

# 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. Exhaust Technology Group (TG) fraction
4. Vehicle Kilometer Travelled (VKT)
5. Trips
6. Speed fraction
7. Relative Humidity

## Advanced

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)

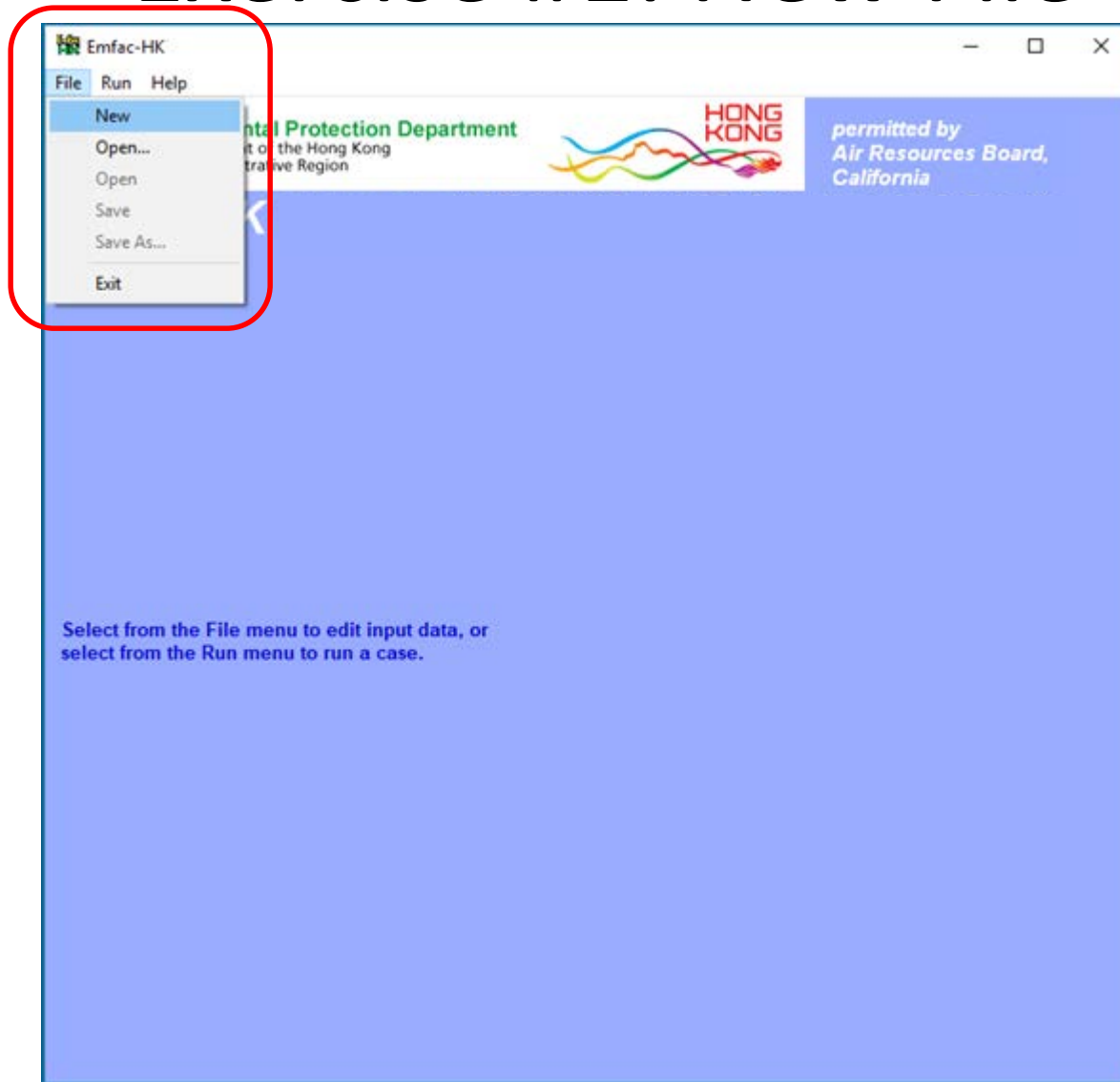
*- check Model Yrs & Tech Groups*

– Output Frequency: **Day** (default)

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

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

# Exercise #1: New File





# Exercise #1: Add New Scenario

Emfac-HK 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

MAIN

No file or scenario

List of Available Scenarios

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

Apply Regime Changes \*

Regime Size Change Data				Regime Size Change Data			
Category-Fuel	% Reduction		Start Year	Category-Fuel	% Reduction		Start Year
	Highs	Supers			Highs	Supers	
Private Car-Petrol:	0	0	2020	Medium Goods Vehicle 6.4-15t-Diesel:	0	0	2020
Taxi-LPG:	0	0	2020	Medium and Heavy Goods Vehicle >15t-Diesel:	0	0	2020
Public Light Bus-LPG:	0	0	2020	Non-Franchised Bus <=6.4t-Diesel:	0	0	2020
Private Light Bus >3.5t-LPG:	0	0	2020	Non-Franchised Bus 6.4-15t-Diesel:	0	0	2020
Public Light Bus-Diesel:	0	0	2020	Non-Franchised Bus >15t-Diesel:	0	0	2020
Light Goods Vehicle <=3.5t-Diesel:	0	0	2020	Motorcycle-Petrol:	0	0	2020
Light Goods Vehicle 3.5-5.5t-Diesel:	0	0	2020				


\* The Model has taken into account the existing I/M Programs for PC-Petrol, Taxi-LPG, PLB-LPG and PrLB-LPB

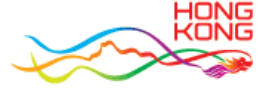
New layout and additional vehicle classes since V3.4

# Exercise #1: Input 1 Tab

Emfac-HK    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

Input 1

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

Select a Calendar Year

Scenario Year for Output

Step 2b - Alternate Base Year

Inactive

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: Input 2 Tab

Emfac-HK 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**

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

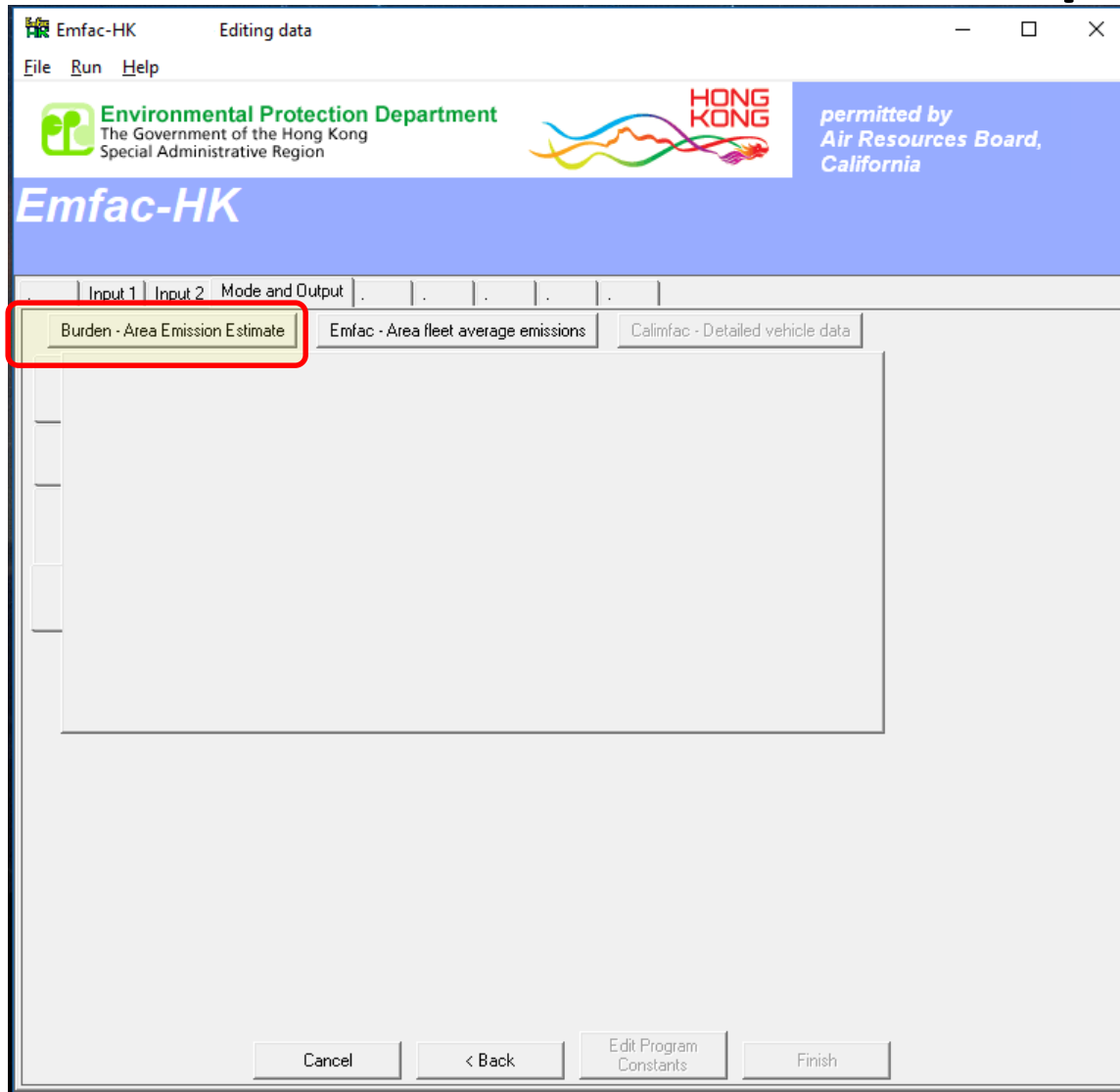
In Emfac Impact Rate reports, titles over 48 characters will be truncated!

Step 5 - Model Years  
All model years selected

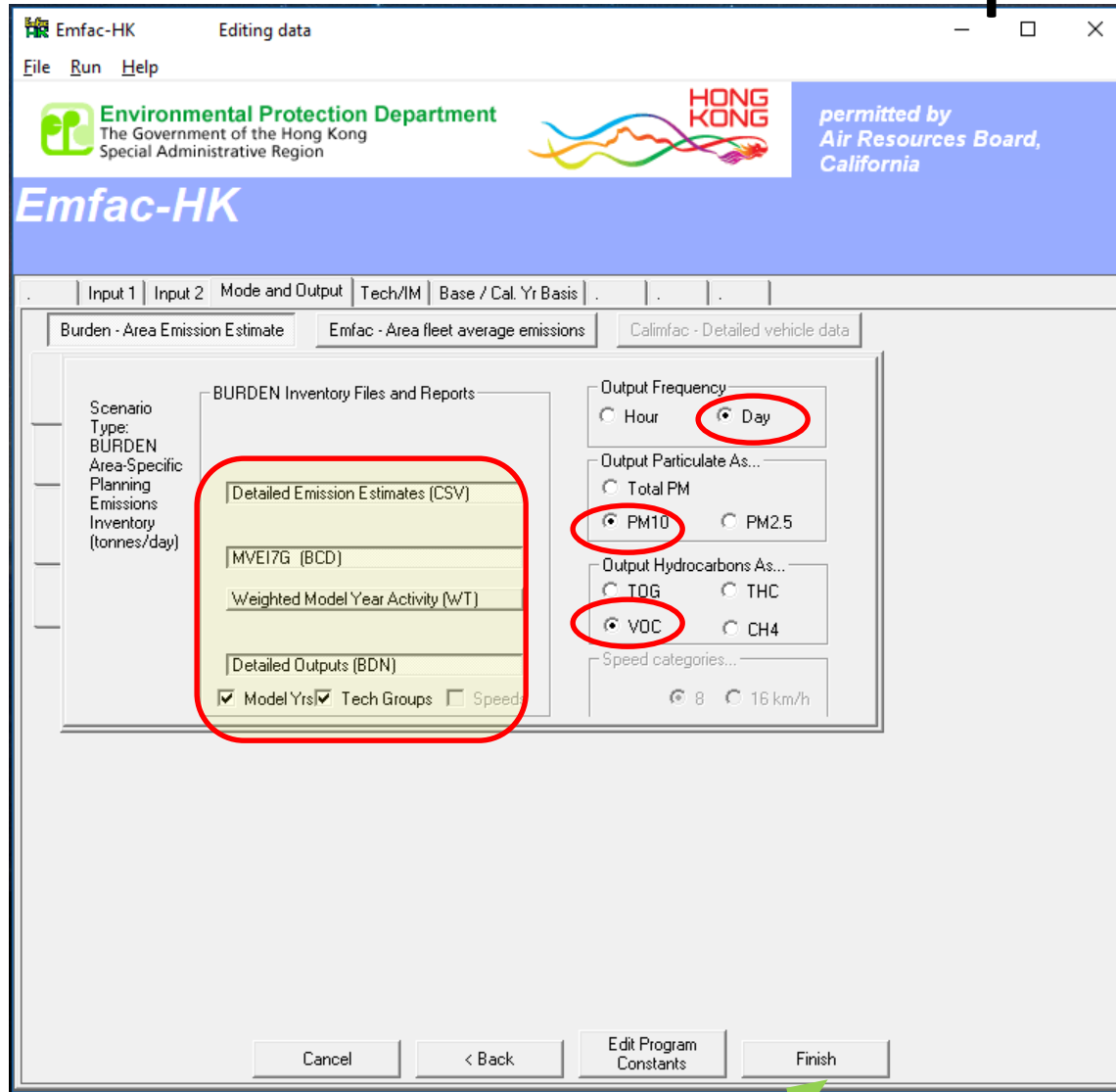
Step 6 - Vehicle Classes  
MODIFIED: All vehicle classes selected

