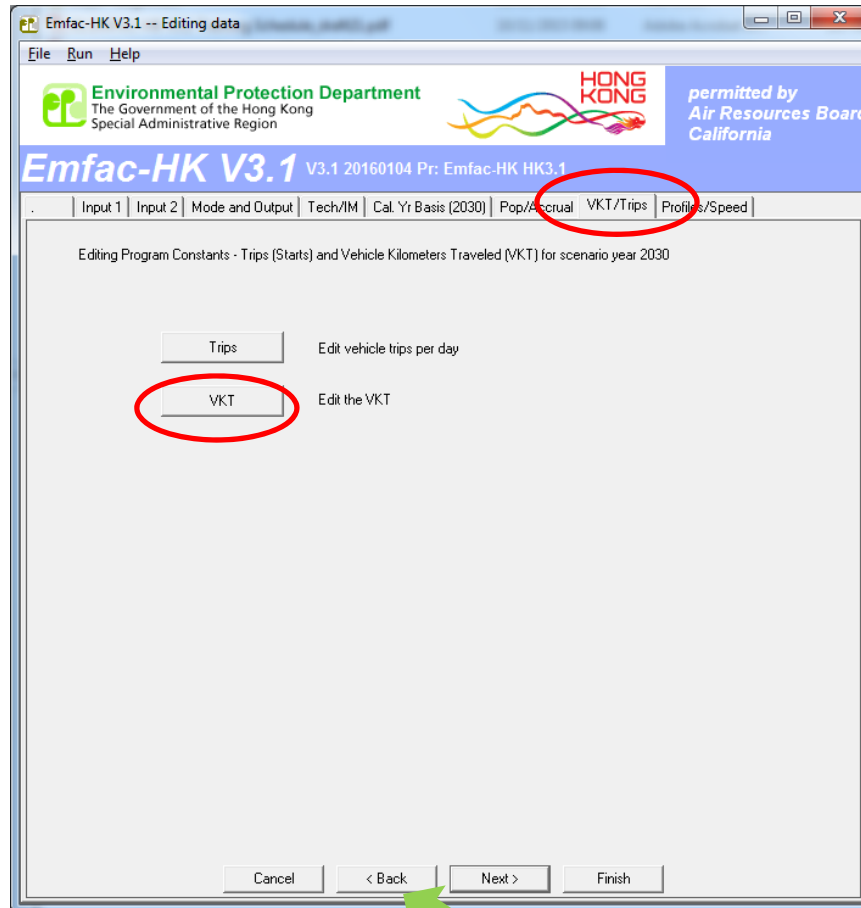
Apply Cancel Done

- VKT adjustment factor is :