Step 7 - I/M Program Schedule  
Standard I/M schedules

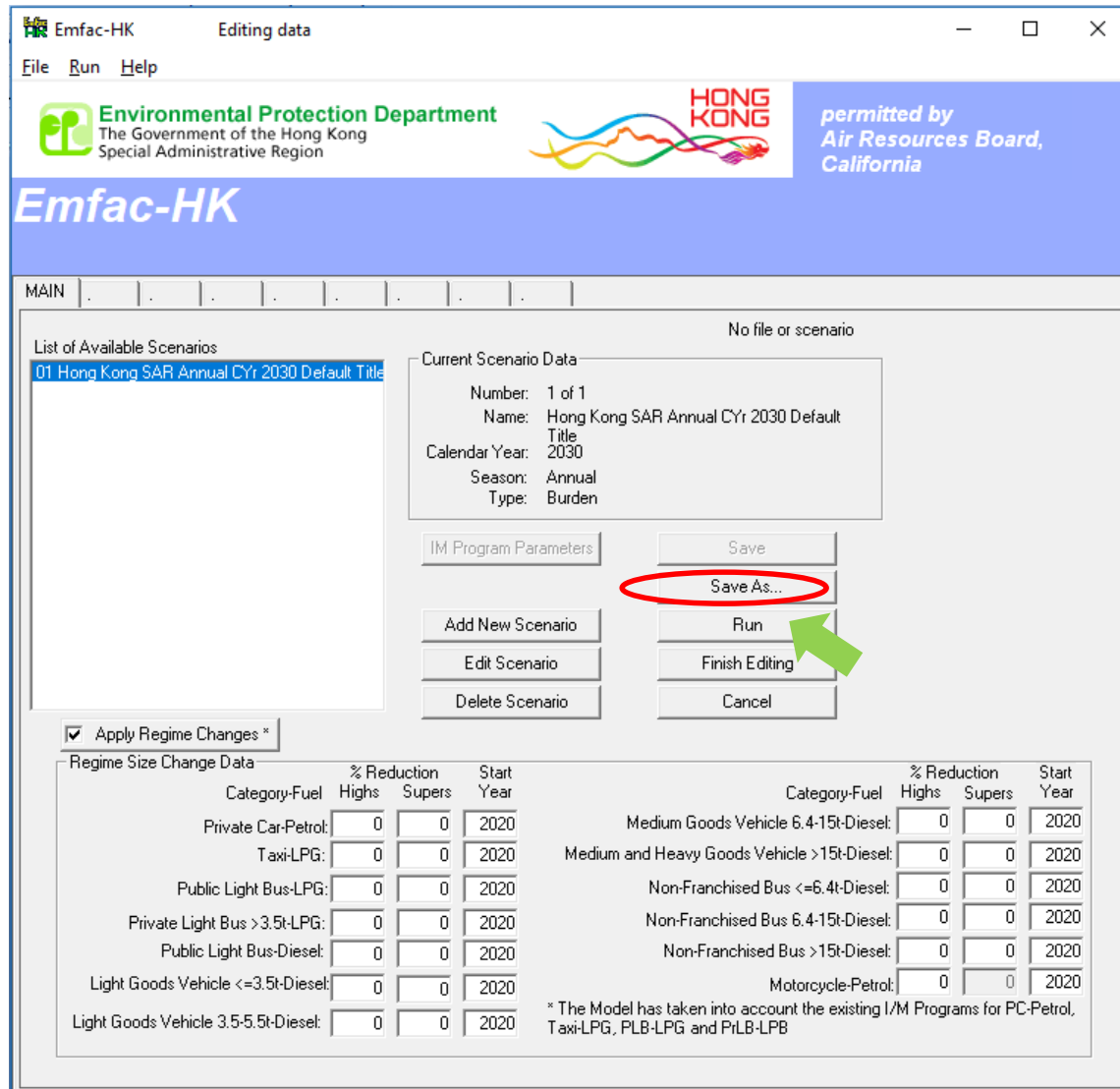
# Exercise #1: Mode and Output Tab



# Exercise #1: Mode and Output Tab

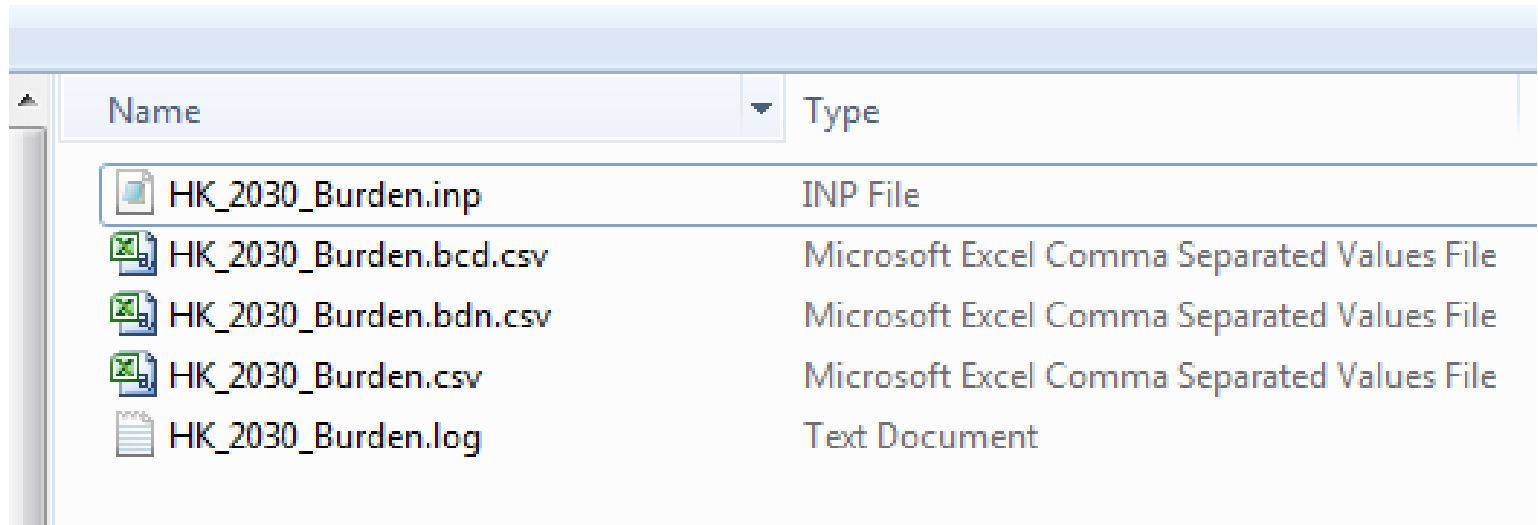







# Exercise #1: Main Screen



- 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

HK\_2030\_Burden.csv - Excel

File Home Insert Page Layout Formulas Data Review View Add-Ins Team Tell me what you want to do... Sign in Share

Clipboard Font Alignment Number Styles Cells Editing

A1 Title : Hong Kong SAR Annual Cvr 2030 Default Title

	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	LGV<=2.5t	LGV2.5-3.5t	LGV2.5-3.5t	LGV2.5-3.5t	LGV2.5-3.5t
1	Title : Hong Kong SAR Annual Cvr 2030 Default Title																		
2	Version : Emfac-HK V4.1 V4.1.0 20181210 Sp: V4.1 Release Version Pr: Emfac-HK HK 4.1																		
3	Run Date : 2018/12/24 10:54:46																		
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																			
11	Vehicles	7	718582	7152	0	725741	0	8	0	18292	18300	1	13	576	0	590	0	1201	53610
12	VKT	121	20791740	206627	0	20998488	0	3292	0	7949132	7952423	29	884	40729	0	41642	11	80498	3784248
13	Trips	10	1077760	10727	0	1088500	0	30	0	73162	73193	2	53	2303	0	2359	1	4804	214442
14	VOC Emissions																		
15	Run Exh	0.00019	0.1196	0.00246	0	0.12224	0	0.00003	0	0.11794	0.11797	0.00004	0.00017	0.00061	0	0.00083	0.00002	0.007	0.05725
16	Start Ex	0.00004	0.05811	0	0	0.05815	0	0	0	0.04204	0.04204	0.00001	0.00001	0	0	0.00002	0	0.00052	0
17	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
18																			
19	Diurnal	0.00009	0.34983	0	0	0.34992	0	0	0	0	0.00001	0.00001	0	0	0.00002	0	0.00092	0	
20	Hot Soak	0.00005	0.18115	0	0	0.1812	0	0.00001	0	0	0.00001	0.00002	0	0	0.00003	0	0.0014	0	
21	Running	0.00021	0.27764	0	0	0.27785	0	0.00003	0	0	0.00003	0.00007	0.00006	0	0	0.00012	0.00001	0.00441	0
22	Resting	0.00008	0.4341	0	0	0.43418	0	0	0	0	0.00001	0.00001	0	0	0.00002	0	0.00103	0	
23	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
24	Carbon Monoxide Emissions																		
25	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----

HK\_2030\_Burden

Ready



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

The screenshot shows an Excel spreadsheet with the following data:

1	CALYR	START MYR	END MYR	REGION	SAR	STARTS	POPULATI	VKT	VEH TYPE	VEH TECH	POLLUTAN	PROCESS	EMISSION	BASIS
2	2030	1986	2030	SAR Avera	Hong Kon	10	7	121	PC	NCAT	CO	Run Exh	0.003855	Day
3	2030	1986	2030	SAR Avera	Hong Kon	10	7	121	PC	NCAT	NOx	Run Exh	0.000432	Day
4	2030	1986	2030	SAR Avera	Hong Kon	10	7	121	PC	NCAT	PM	Run Exh	0.000004	Day
5	2030	1986	2030	SAR Avera	Hong Kon	10	7	121	PC	NCAT	VOC	Run Exh	0.000185	Day
6	2030	1986	2030	SAR Avera	Hong Kon	10	7	121	PC	NCAT	CO2	Run Exh	0.026478	Day
7	2030	1986	2030	SAR Avera	Hong Kon	10	7	121	PC	NCAT	CO	Start Ex	0.000424	Day
8	2030	1986	2030	SAR Avera	Hong Kon	10	7	121	PC	NCAT	NOx	Start Ex	0.000029	Day
9	2030	1986	2030	SAR Avera	Hong Kon	10	7	121	PC	NCAT	PM	Start Ex	0.000001	Day
10	2030	1986	2030	SAR Avera	Hong Kon	10	7	121	PC	NCAT	VOC	Start Ex	0.000042	Day
11	2030	1986	2030	SAR Avera	Hong Kon	10	7	121	PC	NCAT	CO2	Start Ex	0.002032	Day
12	2030	1986	2030	SAR Avera	Hong Kon	10	7	121	PC	NCAT	CO	Hot Soak	0	Day
13	2030	1986	2030	SAR Avera	Hong Kon	10	7	121	PC	NCAT	NOx	Hot Soak	0	Day
14	2030	1986	2030	SAR Avera	Hong Kon	10	7	121	PC	NCAT	PM	Hot Soak	0	Day
15	2030	1986	2030	SAR Avera	Hong Kon	10	7	121	PC	NCAT	VOC	Hot Soak	0.000045	Day
16	2030	1986	2030	SAR Avera	Hong Kon	10	7	121	PC	NCAT	CO2	Hot Soak	0	Day
17	2030	1986	2030	SAR Avera	Hong Kon	10	7	121	PC	NCAT	CO	Running	0	Day
18	2030	1986	2030	SAR Avera	Hong Kon	10	7	121	PC	NCAT	NOx	Running	0	Day
19	2030	1986	2030	SAR Avera	Hong Kon	10	7	121	PC	NCAT	PM	Running	0	Day
20	2030	1986	2030	SAR Avera	Hong Kon	10	7	121	PC	NCAT	VOC	Running	0.000215	Day
21	2030	1986	2030	SAR Avera	Hong Kon	10	7	121	PC	NCAT	CO2	Running	0	Day
22	2030	1986	2030	SAR Avera	Hong Kon	10	7	121	PC	NCAT	CO	PD Rest	0	Day
23	2030	1986	2030	SAR Avera	Hong Kon	10	7	121	PC	NCAT	NOx	PD Rest	0	Day
24	2030	1986	2030	SAR Avera	Hong Kon	10	7	121	PC	NCAT	PM	PD Rest	0	Day

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

HK\_2030\_Burden.bdn.csv - Excel

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A1 #Title :