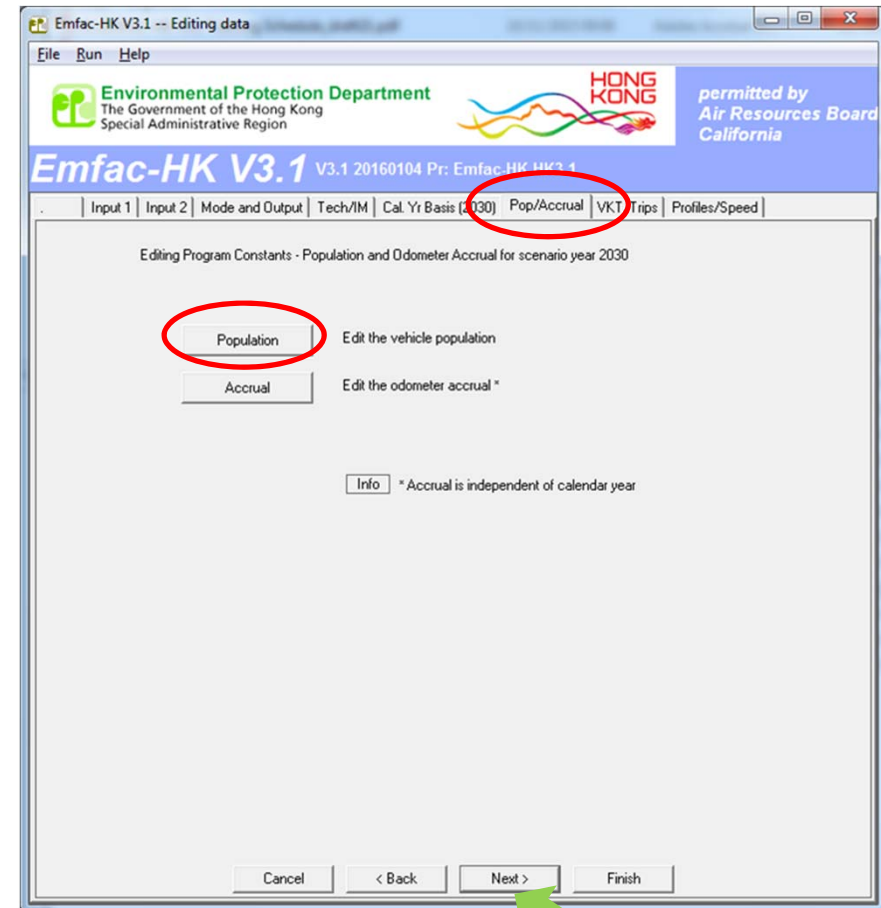
$$1,609,000 \div 21,887,260 = 0.0735$$

# Exercise # 4a:

## VKT/Trips tab



## Pop/Accrual tab



- Back to Population → By Vehicle and Fuel tab

# Exercise # 4a:

## 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** | Vehicle/Fuel/Age

Vehicle Class	Fuel (1=Petrol/2=Diesel/3=LPG)		
	1	2	3
01 - Private Cars (PC)	<b>783924.3</b>	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** | Vehicle/Fuel/Age

Vehicle Class	Fuel (1=Petrol/2=Diesel/3=LPG)		
	1	2	3
01 - Private Cars (PC)	<b>57628.7</b>	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

- Multiply population by factor:

$$783,924 * 0.0735 = 57,629$$

# Exercise # 4a: 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: 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

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: By Vehicle and Fuel

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

- Save input file as

HK\_2030\_Burden\_by\_Hour\_edit VKT (conformity).inp and Run

## Exercise # 4b: Direct VKT adjustment

- Create a **new case** with same scenario data as base case
- **Direct entry of new VKT** for petrol private cars as **1,609,000 km/day**



# Exercise # 4b: 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)

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 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)

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)	1609000.0	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

- Save input file as

HK\_2030\_Burden\_by\_Hour\_edit VKT (directly).inp and Run

# Exercise # 4: Solution

PC-NCAT & PC-CAT	Base	#4a: Pop-adjusted VKT	#4b: VKT direct
Vehicles	783,924	<b>57,628</b>	783,924
VKT	21,887,261	1,609,000	1,609,000
Trips	1,176,004	<b>86,451</b>	1,176,004
NOx Run Exhaust (tonne/day)	0.2224	0.0163	0.0163
NOx Start Exhaust (tonne/day)	0.0402	<b>0.0030</b>	0.0402

## Notes:

Results show how the model adjusted trips in Exercise #4a, thus, starting exhaust as well. Running exhaust emissions do not differ.

Exercise #4b 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 #5: Changing Trips

- This exercise estimates the emission reduction when reduces trips for petrol Private Cars in 2015 to 250,000 trips per day.
- There are two potential methods:
  - 1) Ex 5a: Adjust the population to match desired Trips (i.e., “conformity” approach)
  - 2) Ex 5b: Directly alter the Trips

# Exercise # 5a: Conformity Adjustment

- Base Case (2030, Burden, CSV outputs)
- New case with same scenario data as base case
- Determine Trips adjustment factor
- Multiply population by above factor

# Exercise # 5a: Trips adjustment factor

## 2030 Trips by Vehicle and Fuel of petrol PC

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

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	0.0	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

$$\text{Factor} = 250,000 \div 1,176,004 = 0.2126$$

# 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

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

Vehicle Class	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

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

Vehicle Class	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

Multiply population by factor:

$$783,924 * 0.2126 = 166,650 \text{ vehicles}$$

# Exercise # 5a: 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: By Vehicle and Fuel

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

## 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: By Vehicle and Fuel

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

- Save input file as

HK\_2030\_Burden\_edit VKT (conformity).inp and Run

# Exercise # 5b: Changing Trips (Directly)

- Create new case with scenario data same as base case

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	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 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	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



- Save input file as

HK\_2030\_Burden\_edit VKT (directly).inp and Run



# Exercise # 5c: Solution

PC-NCAT & PC-CAT	Base	#5a: Pop-adjusted Trips	#5b: Trips direct
Vehicles	783,924	<b>166,650</b>	783,924
VKT	21,887,261	<b>4,652,888</b>	21,887,261
Trips	1,176,004	250,000	250,000
NOx Run Exhaust	0.2224	<b>0.0473</b>	0.2224
NOx Start Exhaust	0.0402	<b>0.0085</b>	0.0085

## Notes:

Results show how altering trips via population (#5a) also alters VKT; thus, running exhaust is altered, as well.

Exercise #5b shows altering trips only reduces starting exhaust.

# Exercise #6: Speed Distributions

- This exercise estimates NOx running exhaust emissions change when average speed of specific vehicle class at different time zone is altered.
- A new policy propose medium and heavy goods vehicles (HGV7 & HGV8) only travel at specific time zone and speed profile.
- 2 periods:
  - from midnight to 8 a.m.; and
  - from 10 p.m. to midnight

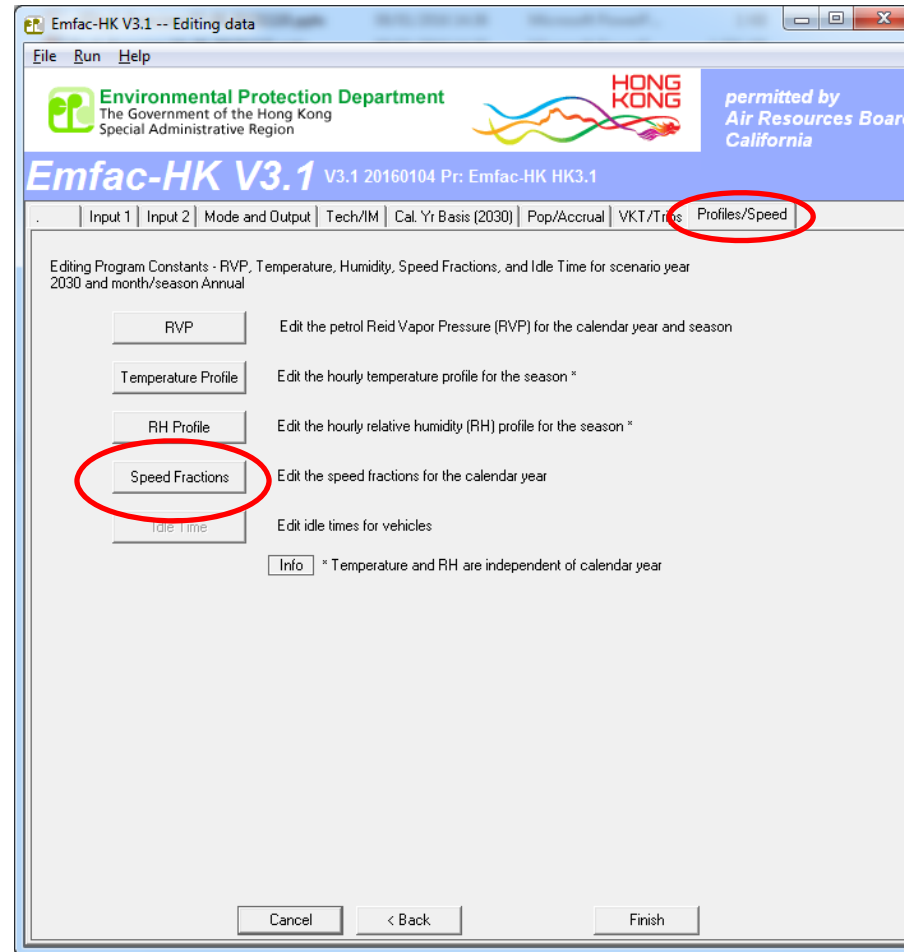
# Exercise #6: Speed Distributions

- limited speed distribution:
  - 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 # 6: Speed Distributions

- Base Case (2030, Burden, CSV outputs)
- New case with same scenario data as base case
- Edit Speed Fractions for HGV7
- Apply same Speed Fraction for HGV8

# Exercise # 6: Profiles/Speed Tab



# Exercise # 6: Editing Speed Fractions

1. Select Vehicle Class;
2. Drag the left-handed corner to select all speed (blue colour);
3. Click button "Copy with Headings".

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)

		Hour (1 to 24)							
		1	2	3	4	5	6	7	8
Speed Bin (8,16,24,...) (1:18)	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