RecType	ScenNum	CalYr	Area	Veh	MdlYr	Tech	Period	Pop	VKT	Trips	VOC_RUN	VOC_STRE	VOC_DIUF	VOC-HTS	VOC_RUN	VOC_REST	CO_RUNE	CO_STREX	NC
# Title : Hong Kong SAR Annual CY2030 Default Title																			
# Version : Emfac-HK V4.1 V4.1.0 20181210 Sp: V4.1 Release Version Pr: Emfac-HK HK4.1																			
# Run Date : #####																			
# Scen Year: 2030 -- All model years in the range 1986 to 2030 selected																			
# Season : Annual																			
# Area : Hong Kong																			
# I/M Stat : HK I/M CY2013+ program in effect																			
# Emission Tonnes Per Period																			
TG	1	2030	Hong Kong	PC	1985	Ex001	Day	0	0	0	0	0	0	0	0	0	0	0	0
TG	1	2030	Hong Kong	PC	1985	Ex171	Day	0	0	0	0	0	0	0	0	0	0	0	0
TG	1	2030	Hong Kong	PC	1985	Ex172	Day	0	0	0	0	0	0	0	0	0	0	0	0
TG	1	2030	Hong Kong	PC	1985	Ev001	Day	0	0	0	0	0	0	0	0	0	0	0	0
MY	1	2030	Hong Kong	PC	1985	GAS	Day	0	0	0	0	0	0	0	0	0	0	0	0
MY	1	2030	Hong Kong	PC	1985	DSL	Day	0	0	0	0	0	0	0	0	0	0	0	0
MY	1	2030	Hong Kong	PC	1985	LPG	Day	0	0	0	0	0	0	0	0	0	0	0	0
MY	1	2030	Hong Kong	PC	1985	TOT	Day	0	0	0	0	0	0	0	0	0	0	0	0
TG	1	2030	Hong Kong	PC	1986	Ex001	Day	0.521748	9.223951	0.782544	1.42E-05	3.27E-06	0	0	0	0	2.95E-04	3.31E-05	3.
TG	1	2030	Hong Kong	PC	1986	Ex171	Day	0.126318	2.233167	0.189458	8.82E-07	0	0	0	0	0	1.73E-06	0	2.
TG	1	2030	Hong Kong	PC	1986	Ex172	Day	5.49E-03	9.71E-02	8.24E-03	1.53E-08	0	0	0	0	0	3.01E-08	0	9.
TG	1	2030	Hong Kong	PC	1986	Ev001	Day	0.521748	9.223951	0.782544	0	0	6.97E-06	3.51E-06	1.67E-05	6.21E-06	0	0	0
MY	1	2030	Hong Kong	PC	1986	GAS	Day	0.521748	9.223951	0.782544	1.42E-05	3.27E-06	6.97E-06	3.51E-06	1.67E-05	6.21E-06	2.95E-04	3.31E-05	3.
MY	1	2030	Hong Kong	PC	1986	DSL	Day	0.13181	2.330261	0.197695	8.97E-07	0	0	0	0	0	1.76E-06	0	2.
MY	1	2030	Hong Kong	PC	1986	LPG	Day	0	0	0	0	0	0	0	0	0	0	0	0

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

	A	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 V4.1 V4.1.0 20181210 Sp: V4.1 Release Version Pr: Emfac-HK HK4.1													
3	Run Date : 2018/12/24 10:54:46													
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-NC	FBDD-CAT	FBDD-DSL	FBDD-LPG	FBDD-TOT	MC-NCAT	MC-CAT	MC-DSL	MC-LPG	MC-TOT	ALL-TOT
14	VOC Emissions													
15	Run Exh	0	0.00355	0	0	0.08244	0	0.08244	0.0708	0.24274	0	0	0.31354	1.18311
16	Start Ex	0	0	0	0	0	0	0	0.0453	0.13344	0	0	0.17874	0.29056
17	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
18														
19	Diurnal	0	0	0	0	0	0	0	0.17825	0.17735	0	0	0.3556	0.70663
20	Hot Soak	0	0	0	0	0	0	0	0.39527	0.13068	0	0	0.52595	0.70878
21	Running	0	0	0	0	0	0	0	2.18452	0.35758	0	0	2.5421	2.82515
22	Resting	0	0	0	0	0	0	0	0.18754	0.13812	0	0	0.32566	0.76108
23	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
24	Carbon Monoxide Emissions													
25	Run Exh	0	0.08418	0	0	2.48533	0	2.48533	0.63245	1.51667	0	0	2.14912	40.1044
26	Start Ex	0	0	0	0	0	0	0	0.15595	0.9955	0	0	1.15145	3.32473
27	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
28	Oxides of Nitrogen Emissions													
29	Run Exh	0	0.04982	0	0	2.97412	0	2.97412	0.01485	0.12725	0	0	0.1421	12.5444
30	Start Ex	0	0.0107	0	0	0.86368	0	0.86368	0.0059	0.02932	0	0	0.03522	1.69443
31	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
32	Carbon Dioxide Emissions (000)													
33	Run Exh	0	0.07808	0	0	1.39972	0	1.39972	0.0023	0.14577	0	0	0.14807	14.5277
34	Start Ex	0	0	0	0	0	0	0	0.00096	0.01251	0	0	0.01346	0.09996
35	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
36	PM10 Emissions													
37	Run Exh	0	0.00334	0	0	0.21808	0	0.21808	0.00086	0.00303	0	0	0.00389	0.63107
38	Start Ex	0	0	0	0	0	0	0	0.00039	0.00232	0	0	0.0027	0.00815

## 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

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
1	CALYR	START MY	END MY	REGION	SAR	STARTS	POPULA	VKT	VEH TYPE	VEH TEC	POLLUTANT	PROCESS	EMISSIONS	BASIS	
3088	2030	1986	2030	SAR Avera	Hong Kong	402599	67093	1129985	MC	CAT	NOx	PD Diurn	0	Day	
3093	2030	1986	2030	SAR Avera	Hong Kong	402599	67093	1129985	MC	CAT	NOx	MD Diurn	0	Day	
3098	2030	1986	2030	SAR Avera	Hong Kong	402599	67093	1129985	MC	CAT	NOx	Diurnal	0	Day	
3103	2030	1986	2030	SAR Avera	Hong Kong	0	0	0	MC	DSL	NOx	Run Exh	0	Day	
3108	2030	1986	2030	SAR Avera	Hong Kong	0	0	0	MC	DSL	NOx	Start Ex	0	Day	
3113	2030	1986	2030	SAR Avera	Hong Kong	0	0	0	MC	DSL	NOx	Hot Soak	0	Day	
3118	2030	1986	2030	SAR Avera	Hong Kong	0	0	0	MC	DSL	NOx	Running	0	Day	
3123	2030	1986	2030	SAR Avera	Hong Kong	0	0	0	MC	DSL	NOx	PD Rest	0	Day	
3128	2030	1986	2030	SAR Avera	Hong Kong	0	0	0	MC	DSL	NOx	MD Rest	0	Day	
3133	2030	1986	2030	SAR Avera	Hong Kong	0	0	0	MC	DSL	NOx	Resting	0	Day	
3138	2030	1986	2030	SAR Avera	Hong Kong	0	0	0	MC	DSL	NOx	PD Diurn	0	Day	
3143	2030	1986	2030	SAR Avera	Hong Kong	0	0	0	MC	DSL	NOx	MD Diurn	0	Day	
3148	2030	1986	2030	SAR Avera	Hong Kong	0	0	0	MC	DSL	NOx	Diurnal	0	Day	
3153	2030	1986	2030	SAR Avera	Hong Kong	0	0	0	MC	LPG	NOx	Run Exh	0	Day	
3158	2030	1986	2030	SAR Avera	Hong Kong	0	0	0	MC	LPG	NOx	Start Ex	0	Day	
3163	2030	1986	2030	SAR Avera	Hong Kong	0	0	0	MC	LPG	NOx	Hot Soak	0	Day	
3168	2030	1986	2030	SAR Avera	Hong Kong	0	0	0	MC	LPG	NOx	Running	0	Day	
3173	2030	1986	2030	SAR Avera	Hong Kong	0	0	0	MC	LPG	NOx	PD Rest	0	Day	
3178	2030	1986	2030	SAR Avera	Hong Kong	0	0	0	MC	LPG	NOx	MD Rest	0	Day	
3183	2030	1986	2030	SAR Avera	Hong Kong	0	0	0	MC	LPG	NOx	Resting	0	Day	
3188	2030	1986	2030	SAR Avera	Hong Kong	0	0	0	MC	LPG	NOx	PD Diurn	0	Day	
3193	2030	1986	2030	SAR Avera	Hong Kong	0	0	0	MC	LPG	NOx	MD Diurn	0	Day	
3198	2030	1986	2030	SAR Avera	Hong Kong	0	0	0	MC	LPG	NOx	Diurnal	0	Day	
3202															
3203															
3204															
3205															

Total Emissions (tonnes) NOx	Run Exh	12.544365	Day
Total Emissions (tonnes) NOx	Start Ex	1.694432	Day

## Exercise #1c:

# Determine Fleet-Average NO<sub>x</sub> Emissions Factor (grams/km) for PC

- 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

VKT (km)	VEH TYPE	POLLUTANT	PROCESS	Emission (tonnes)	Emission Factor (g/km)
20,998,488	PC	NOx	Run Exh	0.178556	0.0085



# 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:  $PM_{10}$  (default)

– Output Hydrocarbons: VOC (default)

– Temperatures: 25°C

– Relative Humidity: 40%

# Exercise #2: Input 1 Tab

Emfac-HK 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

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

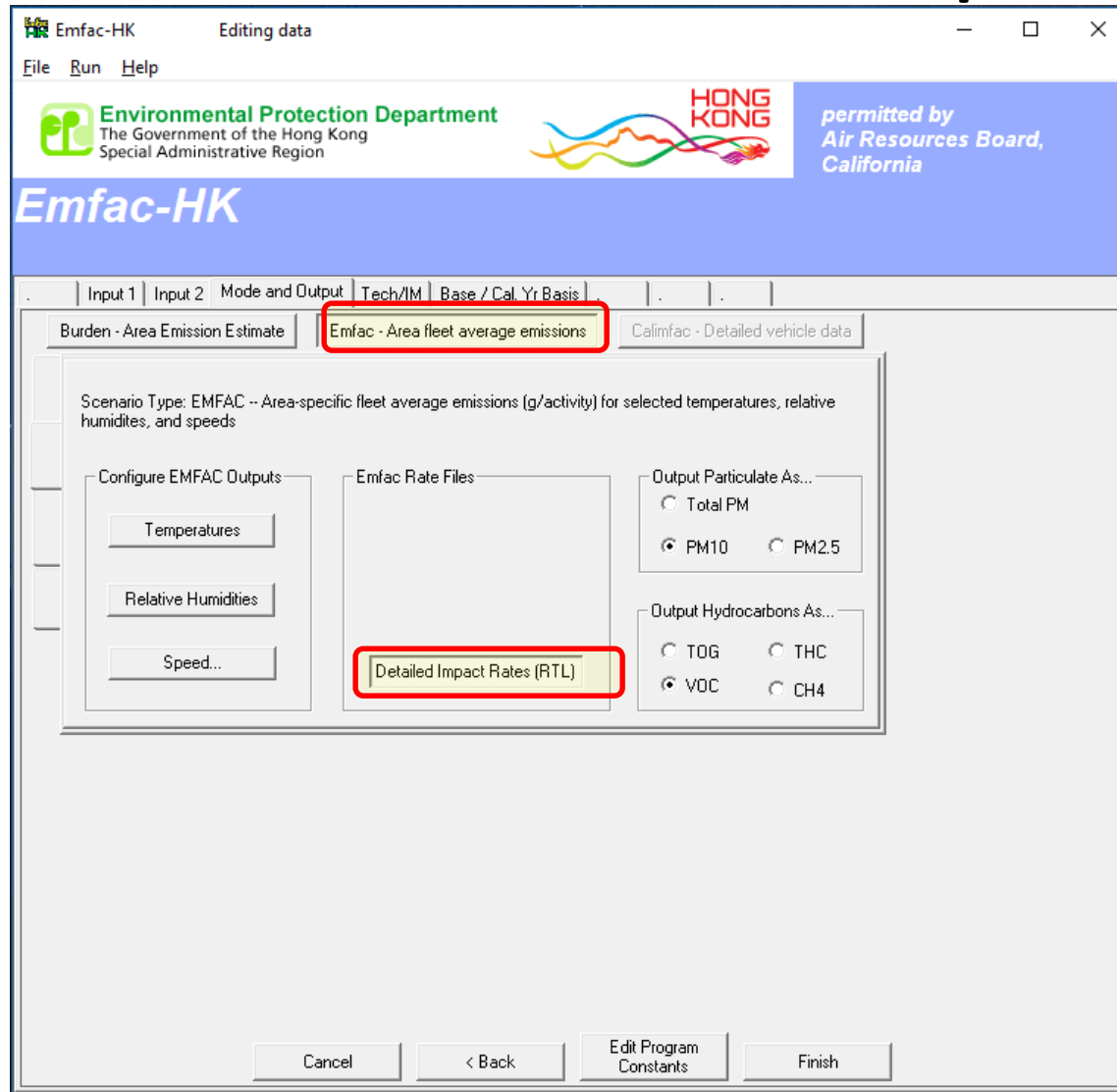
OPTIONAL: Selecting this  
option overrides EMFAC-HK  
default base year.

Step 3 - Season or Month

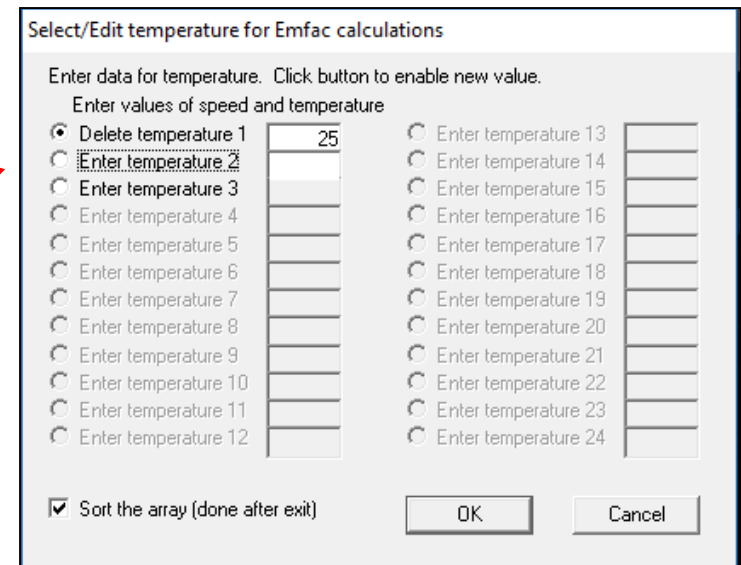
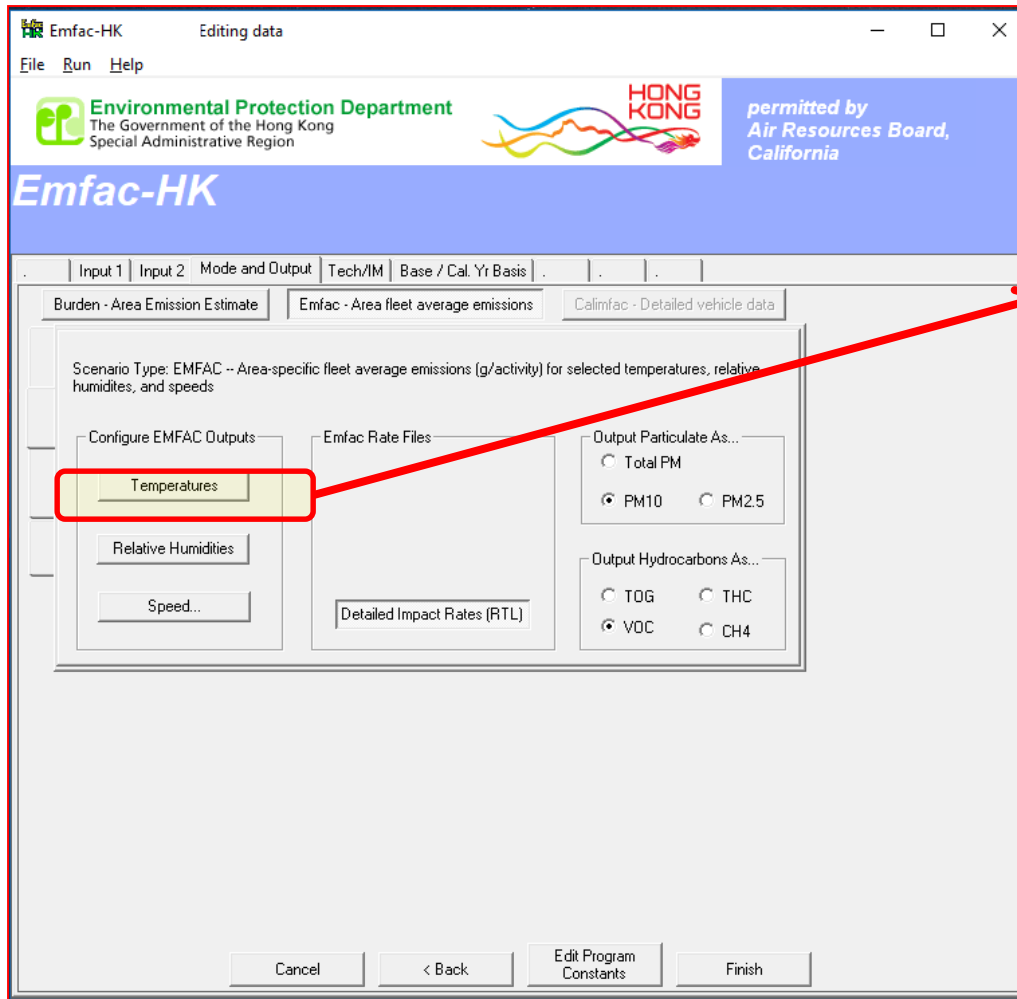
Annual

Cancel Next > Finish

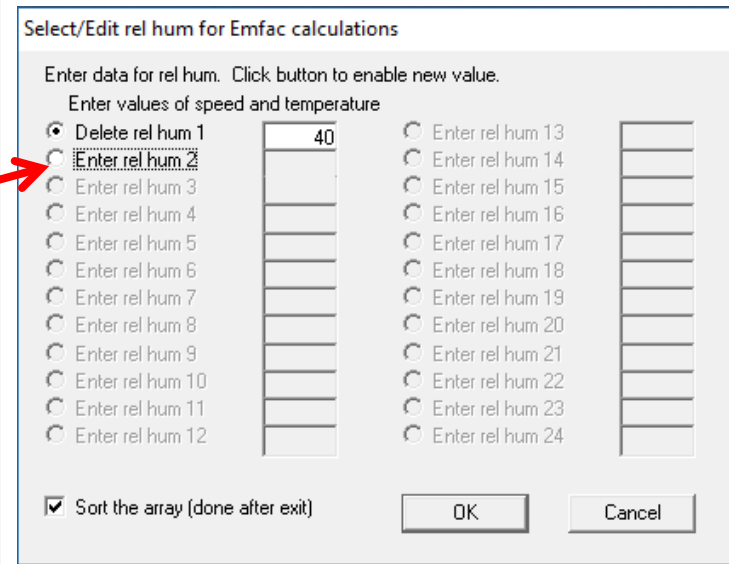
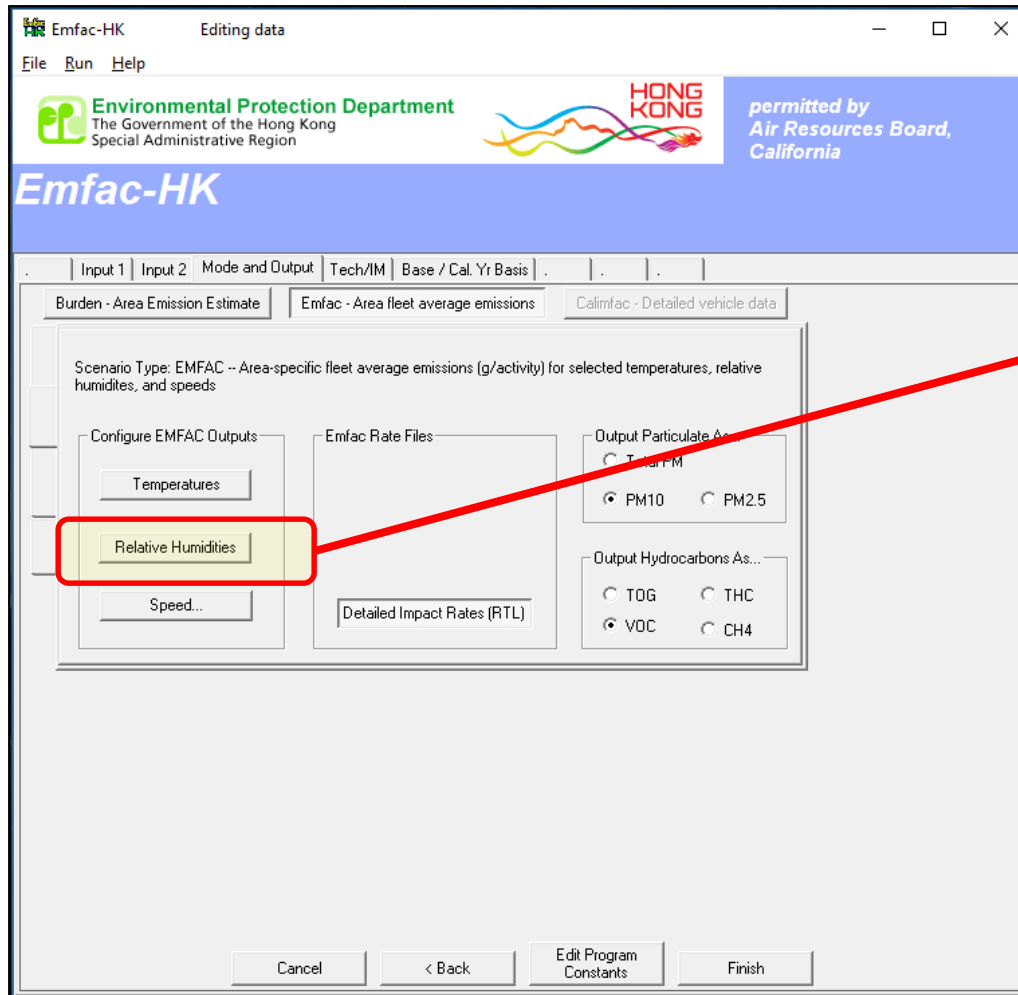
# Exercise #2: Mode and Output Tab



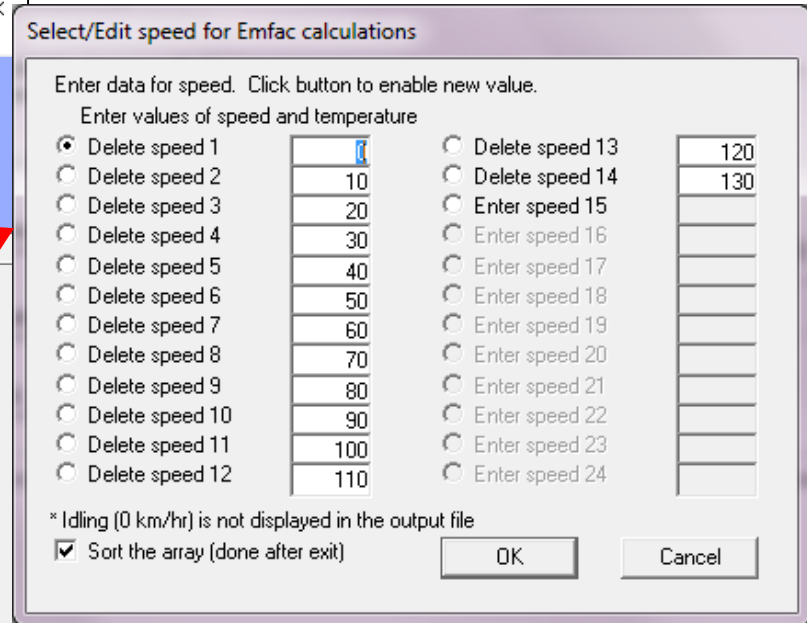
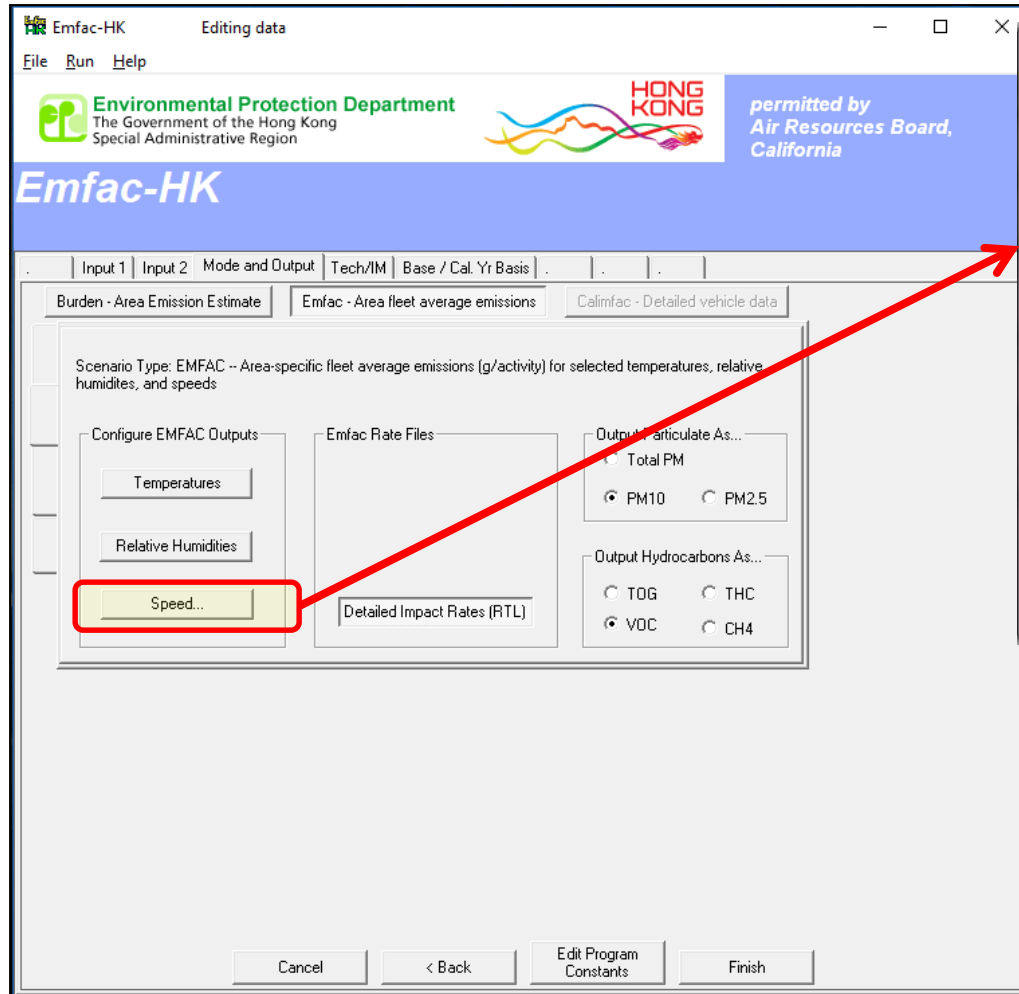
# Exercise #2: Select/Edit Temperature (delete until just 1. set to 25°C)