- Paste values into Excel worksheet

# Exercise # 6: Editing Speed Fractions

	Hour : 00	01	02	03	04	05	06	07	08	09	10	.....
1	Vehicle Class 06 Speed Fractions											
2	Spd008	0	0	0	0	0	0	0	1.88E-03	1.88E-03	0	0
3	Spd016	0	0	0	0	0	0	0	6.64E-02	6.64E-02	0	0
4	Spd024	0	0	0	0	0	0	0	6.88E-02	6.88E-02	0	0
5	Spd032	0.268248	0.268248	0.268248	0.268248	0.268248	0.268248	0.191458	0.173041	0.173041	0.191458	0.191458
6	Spd040	3.74E-02	3.74E-02	3.74E-02	3.74E-02	3.74E-02	3.74E-02	4.01E-02	8.15E-02	8.15E-02	4.01E-02	4.01E-02
7	Spd048	0	0	0	0	0	0	0	0.192936	0.192936	0	0
8	Spd056	0.327716	0.327716	0.327716	0.327716	0.327716	0.327716	0.257926	8.75E-02	8.75E-02	0.257926	0.257926
9	Spd064	1.97E-02	1.97E-02	1.97E-02	1.97E-02	1.97E-02	1.97E-02	3.10E-02	0.113836	0.113836	3.10E-02	3.10E-02
10	Spd072	0.346919	0.346919	0.346919	0.346919	0.346919	0.346919	0.479484	0.214092	0.214092	0.479484	0.479484
11	Spd080	0	0	0	0	0	0	0	0	0	0	0
12	Spd088	0	0	0	0	0	0	0	0	0	0	0
13	Spd096	0	0	0	0	0	0	0	0	0	0	0
14	Spd104	0	0	0	0	0	0	0	0	0	0	0
15	Spd112	0	0	0	0	0	0	0	0	0	0	0
16	Spd120	0	0	0	0	0	0	0	0	0	0	0
17	Spd128	0	0	0	0	0	0	0	0	0	0	0
18	Spd136	0	0	0	0	0	0	0	0	0	0	0
19	Spd144	0	0	0	0	0	0	0	0	0	0	0

- From hour 00 to 07 (midnight to 8 a.m.) and hour 22 to 23 (10 p.m. to midnight)
- Speed Fractions:
  - 5% at Spd008 (1-8 km/hr); 25% at Spd032 (24-32 km/hr);
  - 20% at Spd056 (48-56 km/hr); 25% at Spd064 (56-64 km/hr) and
  - 25% at Spd072 (64-72 km/hr).

# Exercise # 6: Editing Speed Fractions

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'

	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

Speed Bin (8,16,24) (1-18)

Total 100 % in each hour

Apply Cancel Done Apply to Others

Editing speed fractions

Paste 24 hours of speed fractions data?

Yes No



# Exercise # 6: Apply Speed Fraction Edits to Other Vehicle Class

## Apply to Others

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)	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)	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

Apply To:

07: Medium & Heavy Goods Vehicles >15t

OK Cancel

Total 100 % in each hour

Apply Cancel Done **Apply to Others**

# Exercise # 6: Solution

Vehicle	Run Exhaust	Base	#6
HGV7	NOx	1.01276	1.02746
	PM	0.02971	0.03017
HGV8	NOx	2.49435	2.57025
	PM	0.11596	0.11713

# Exercise #7: Changing Relative Humidity (RH)

- This exercise shows how to change the annual RH for individual month by editing the input file (INP).
- Monthly average RH of each hour is provided on **RH.XLS**.

# Exercise # 7: Changing RH

- Create a new case
  - Calendar Years: 2015
  - Scenario Type: BURDEN
  - Output File types: Detailed Emission Estimates (CSV)
  - Pollutants: PM10, VOC
- Alter one of the RH **hour** value in GUI and save as “HK\_2015\_Burden\_edit RH.INP”
- Update RH for **each month** in INP

# Exercise # 7: Changing RH

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

- **Alter RH to 90% at hour 0000**

# Exercise # 7: Changing RH

```
HK_2015_Burden_edit RH.inp - Notepad
File Edit Format View Help
EmfachK31-Header
Version 3 1 1 0
Scenario-Count 1
HK-IM Y 20 20 2014 85 85 2014 40 40 2014 20 20 2014 0 0 2014
HKUNITS Y
End-Header
Begin-Scenario 1
Title Hong Kong SAR Annual CYr 2015 Default Title
Program-Mode Burden
Area-Method One-County
Area-Type SAR
Area-Number 38 [Hong Kong SAR]
HC-Mode VOC
PM-Mode PM10
CYr 2015
BYr -1
MYr All
Vehicles PC TAXI LGV3 LGV4 LGV6 HGV7 HGV8 PLB PV4 PV5 NFB6 NFB7 NFB8 FBSD FBDD MC
Season Annual
Burden-Reports CSV_Standard
Burden-Daily
Burden-Speeds 5
End-Scenario
Begin-Scenario-ProgData 12
Begin-Data-Item
DataType 3 RelativeHumidity
Applies-To Season January
Applies-To Area-Method One-County
Applies-To Area-Type SAR
Applies-To Area-Number 38 [Hong Kong SAR]
Begin-Real-Array
Dims 24 1 1 1
Data
85.06667 76.2 75.8 75.5 75.1 75. 75.4 75.2 73.7 67.9 64.2 61.40001 58.7 57.7 57.3 57.6 59.7 63.4 6
End-Real-Array
End-Data-Item
Begin-Data-Item
DataType 3 RelativeHumidity
Applies-To Season February
Applies-To Area-Method One-County
Applies-To Area-Type SAR
Applies-To Area-Number 38 [Hong Kong SAR]
Begin-Real-Array
Dims 24 1 1 1
Data
91.56667 83. 83.4 83.8 83.9 84. 84.2 83.6 82.6 80.3 76.4 73.7 71.2 69.4 68.7 69. 70.2 72.4 76.5 75
End-Real-Array
End-Data-Item
Begin-Data-Item
```