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



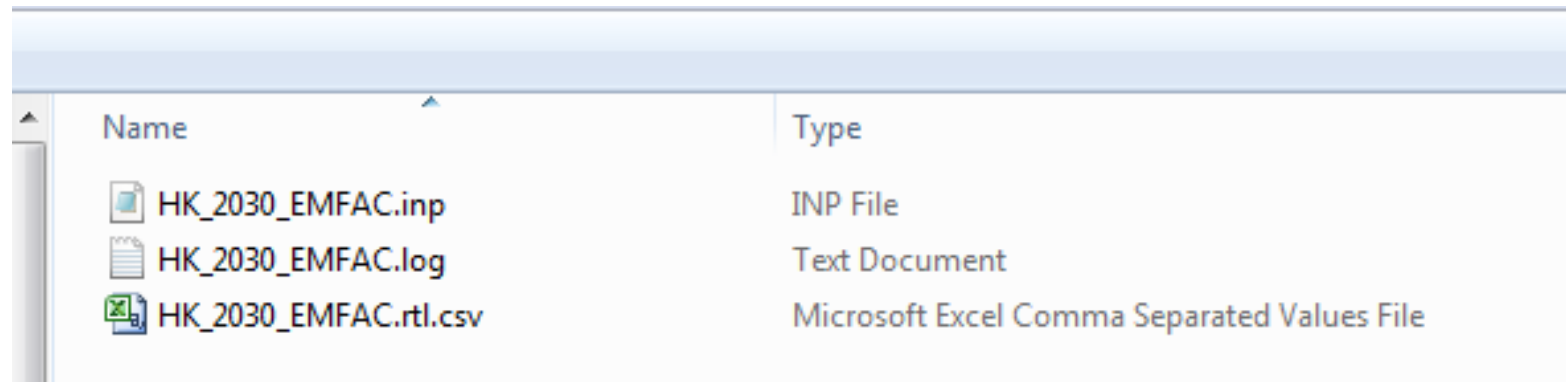
# Exercise #2: Select/Edit Speed (default)






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



# Exercise #2: Output Generated



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 - Excel

File Home Insert Page Layout Formulas Data Review View Add-Ins Team Tell me what you want to do... Sign in Share

Clipboard Font Alignment Number Styles Cells Editing

A1 Title : Hong Kong SAR Annual Cvr 2030 Default Title

1	Title : Hong Kong SAR Annual Cvr 2030 Default Title																			
2	Version : Emfac-HK V4.1 V4.1.0 20181210 Sp: V4.1 Release Version Pr: Emfac-HK HK4.1																			
3	Run Date : 2018/12/31 09:37:53																			
4	Scen Year: 2030 -- All model years in the range 1986 to 2030 selected																			
5	Season : Annual																			
6	Area : Hong Kong																			
7	*****																			
8	Year:	2030	-- Model Years	1986 to	2030 Inclusive --															Annual
9	Emfac-HK V4.1 Emission Factors: V4.1.0 20181210 Sp: V4.1 Release Version Pr: Emfac-HK HK4.1																			
10																				
11	SAR Average						Hong Kong						SAR Average							
12																				
13	Table 1: Running Exhaust Emissions (grams/km)																			
14																				
15	Pollutant Name: Volatile Org Cpds					Temperature: 25C				Relative Humidity: 40%										
16																				
17	Speed	PC	PC	PC	PC	PC	TAXI	TAXI	TAXI	TAXI	TAXI	LGV3	LGV3	LGV3	LGV3	LGV3	LGV4	LGV4	LGV4	LGV4
18	km/hr	NCAT	CAT	DSL	LPG	ALL	NCAT	CAT	DSL	LPG	ALL	NCAT	CAT	DSL	LPG	ALL	NCAT	CAT	DSL	LPG
19																				
20	10	4.1314	0.0142	0.033	0	0.0144	0	0.0193	0	0.044	0.044	4.1395	0.7162	0.0383	0	0.0556	3.8882	0.4074	0.0384	
21	20	2.7457	0.0089	0.0228	0	0.0091	0	0.0123	0	0.0247	0.0247	2.7512	0.4532	0.0287	0	0.0396	2.583	0.2413	0.0287	
22	30	1.9549	0.006	0.0173	0	0.0062	0	0.0083	0	0.0185	0.0185	1.9588	0.3004	0.0222	0	0.0294	1.8381	0.1474	0.0222	
23	40	1.4924	0.0054	0.0137	0	0.0055	0	0.0074	0	0.0151	0.0151	1.4954	0.2141	0.0177	0	0.0229	1.4025	0.098	0.0178	
24	50	1.2231	0.0048	0.0114	0	0.0049	0	0.0067	0	0.0129	0.0129	1.2255	0.164	0.0147	0	0.0187	1.1489	0.0715	0.0147	

HK\_2030\_EMFAC.rtl

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 VI in 1.1.2019 for Non-Franchised Buses < 6.4 tonnes (i.e. NFB6).
- Hints:
  - Changes % of Euro V/VI from model year 2019 to 2020 for NFB6

# Exercise #3: Changing TG Fractions

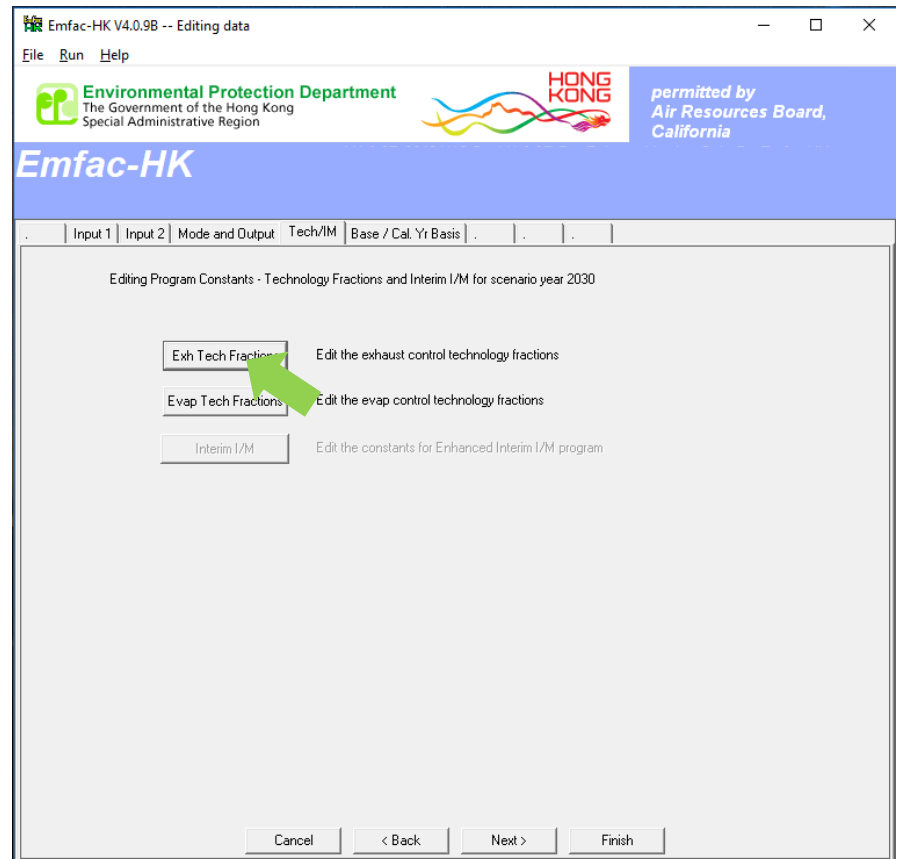
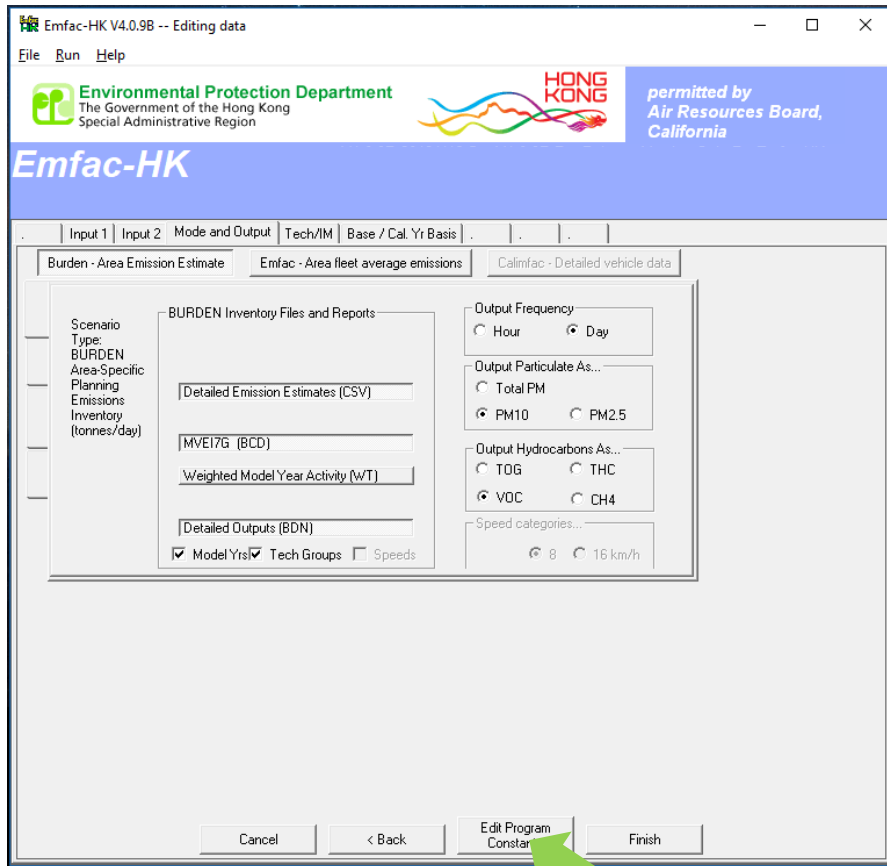
- **Base Case** (similar to Ex1):
  - Calendar Years: **2030**
  - Scenario Type: **BURDEN**
  - Output File types: **MVEI7G (BCD)**
  - Pollutants: **PM10, VOC**
- Create a **new case** with same scenario data and edit TG fraction on NFB6

# Exercise #3: Update TG fraction on NFB6

Case	Model Year	TG 103 Euro V	TG 104 Euro VI	Total Fraction
Base	2019-2020	100%	0%	100%
New	2019-2020	0%	100%	100%

- Move 100% from TG103 to TG 104 for model year 2019
- Apply same fraction to 2020


# Exercise #3: Update TG fraction on NFB6




# Exercise #3: Update TG fraction on NFB6

Emfac-HK V4.1 -- 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

#### Exhaust Technology Fractions

Input 1

Edit Exhaust Technology Fractions by

Vehicle Class

Model Year 2019

EXHAUST Technology Group Total: 100

# of Tech Groups 1

Group	%	Model year	Euro V NF
103	100.0		
1			
1			
1			
1			
1			
1			
1			
1			
1			
1			

11: Non-franchised Buses (<6.4t) (NFB6)

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)>

19: <Placeholder (P3)>


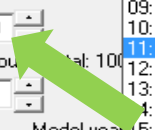
20: <Placeholder (P5)>

21: <Placeholder (P6)>

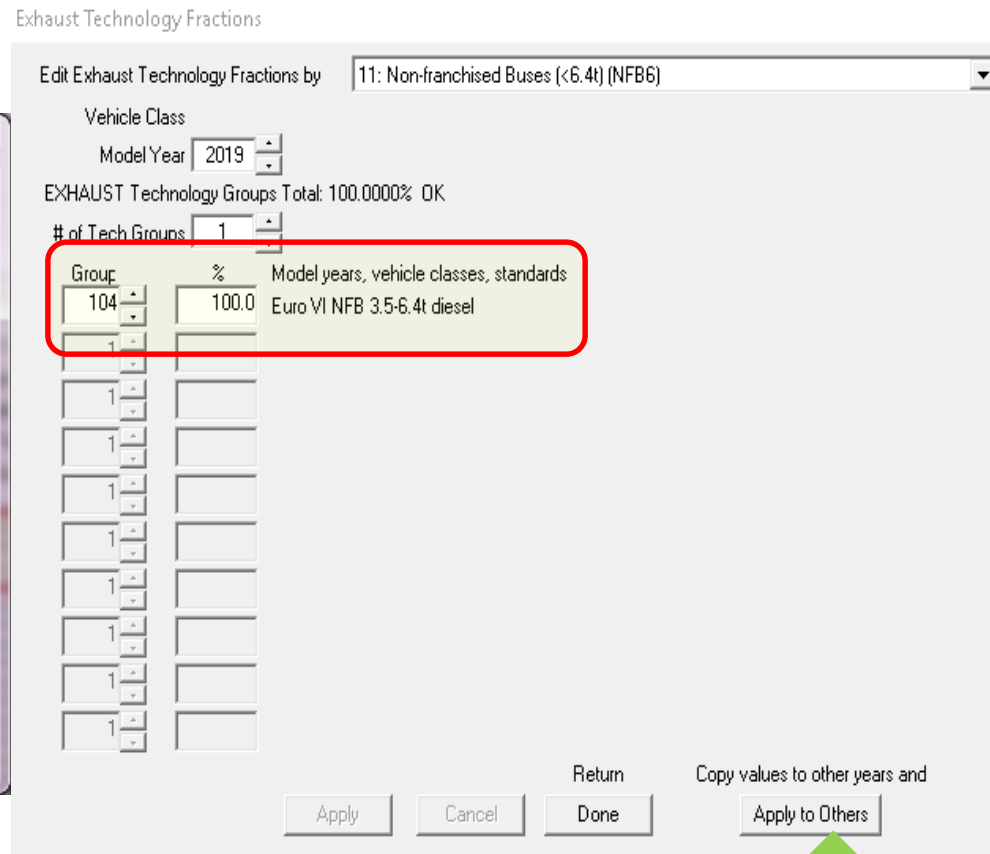
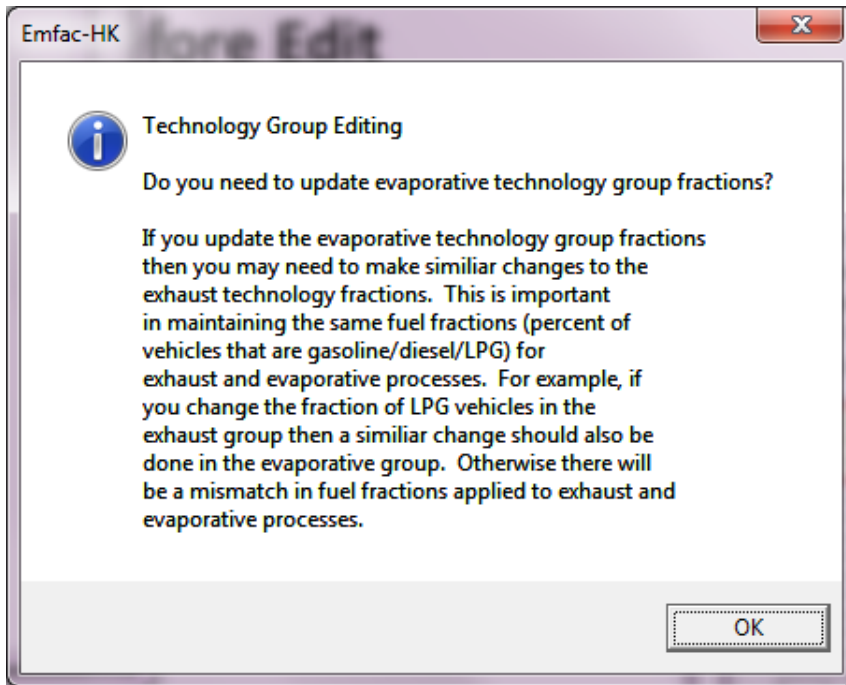
Return Copy values to other years and