- Update data row for each month from RH.XLS

# Exercise # 7: Changing RH


```
rh.inp - Notepad
File Edit Format View Help
EmfachK31-Header
  Version 3 1 1 0
  Scenario-Count 1
  HK-IM Y 20 20 2014 85 85 2014 40 40 2014 20 20 2014 0 0 2014
  HKUNITS Y
End-Header
Begin-Scenario 1
  Title Hong Kong SAR Annual CYr 2015 Default Title
  Program-Mode Burden
  Area-Method One-County
  Area-Type SAR
  Area-Number 38 [Hong Kong SAR]
  HC-Mode VOC
  PM-Mode PM10
  CYr 2015
  BYr -1
  MYr All
  Vehicles PC TAXI LGV3 LGV4 LGV6 HGV7 HGV8 PLB PV4 PV5 NFB6 NFB7 NFB8 FBSD FBDD MC
  Season Annual
  Burden-Reports CSV_Standard
  Burden-Daily
  Burden-Speeds 5
End-Scenario
Begin-Scenario-ProgData 12
  Begin-Data-Item
    DataType 3 RelativeHumidity
    Applies-To Season January
    Applies-To Area-Method One-County
    Applies-To Area-Type SAR
    Applies-To Area-Number 38 [Hong Kong SAR]
    Begin-Real-Array
      Dims 24 1 1 1
      Data
        80.2 80.3 80.8 80.4 79.9 81.0 80.5 78.2 75.4 72.9 70.1 68.6 67.4 67.0 67.5 68.6
    End-Real-Array
  End-Data-Item
  Begin-Data-Item
    DataType 3 RelativeHumidity
    Applies-To Season February
    Applies-To Area-Method One-County
    Applies-To Area-Type SAR
    Applies-To Area-Number 38 [Hong Kong SAR]
    Begin-Real-Array
      Dims 24 1 1 1
      Data
        91.56667 83. 83.4 83.8 83.9 84. 84.2 83.6 82.6 80.3 76.4 73.7 71.2 69.4 68.7 69. 70.2 72.4 76.5 79.6 81.3 81.9 82.6 82.8
    End-Real-Array
  End-Data-Item
  Begin-Data-Item
```

- Copy each RH values for each month from Excel and paste into INP file accordingly
- Save the INP and run

# Exercise # 7: Changing RH

Diurnal Relative Humidity Profile

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



Hong Kong

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



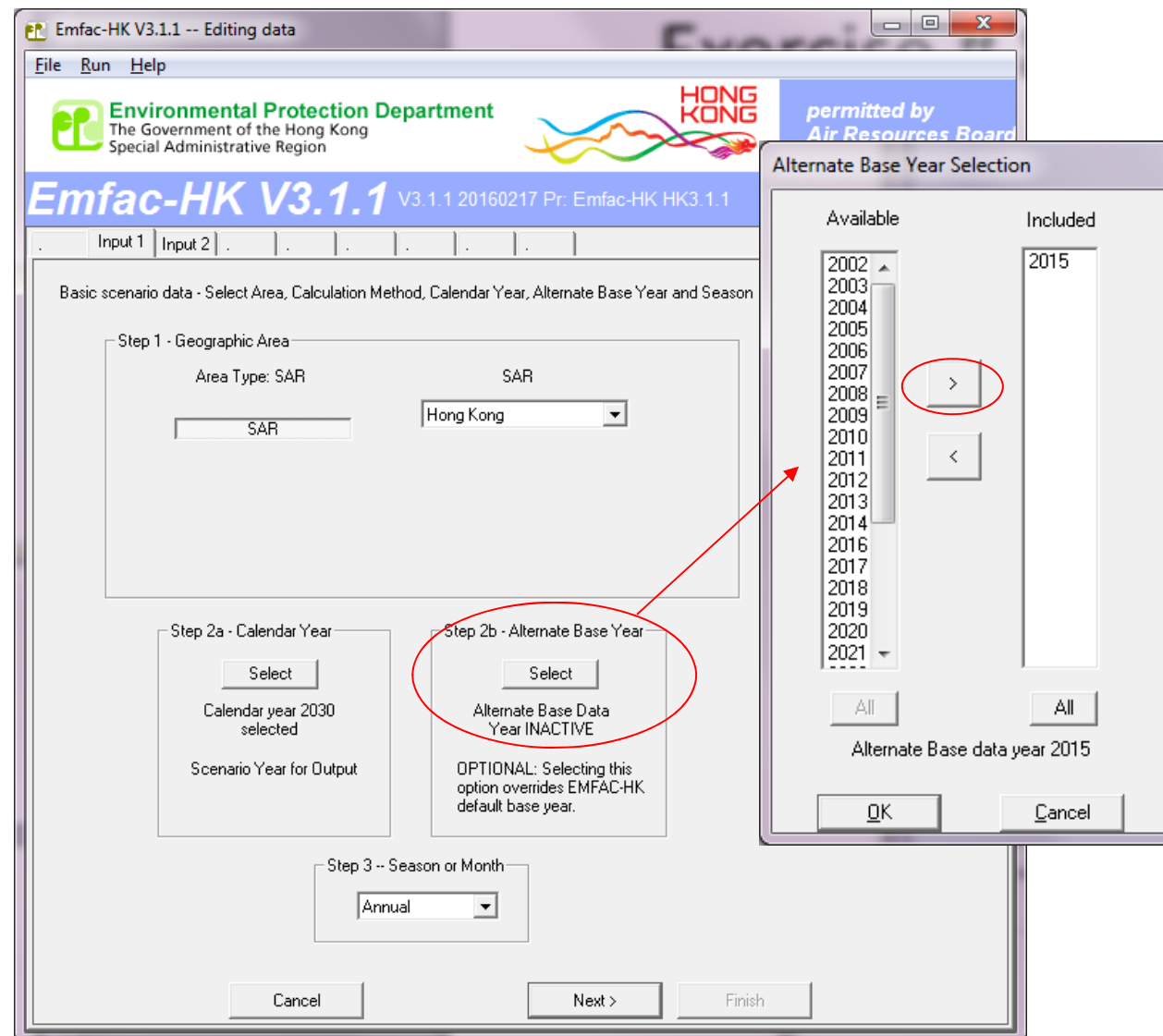
# Advance Exercises

## Exercise #8: Alternate Base Year

- This exercise shows how to change the alternate base year with new population; then, perform a forecast of these data.
- Scenario data:
  - Calendar year : 2030
  - **Alternate base year : 2015**
  - Burden; CSV output; Day; PM<sub>10</sub>; VOC;
- Alter alternate base year population by 2015\_Pop.XLS

# Exercise # 8: Alternate Base Year

- Alternate Base Year Selection: **2015**



# Exercise # 8: Alternate Base Year

Emfac-HK V3.1.1 -- 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 V3.1.1** V3.1.1 20160217 Pr. Emfac-HK HK3.1.1