Apply Cancel Done Apply to Others

Cancel < Back Next > Finish



# Exercise #3:

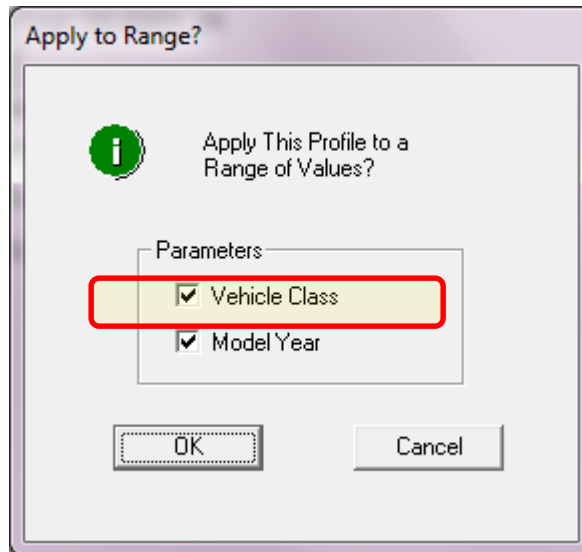


Click "Apply to Others"



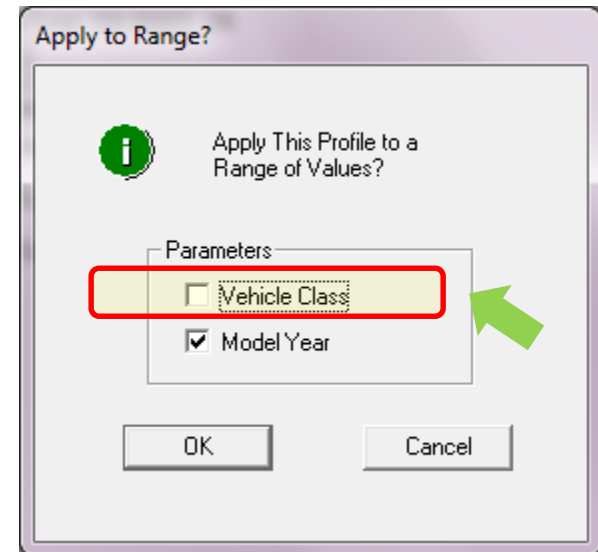
# Exercise #3:

## 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". The "Vehicle Class" checkbox is highlighted with a red rectangular border. 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). The "Vehicle Class" checkbox is highlighted with a red rectangular border, 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

Exhaust Technology Fractions

Edit Exhaust Technology Fractions by: 11: Non-franchised Buses (<6.4t) (NFB6)

Vehicle Class

Apply updated values for Tech Group Fractions

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

Model Years	Apply To:
1965	2019
1966	
1967	
1968	
1969	
1970	
1971	
1972	
1973	
1974	
1975	
1976	
1977	

OK Cancel

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

## After Edit

Apply updated values for Tech Group Fractions

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

Model Years	Apply To:
1965	2019 2020
1966	
1967	
1968	
1969	
1970	
1971	
1972	
1973	
1974	
1975	
1976	
1977	

OK Cancel

- 2019 TG fraction same as 2020

# Exercise #3:

Verify that the TG fraction is changed correctly.

Exhaust Technology Fractions

Edit Exhaust Technology Fractions by 11: Non-franchised Buses (<6.4t) (NFB6)

Vehicle Class

Model Year 2020

EXHAUST Technology Groups Total: 100.0000% OK

# of Tech Groups 1

Group	%	Model years, vehicle classes, standards
104	100.0	Euro VI NFB 3.5-6.4t diesel
1		
1		
1		
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

CALYR	START MY	END MYR	REGION	SAR	STARTS	POPULATI	VKT	VEH TYPE	VEH TECH	POLLUTAN	PROCESS	EMISSIONS	BASIS	Case
2030	1986	2030	SAR Avera	Hong Kong	10945	2736	321328	NFB6	DSL	NOx	Run Exh	0.179775	Day	Base
2030	1986	2030	SAR Avera	Hong Kong	10945	2736	321328	NFB6	DSL	NOx	Run Exh	0.15426	Day	Euro VI
2030	1986	2030	SAR Avera	Hong Kong	0	0	0	NFB6	DSL	NOx	Run Exh	-0.025515	Day	Diff

# 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

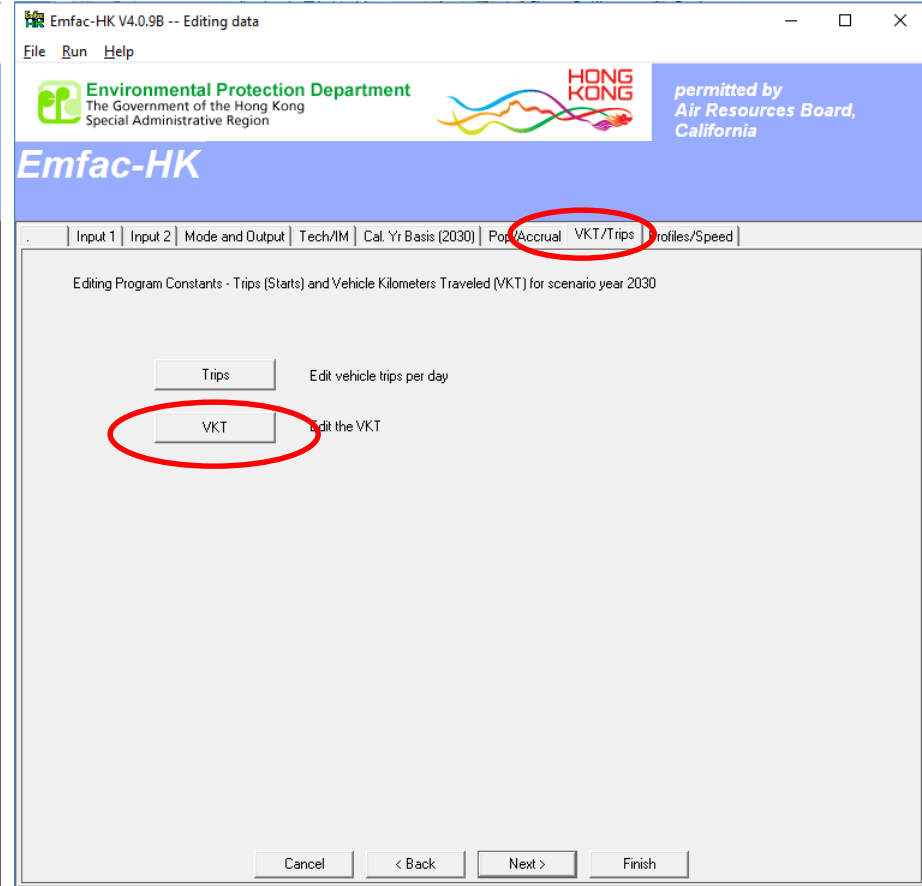
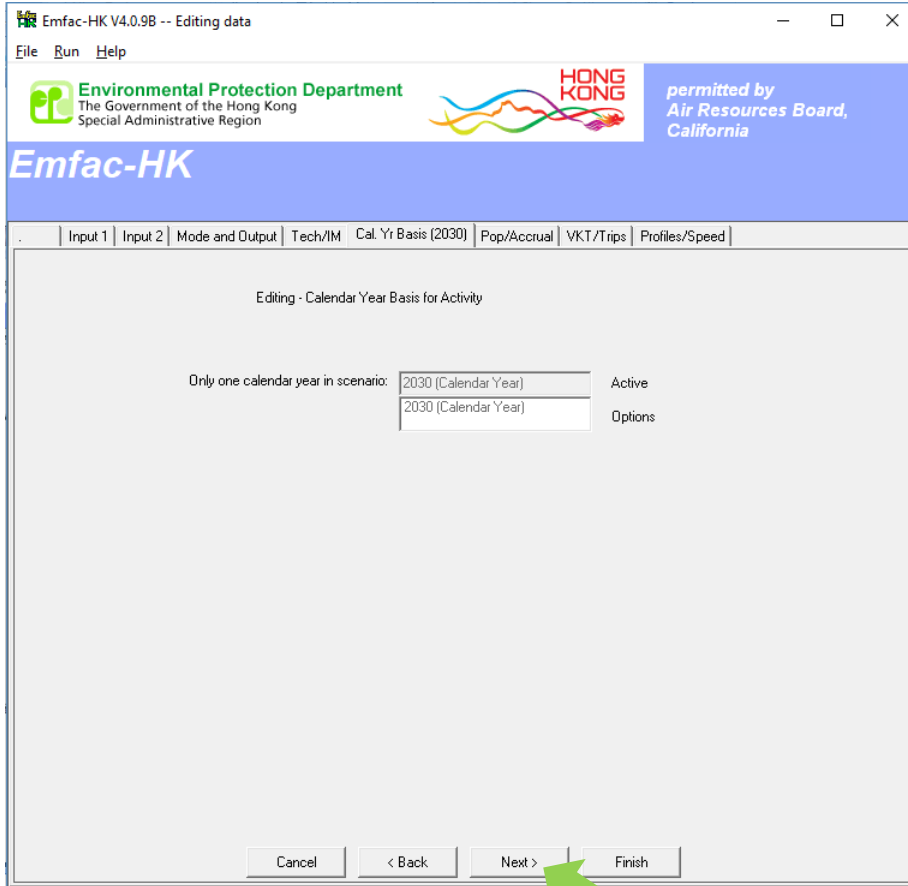
- Scenario data:
  - Calendar Years: 2030
  - Scenario Type: BURDEN
  - Output File types: Detailed Estimates (CSV)
  - Output Frequency: Day
  - Pollutants: PM10, VOC

# 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 Cjr 2030 Default Title

Total VKT for area

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

Previous Total VKT

## By Vehicle and Fuel tab

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

Total VKT for area

Editing Mode  Editing VKT (vehicle km traveled per weekday)

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

	Petrol	Diesel	LPG
01 - Private Cars (PC)	20791860	206627	0
02 - Taxi	3292	0	7949132
03 - Light Goods Vehicles<=2.5t	888	41053	0
04 - Lt Goods Vehicles 2.5-3.5t	78039	3840346	0
05 - Light Goods Vehicles>3.5t	0	2083233	0
06 - Medium Heavy Goods Vehicles<=15t	0	1081536	0
07 - Medium Heavy Goods Vehicles>15t	0	2837768	0
08 - Public Light Buses	0	993919	207253
09 - Private Light Bus <=3.5t	16318	34793	0
10 - Private Light Bus >3.5t	98	268344	17802
11 - Non-franchised Bus<=6.4t	0	322358	0
12 - Non-franchised Bus 6.4-15t	0	223921	0
13 - Non-franchised Bus >15t	0	400613	0
14 - Franchised Bus (SD)	0	77969	0
15 - Franchised Bus (DD)	0	1240047	0
16 - Motorcycles (MC)	1155100	0	0
17 - <Placeholder (P1)>	0	0	0
18 - <Placeholder (P2)>	0	0	0
19 - <Placeholder (P3)>	0	0	0
20 - <Placeholder (P4)>	0	0	0
21 - <Placeholder (P5)>	0	0	0

- VKT adjustment factor is :

$$1,609,000 \div 20,791,860 = 0.077386$$

# Exercise # 4a:

## VKT/Trips tab

## Pop/Accrual tab

The image displays two side-by-side screenshots of the Emfac-HK V4.0.9B software interface. Both windows show the 'Environmental Protection Department' logo and the text 'permitted by Air Resources Board, California'. The left window is titled 'VKT/Trips tab' and shows the 'VKT/Trips' menu item circled in red. Below the menu, there are two buttons: 'Trips' (Edit vehicle trips per day) and 'VKT' (Edit the VKT), with the 'VKT' button circled in red. The right window is titled 'Pop/Accrual tab' and shows the 'Pop/Accrual' menu item circled in red. Below the menu, there are two buttons: 'Population' (Edit the vehicle population) and 'Accrual' (Edit the odometer accrual \*), with both buttons circled in red. An 'Info' box at the bottom right of the right window states: '\* Accrual rates are the same in respect to the change of calendar year'. At the bottom of both windows are navigation buttons: 'Cancel', '< Back', 'Next >', and 'Finish'. A green arrow points to the '< Back' button in the left window.