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

ACTIVATED

Alternate Base data  
year 2015 selected

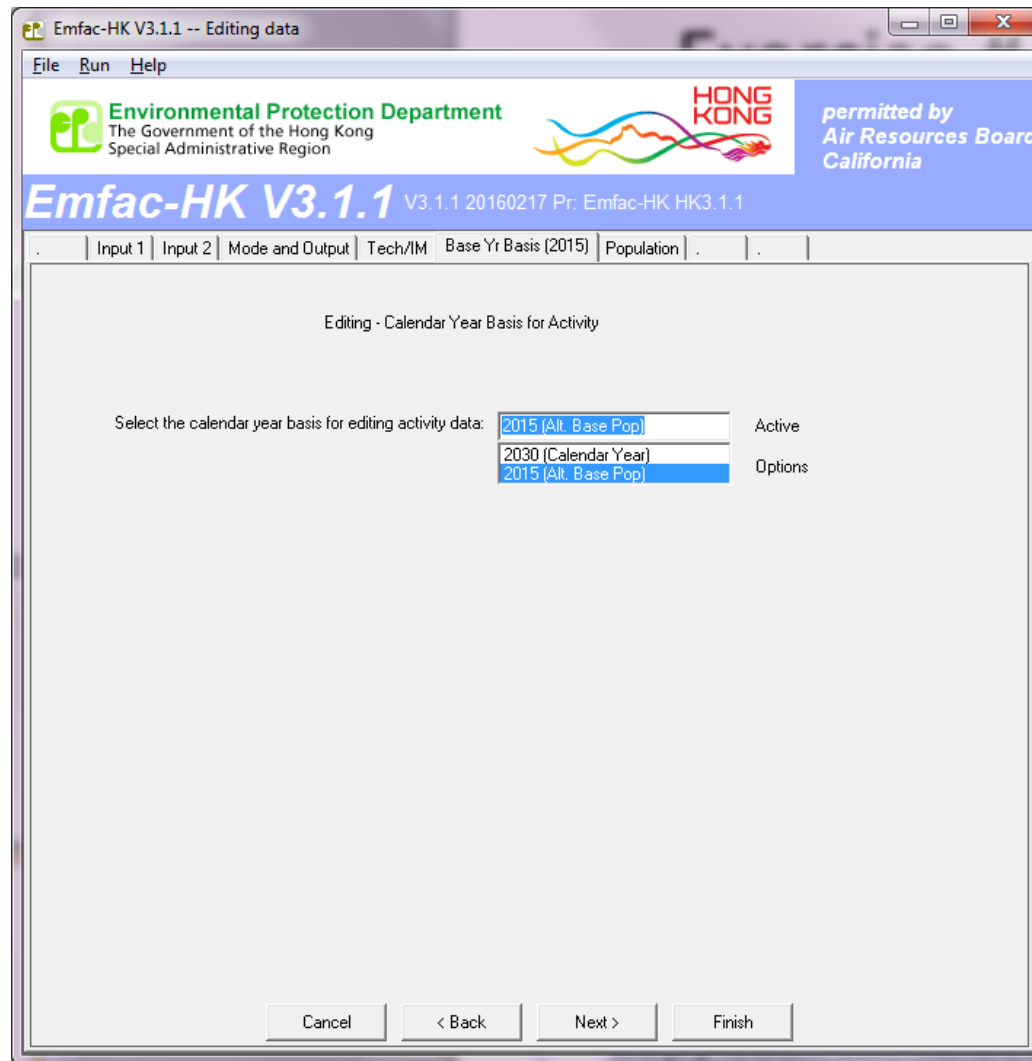
OPTIONAL: Selecting this  
option overrides EMFAC-HK  
default base year.