- 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)

By Vehicle Class | **By Vehicle and Fuel** | By Vehicle/Fuel/Age

	Petrol	Diesel	LPG
01 - Private Cars (PC)	718589	7152	0
02 - Taxi	8	0	18292
03 - Light Goods Vehicles<=2.5t	13	576	0
04 - Lt Goods Vehicles 2.5-3.5t	1142	53670	0
05 - Light Goods Vehicles>3.5t	0	21614	0
06 - Medium Heavy Goods Vehicles<=15t	0	12598	0
07 - Medium Heavy Goods Vehicles>15t	0	33063	0
08 - Public Light Buses	0	3597	750
09 - Private Light Bus <=3.5t	209	398	0
10 - Private Light Bus >3.5t	2	3320	349
11 - Non-franchised Bus<=6.4t	0	2736	0
12 - Non-franchised Bus 6.4-15t	0	1898	0
13 - Non-franchised Bus >15t	0	3403	0
14 - Franchised Bus (SD)	0	313	0
15 - Franchised Bus (DD)	0	5590	0
16 - Motorcycles (MC)	69786	0	0
17 - <Placeholder (P1)>	0	0	0
18 - <Placeholder (P2)>	0	0	0
19 - <Placeholder (P3)>	0	0	0
20 - <Placeholder (P4)>	0	0	0
21 - <Placeholder (P5)>	0	0	0

## 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)

By Vehicle Class | **By Vehicle and Fuel** | By Vehicle/Fuel/Age

	Petrol	Diesel	LPG
01 - Private Cars (PC)	55608.77	7152	0
02 - Taxi	8	0	18292
03 - Light Goods Vehicles<=2.5t	13	576	0
04 - Lt Goods Vehicles 2.5-3.5t	1142	53670	0
05 - Light Goods Vehicles>3.5t	0	21614	0
06 - Medium Heavy Goods Vehicles<=15t	0	12598	0
07 - Medium Heavy Goods Vehicles>15t	0	33063	0
08 - Public Light Buses	0	3597	750
09 - Private Light Bus <=3.5t	209	398	0
10 - Private Light Bus >3.5t	2	3320	349
11 - Non-franchised Bus<=6.4t	0	2736	0
12 - Non-franchised Bus 6.4-15t	0	1898	0
13 - Non-franchised Bus >15t	0	3403	0
14 - Franchised Bus (SD)	0	313	0
15 - Franchised Bus (DD)	0	5590	0
16 - Motorcycles (MC)	69786	0	0
17 - <Placeholder (P1)>	0	0	0
18 - <Placeholder (P2)>	0	0	0
19 - <Placeholder (P3)>	0	0	0
20 - <Placeholder (P4)>	0	0	0
21 - <Placeholder (P5)>	0	0	0

Apply Cancel Done

- Multiply population by factor:

$$718,589 * 0.077386 = 55,608.77$$

# Exercise # 4a: Verify VKT Adjustment

## 2030 VKT (Base Case)

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

Total VKT for area

Editing Mode

	Petrol	Diesel	LPG
01 - Private Cars (PC)	20791860.	206627.	0.
02 - Taxi	3232.	0.	7949132.
03 - Light Goods Vehicles<=2.5t	888.	41053.	0.
04 - Lt Goods Vehicles 2.5-3.5t	78039.	3840346.	0.
05 - Light Goods Vehicles>3.5t	0.	2083233.	0.
06 - Medium Heavy Goods Vehicles<=15t	0.	1081536.	0.
07 - Medium Heavy Goods Vehicles>15t	0.	2837768.	0.
08 - Public Light Buses	0.	993919.	207253.
09 - Private Light Bus <=3.5t	16318.	34793.	0.
10 - Private Light Bus >3.5t	98.	268344.	17802.
11 - Non-franchised Bus<=6.4t	0.	322358.	0.
12 - Non-franchised Bus 6.4-15t	0.	223921.	0.
13 - Non-franchised Bus >15t	0.	400613.	0.
14 - Franchised Bus (SD)	0.	77969.	0.
15 - Franchised Bus (DD)	0.	1240047.	0.
16 - Motorcycles (MC)	1155100.	0.	0.
17 - <Placeholder (P1)>	0.	0.	0.
18 - <Placeholder (P2)>	0.	0.	0.
19 - <Placeholder (P3)>	0.	0.	0.
20 - <Placeholder (P4)>	0.	0.	0.
21 - <Placeholder (P5)>	0.	0.	0.

## 2030 VKT (After Pop Edit)

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

Total VKT for area

Editing Mode

	Petrol	Diesel	LPG
01 - Private Cars (PC)	1609001.	206627.	0.
02 - Taxi	3232.	0.	7949132.
03 - Light Goods Vehicles<=2.5t	888.	41053.	0.
04 - Lt Goods Vehicles 2.5-3.5t	78039.	3840346.	0.
05 - Light Goods Vehicles>3.5t	0.	2083233.	0.
06 - Medium Heavy Goods Vehicles<=15t	0.	1081536.	0.
07 - Medium Heavy Goods Vehicles>15t	0.	2837768.	0.
08 - Public Light Buses	0.	993919.	207253.
09 - Private Light Bus <=3.5t	16318.	34793.	0.
10 - Private Light Bus >3.5t	98.	268344.	17802.
11 - Non-franchised Bus<=6.4t	0.	322358.	0.
12 - Non-franchised Bus 6.4-15t	0.	223921.	0.
13 - Non-franchised Bus >15t	0.	400613.	0.
14 - Franchised Bus (SD)	0.	77969.	0.
15 - Franchised Bus (DD)	0.	1240047.	0.
16 - Motorcycles (MC)	1155100.	0.	0.
17 - <Placeholder (P1)>	0.	0.	0.
18 - <Placeholder (P2)>	0.	0.	0.
19 - <Placeholder (P3)>	0.	0.	0.
20 - <Placeholder (P4)>	0.	0.	0.
21 - <Placeholder (P5)>	0.	0.	0.

- 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 Cvr 2030 Default Title

Total VKT for area:

Editing Mode:  Total VKT  By Vehicle Class  By Vehicle and Fuel  By Vehicle/Fuel/Hour

Editing VKT (vehicle km traveled per weekday)

	Petrol	Diesel	LPG
01 - Private Cars (PC)	20791860	206627	0
02 - Taxi	3292	0	7949132
03 - Light Goods Vehicles <=2.5t	888	41053	0
04 - Lt Goods Vehicles 2.5-3.5t	78039	3840346	0
05 - Light Goods Vehicles >3.5t	0	2083233	0
06 - Medium Heavy Goods Vehicles <=15t	0	1081536	0
07 - Medium Heavy Goods Vehicles >15t	0	2837768	0
08 - Public Light Buses	0	993919	207253
09 - Private Light Bus <=3.5t	16318	34793	0
10 - Private Light Bus >3.5t	98	268344	17802
11 - Non-franchised Bus <=6.4t	0	322358	0
12 - Non-franchised Bus 6.4-15t	0	223921	0
13 - Non-franchised Bus >15t	0	400613	0
14 - Franchised Bus (SD)	0	77969	0
15 - Franchised Bus (DD)	0	1240047	0
16 - Motorcycles (MC)	1155100	0	0
17 - <Placeholder (P1)>	0	0	0
18 - <Placeholder (P2)>	0	0	0
19 - <Placeholder (P3)>	0	0	0
20 - <Placeholder (P4)>	0	0	0
21 - <Placeholder (P5)>	0	0	0

## 2030 VKT (After VKT Edit)

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

Total VKT for area:

Editing Mode:  Total VKT  By Vehicle Class  By Vehicle and Fuel  By Vehicle/Fuel/Hour

Editing VKT (vehicle km traveled per weekday)

	Petrol	Diesel	LPG
01 - Private Cars (PC)	1609000	206627	0
02 - Taxi	3292	0	7949132
03 - Light Goods Vehicles <=2.5t	914	40772	0
04 - Lt Goods Vehicles 2.5-3.5t	80568	3787858	0
05 - Light Goods Vehicles >3.5t	0	2043798	0
06 - Medium Heavy Goods Vehicles <=15t	0	1078872	0
07 - Medium Heavy Goods Vehicles >15t	0	2832228	0
08 - Public Light Buses	0	977404	223768
09 - Private Light Bus <=3.5t	16543	34637	0
10 - Private Light Bus >3.5t	95	268596	17298
11 - Non-franchised Bus <=6.4t	0	321311	0
12 - Non-franchised Bus 6.4-15t	0	223818	0
13 - Non-franchised Bus >15t	0	400456	0
14 - Franchised Bus (SD)	0	77969	0
15 - Franchised Bus (DD)	0	1240047	0
16 - Motorcycles (MC)	1155099	0	0
17 - <Placeholder (P1)>	0	0	0
18 - <Placeholder (P2)>	0	0	0
19 - <Placeholder (P3)>	0	0	0
20 - <Placeholder (P4)>	0	0	0
21 - <Placeholder (P5)>	0	0	0

- 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
Population	718,589	<b>55,609</b>	718,589
VKT	20,791,860	1,609,000	1,609,000
Trips	1,077,775	<b>83,405</b>	1,077,775
NOx Run Exhaust (tonne/day)	0.1715	0.0133	0.0133
NOx Start Exhaust (tonne/day)	0.07198	<b>0.00557</b>	0.07198

## 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 2030 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

	Petrol	Diesel	LPG
01 - Private Cars (PC)	1077775	10727	0
02 - Taxi	30	0	73162
03 - Light Goods Vehicles<=2.5t	56	2303	0
04 - Lt Goods Vehicles 2.5-3.5t	4805	214442	0
05 - Light Goods Vehicles>3.5t	0	86446	0
06 - Medium ,Heavy Goods Vehicles<=15t	0	50396	0
07 - Medium ,Heavy Goods Vehicles>15t	0	132265	0
08 - Public Light Buses	0	14149	3239
09 - Private Light Bus <=3.5t	598	1102	0
10 - Private Light Bus >3.5t	5	9324	953
11 - Non-franchised Bus<=6.4t	0	10945	0
12 - Non-franchised Bus 6.4-15t	0	7593	0
13 - Non-franchised Bus >15t	0	13613	0
14 - Franchised Bus (SD)	0	3340	0
15 - Franchised Bus (DD)	0	59633	0
16 - Motorcycles (MC)	418759	0	0
17 - <Placeholder (P1)>	0	0	0
18 - <Placeholder (P2)>	0	0	0
19 - <Placeholder (P3)>	0	0	0
20 - <Placeholder (P4)>	0	0	0
21 - <Placeholder (P5)>	0	0	0

Buttons: Apply, Cancel, Done

$$\text{Factor} = 250,000 \div 1,077,775 = 0.231959$$

# 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)

By Vehicle and Fuel

	Petrol	Diesel	LPG
01 - Private Cars (PC)	718589	7152	0
02 - Taxi	8	0	18292
03 - Light Goods Vehicles<=2.5t	13	576	0
04 - Lt Goods Vehicles 2.5-3.5t	1142	53670	0
05 - Light Goods Vehicles>3.5t	0	21614	0
06 - Medium Heavy Goods Vehicles<=15t	0	12598	0
07 - Medium Heavy Goods Vehicles>15t	0	33063	0
08 - Public Light Buses	0	3597	750
09 - Private Light Bus <=3.5t	209	398	0
10 - Private Light Bus >3.5t	2	3320	349
11 - Non-franchised Bus<=6.4t	0	2736	0
12 - Non-franchised Bus 6.4-15t	0	1898	0
13 - Non-franchised Bus >15t	0	3403	0
14 - Franchised Bus (SD)	0	313	0
15 - Franchised Bus (DD)	0	5590	0
16 - Motorcycles (MC)	69786	0	0
17 - <Placeholder (P1)>	0	0	0
18 - <Placeholder (P2)>	0	0	0
19 - <Placeholder (P3)>	0	0	0
20 - <Placeholder (P4)>	0	0	0
21 - <Placeholder (P5)>	0	0	0

## 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)

By Vehicle and Fuel

	Petrol	Diesel	LPG
01 - Private Cars (PC)	166683	7152	0
02 - Taxi	8	0	18292
03 - Light Goods Vehicles<=2.5t	14	576	0
04 - Lt Goods Vehicles 2.5-3.5t	1201	53610	0
05 - Light Goods Vehicles>3.5t	0	21614	0
06 - Medium Heavy Goods Vehicles<=15t	0	12598	0
07 - Medium Heavy Goods Vehicles>15t	0	33063	0
08 - Public Light Buses	0	3537	810
09 - Private Light Bus <=3.5t	213	394	0
10 - Private Light Bus >3.5t	2	3329	340
11 - Non-franchised Bus<=6.4t	0	2736	0
12 - Non-franchised Bus 6.4-15t	0	1898	0
13 - Non-franchised Bus >15t	0	3403	0
14 - Franchised Bus (SD)	0	313	0
15 - Franchised Bus (DD)	0	5590	0
16 - Motorcycles (MC)	69786	0	0
17 - <Placeholder (P1)>	0	0	0
18 - <Placeholder (P2)>	0	0	0
19 - <Placeholder (P3)>	0	0	0
20 - <Placeholder (P4)>	0	0	0
21 - <Placeholder (P5)>	0	0	0