Step 3 -- Season or Month

Annual

Cancel Next > Finish

# Exercise # 8: Alternate Base Year

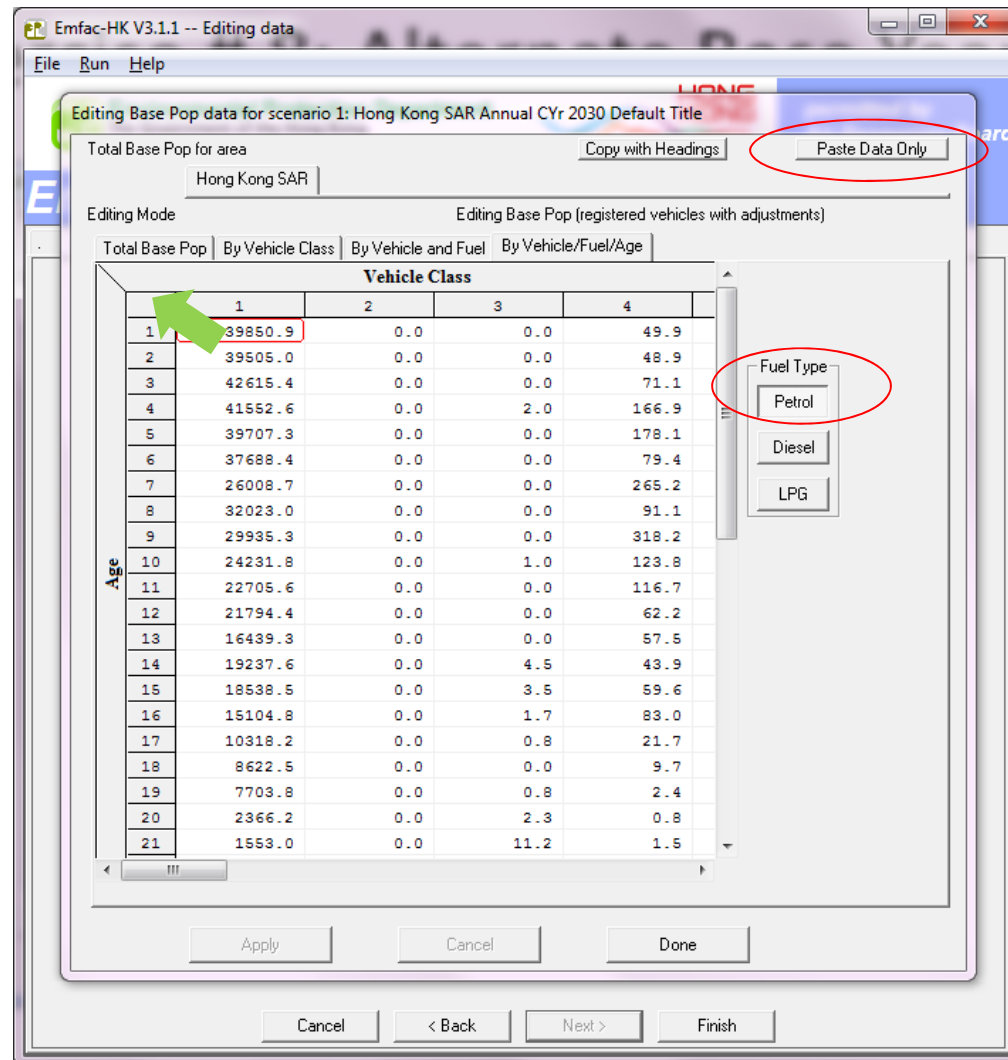


- Select “2015 (Alt. Base Pop)”

# Exercise # 8: Alternate Base Year

The screenshot shows the 'Emfac-HK V3.1.1 -- Editing data' window. The title bar includes 'File', 'Run', and 'Help' menus. The header area features the Environmental Protection Department logo (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 V3.1.1 V3.1.1 20160217 Pr: Emfac-HK HK3.1.1' is displayed. The main window has a tabbed interface with the following tabs: 'Input 1', 'Input 2', 'Mode and Output', 'Tech/IM', 'Base Yr Basis (2015)', and 'Population'. The 'Population' tab is active and contains the text 'Editing Program Constants - Population for Alternate Base year 2015', which is circled in red. Below this text are two buttons: 'Population' and 'Accrual'. The 'Population' button is associated with the text 'Edit the vehicle population', and the 'Accrual' button is associated with 'the odometer accrual \*'. A green arrow points to the 'Accrual' button. At the bottom of the window, there is an 'Info' box containing the text '\* Accrual is independent of calendar year'. The bottom navigation bar includes 'Cancel', '< Back', 'Next >', and 'Finish' buttons.

# Exercise # 8: Alternate Base Year



- Select Fuel Type, drag to highlight all Vehicle Class/Age
- Paste value from 2015\_Pop.XLS by individual fuel type

# Exercise # 8: Alternate Base Year

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

Total Base Pop for area: Hong Kong SAR

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

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

Age	Vehicle Class			
	1	2	3	4
1	45005.0	0.0	1.0	65.0
2	43132.0	0.0	4.0	128.0
3	42789.0	6.0	0.0	59.0
4	41671.0	0.0	2.0	164.0
5	39765.0	4.0	1.0	180.0
6	37926.0	0.0	2.0	78.0
7	26417.0	0.0	0.0	268.0
8	32565.0	0.0	0.0	82.0
9	30651.0	0.0	1.0	272.0
10	25060.0	0.0	1.0	108.0
11	23568.0	0.0	2.0	89.0
12	22692.0	0.0	0.0	46.0
13	16944.0	0.0	0.0	39.0
14	19531.0	0.0	4.0	31.0
15	18454.0	0.0	3.0	40.0
16	14862.0	0.0	2.0	52.0
17	9668.0	0.0	0.0	10.0
18	7915.0	0.0	0.0	2.0
19	7008.0	0.0	1.0	3.0
20	2134.0	0.0	2.0	2.0
21	1561.0	0.0	8.0	2.0

Fuel Type: Petrol, Diesel, LPG

Apply, Cancel, Done

- Repeat for the rest fuel type
- Save as HK\_2030\_AltBYr\_2015\_Burden\_edit Pop.inp and run



# Exercise #9: Buses Retirement

- This exercise evaluates emission changes franchised double-deck buses older than 15 years are retired from the fleet and replaced with newer buses.
- Two policies to replace retired buses:
  1. All buses age 15 or older replaced with brand new
  2. All buses age 15 or old replaced with 1-5 yr-old buses

# Exercise #9: Buses Retirement

- Base Cases (2020, Burden, CSV outputs)
- Copy out FBDD populations by fuel/age from GUI to worksheet and calculate the bus no. for replacement
- 2 New cases with same scenario data as base cases
- Implement different policies

# Exercise #10: Link Example

- This exercise compile NO<sub>x</sub> emission for a road using EMFAC mode.
- Create a Base case at 2030 using EMFAC mode
  - Output File types: RTL
  - Temperature: 20°C
  - Relative Humidity: 70%

## Exercise #10: Link Example

- Compile NOx emission factor for each vehicle class at target speed bin from RTL output;
- Given the VTK (km) of each vehicle class, calculate the emission in gram;
- Calculate average emission factor of each road;

Thank you