Apply Cancel Done

Multiply population by factor:

$$718,589 * 0.231959 = 166,683 \text{ vehicles}$$

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

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

	Petrol	Diesel	LPG
01 - Private Cars (PC)	107775	10727	0
02 - Taxi	30	0	73162
03 - Light Goods Vehicles<=2.5t	56	2303	0
04 - Lt Goods Vehicles 2.5-3.5t	4805	214442	0
05 - Light Goods Vehicles>3.5t	0	86446	0
06 - Medium Heavy Goods Vehicles<=15t	0	50396	0
07 - Medium Heavy Goods Vehicles>15t	0	132265	0
08 - Public Light Buses	0	14149	3239
09 - Private Light Bus <=3.5t	598	1102	0
10 - Private Light Bus >3.5t	5	9324	953
11 - Non-franchised Bus<=6.4t	0	10945	0
12 - Non-franchised Bus 6.4-15t	0	7593	0
13 - Non-franchised Bus >15t	0	13613	0
14 - Franchised Bus (SD)	0	3340	0
15 - Franchised Bus (DD)	0	59633	0
16 - Motorcycles (MC)	418759	0	0
17 - <Placeholder (P1)>	0	0	0
18 - <Placeholder (P2)>	0	0	0
19 - <Placeholder (P3)>	0	0	0
20 - <Placeholder (P4)>	0	0	0
21 - <Placeholder (P5)>	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 weekday)

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

	Petrol	Diesel	LPG
01 - Private Cars (PC)	249999	10727	0
02 - Taxi	30	0	73162
03 - Light Goods Vehicles<=2.5t	56	2303	0
04 - Lt Goods Vehicles 2.5-3.5t	4805	214442	0
05 - Light Goods Vehicles>3.5t	0	86446	0
06 - Medium Heavy Goods Vehicles<=15t	0	50396	0
07 - Medium Heavy Goods Vehicles>15t	0	132265	0
08 - Public Light Buses	0	14149	3239
09 - Private Light Bus <=3.5t	598	1102	0
10 - Private Light Bus >3.5t	5	9324	953
11 - Non-franchised Bus<=6.4t	0	10945	0
12 - Non-franchised Bus 6.4-15t	0	7593	0
13 - Non-franchised Bus >15t	0	13613	0
14 - Franchised Bus (SD)	0	3340	0
15 - Franchised Bus (DD)	0	59633	0
16 - Motorcycles (MC)	418759	0	0
17 - <Placeholder (P1)>	0	0	0
18 - <Placeholder (P2)>	0	0	0
19 - <Placeholder (P3)>	0	0	0
20 - <Placeholder (P4)>	0	0	0
21 - <Placeholder (P5)>	0	0	0

Buttons: Apply, Cancel, Done

- Save input files as **HK\_2030\_Burden\_edit Trips (conformity).inp** and Run

# Exercise # 5b: Changing Trips (Directly)

- Create new case with scenario data same as base case

2030 Trips  
(Base Case)

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

	Petrol	Diesel	LPG
01 - Private Cars (PC)	1077775	10727	0
02 - Taxi	20	0	73162
03 - Light Goods Vehicles<=2.5t	56	2303	0
04 - Lt Goods Vehicles 2.5-3.5t	4805	214442	0
05 - Light Goods Vehicles>3.5t	0	86446	0
06 - Medium_Heavy Goods Vehicles<=15t	0	50396	0
07 - Medium_Heavy Goods Vehicles>15t	0	132265	0
08 - Public Light Buses	0	14149	3239
09 - Private Light Bus <=3.5t	598	1102	0
10 - Private Light Bus >3.5t	5	9324	953
11 - Non-franchised Bus<=6.4t	0	10945	0
12 - Non-franchised Bus 6.4-15t	0	7593	0
13 - Non-franchised Bus >15t	0	13613	0
14 - Franchised Bus (SD)	0	3340	0
15 - Franchised Bus (DD)	0	59633	0
16 - Motorcycles (MC)	418759	0	0
17 - <Placeholder (P1)>	0	0	0
18 - <Placeholder (P2)>	0	0	0
19 - <Placeholder (P3)>	0	0	0
20 - <Placeholder (P4)>	0	0	0
21 - <Placeholder (P5)>	0	0	0

Buttons: Apply, Cancel, Done

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

	Petrol	Diesel	LPG
01 - Private Cars (PC)	250000	10727	0
02 - Taxi	20	0	73162
03 - Light Goods Vehicles<=2.5t	56	2303	0
04 - Lt Goods Vehicles 2.5-3.5t	4805	214442	0
05 - Light Goods Vehicles>3.5t	0	86446	0
06 - Medium_Heavy Goods Vehicles<=15t	0	50396	0
07 - Medium_Heavy Goods Vehicles>15t	0	132265	0
08 - Public Light Buses	0	14149	3239
09 - Private Light Bus <=3.5t	598	1102	0
10 - Private Light Bus >3.5t	5	9324	953
11 - Non-franchised Bus<=6.4t	0	10945	0
12 - Non-franchised Bus 6.4-15t	0	7593	0
13 - Non-franchised Bus >15t	0	13613	0
14 - Franchised Bus (SD)	0	3340	0
15 - Franchised Bus (DD)	0	59633	0
16 - Motorcycles (MC)	418759	0	0
17 - <Placeholder (P1)>	0	0	0
18 - <Placeholder (P2)>	0	0	0
19 - <Placeholder (P3)>	0	0	0
20 - <Placeholder (P4)>	0	0	0
21 - <Placeholder (P5)>	0	0	0

Buttons: Apply, Cancel, Done



- Save input files as

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

# Exercise # 5c: Solution

PC-NCAT & PC-CAT	Base	#5a: Pop-adjusted Trips	#5b: Trips direct
Vehicles	718,589	<b>166,683</b>	718,589
VKT	20,791,860	4,822,855	20,791,861
Trips	1,077,775	<b>249,999</b>	250,000
NOx Run Exhaust	0.1715	0.0398	0.1715
NOx Start Exhaust	0.07198	<b>0.01670</b>	0.01670

## 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

The screenshot shows the Emfac-HK software interface. The window title is "Emfac-HK" and the current view is "Editing data". The menu bar includes "File", "Run", and "Help". 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 is a blue banner with "Emfac-HK" in white text. A navigation bar contains several tabs: "Input 1", "Input 2", "Mode and Output", "Tech/IM", "Cal. Yr Basis (2030)", "Pop/Accrual", "VKT/Trips", and "Profiles/Speed". The "Profiles/Speed" tab is circled in red. The main content area is titled "Editing Program Constants - RVP, Temperature, Humidity, Speed Fractions, and Idle Time for scenario year 2030 and month/season Annual". It contains five buttons: "RVP" (Edit the petrol Reid Vapor Pressure (RVP) for the calendar year and season), "Temperature Profile" (Edit the hourly temperature profile for the season \*), "RH Profile" (Edit the hourly relative humidity (RH) profile for the season \*), "Speed Fractions" (Edit the speed fractions for the calendar year), and "Idle Time" (Edit idle times for vehicles). The "Speed Fractions" button is circled in red. An "Info" box at the bottom states: "\* Temperature and RH are the same in respect to the change of calendar year". At the bottom of the window are three buttons: "Cancel", "< Back", and "Finish".

# Exercise # 6: Editing Speed Fractions

1. Select Vehicle 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 Vehicle Class: 06: Heavy Goods Vehicles (5.5-15t)

01: Private Cars (PC)  
02: Taxi (Taxi)  
03: Light Goods Vehicles (<=2.5t) (LGV)  
04: Light Goods Vehicles (2.5-3.5t) (LGV)  
05: Light Goods Vehicles (3.5-5.5t) (LGV)  
06: Heavy Goods Vehicles (5.5-15t) (HGV)  
07: Heavy Goods Vehicles (>=15t) (HGV)  
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) (NFB8)  
12: Non-franchised Buses (6.4-15t) (NFB8)  
13: Non-franchised Buses (>15t) (NFB8)  
14: Single Deck Franchised Buses (FB8)  
15: Double Deck Franchised Buses (FB8)  
16: Motor Cycles (MC)  
17: <Placeholder (P1)>  
18: <Placeholder (P2)>  
19: <Placeholder (P3)>  
20: <Placeholder (P5)>  
21: <Placeholder (P6)>

**Grid Control Removed/Deactivated (Replaced with 5-step process)**

- > 1. Press "Copy with Headings" button to copy data to clipboard
- > 2. Open spreadsheet and paste clipboard contents to spreadsheet for viewing/editing.
- > 3. Perform edits.
- > 4. Highlight Data Only portion in spreadsheet and copy to clipboard
- > 5. Press "Paste Data Only" to paste edits back into program

Total 100 % in each hour

Apply Cancel Done Apply to Others

# Exercise # 6: Editing Speed Fractions

Speed Fractions by Scenario Year and Vehicle Class

Area: Hong Kong SAR Scenario Year: 2030

Hong Kong SAR

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

**Grid Control Removed/Deactivated (Replaced with 5-step process).**  
**Data Copied to Clipboard.. Perform STEPS 2 thru 5.**  
-> 1. Press "Copy with Headings" button to copy data to clipboard.  
-> 2. Open spreadsheet and paste clipboard contents to spreadsheet for viewing/editing.  
-> 3. Perform edits.  
-> 4. Highlight Data Only portion in spreadsheet and copy to clipboard.  
-> 5. Press "Paste Data Only" to paste edits back into program.

Grade

Total 100 % in each hour

1. Select Vehicle Class;
2. Click button "Copy with Headings".
3. Open Excel worksheet and paste values


# Exercise # 6: Editing Speed Fractions

	Hour	00	01	02	03	04	05	06	07	08	09	10	.....			
1	Vehicle Class 06 Speed Fractions	0	100	200	300	400	500	600	700	800	900	1000	1100	1200	1300	1400
2	Spd008	0	0	0	0	0	0	0	0	1.88E-03	1.88E-03	0	0	0	0	0
3	Spd016	0	0	0	0	0	0	0	0	6.64E-02	6.64E-02	0	0	0	0	0
4	Spd024	0	0	0	0	0	0	0	0	6.88E-02	6.88E-02	0	0	0	0	0
5	Spd032	0.268248	0.268248	0.268248	0.268248	0.268248	0.268248	0.268248	0.191458	0.173041	0.173041	0.191458	0.191458	0.191458	0.191458	0.191458
6	Spd040	3.74E-02	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	4.01E-02	4.01E-02	4.01E-02
7	Spd048	0	0	0	0	0	0	0	0	0.192936	0.192936	0	0	0	0	0
8	Spd056	0.327716	0.327716	0.327716	0.327716	0.327716	0.327716	0.327716	0.257926	8.75E-02	8.75E-02	0.257926	0.257926	0.257926	0.257926	0.257926
9	Spd064	1.97E-02	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	3.10E-02	3.10E-02	3.10E-02
10	Spd072	0.346919	0.346919	0.346919	0.346919	0.346919	0.346919	0.346919	0.479484	0.214092	0.214092	0.479484	0.479484	0.479484	0.479484	0.479484
11	Spd080	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12	Spd088	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
13	Spd096	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
14	Spd104	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
15	Spd112	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
16	Spd120	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
17	Spd128	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
18	Spd136	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
19	Spd144	0	0	0	0	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   


Hong Kong SAR

VKT-Weighted Average Basis:  Vehicle Class:

Grade

**Grid Control Removed/Deactivated (Replaced with 5-step process).**  
**Data Copied to Clipboard.. Perform STEPS 2 thru 5.**  
-> 1. Press "Copy with Headings" button to copy data to clipboard  
-> 2. Open spreadsheet and paste clipboard contents to spreadsheet for viewing/editing  
-> 3. Perform edits.  
-> 4. Highlight Data Only  
-> 5. Press "Paste Data Only" button

Editing speed fractions

 Paste 24 hours of speed fractions data?

Total 100 % in each hour

# Exercise # 6: Editing Speed Fractions

Speed Fractions by Scenario Year and Vehicle Class

Area: Hong Kong SAR Scenario Year: 2030

Hong Kong SAR

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

Grade

**Grid Control Removed/Deactivated (Replaced with 5-step process).**

- > 1. Press "Copy with Headings" button to copy data to clipboard.
- > 2. Open spreadsheet and paste clipboard contents to spreadsheet for viewing/editing.
- > 3. Perform edits.
- > 4. Highlight Data Only portion in spreadsheet and copy to clipboard.
- > 5. Press "Paste Data Only" to paste edits back into program.
- > 6. **PASTE SUCCESSFUL.**

Successful Paste.  
Apply Changes

Total 100 % in each hour



# 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 Vehicle Class: 06: Heavy Goods Vehicles (5.5-15t)

**Grid Control Removed**

**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**

*Instructions:*

- > 1. Press "Copy with Headings"
- > 2. Open spreadsheet for viewing/editing
- > 3. Perform edits.
- > 4. Highlight Data
- > 5. Press "Paste Data Only"

## 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 Vehicle Class: 06: Heavy Goods Vehicles (5.5-15t)

**Apply updated values for Speed Fractions**

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

Vehicle Classes

Selections Available	Apply To:
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<=	
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 (FB)	

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	0.766	0.778
	PM	0.030	0.030
HGV8	NOx	2.352	2.419
	PM	0.168	0.170

# 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
84.4	84.6	85.4	86.1	85.8	86.2	85.9	85.4	83.0	79.0	75.5	73.7
1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300
71.8	72.5	72.0	72.7	73.8	75.6	78.6	80.4	81.9	83.2	83.4	83.9

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

```
trnp.inp - Notepad
File Edit Format View Help
EmfachK41-Header
  Version 4 1 0 0
  Scenario-Count 1
  HK-IM Y 0 0 2020 0 0 2020 0 0 2020 0 0 2020 0 0 2020 0 0 2020 0 0 2020 0 0 2020 0 0 2020 0 0 2020 0 0 2020 0 0 2020
  HKUNITS Y
End-Header
Begin-Scenario 1
  Title Hong Kong SAR Annual Cvr 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
  Cvr 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 Detail_ModelYear Detail_TechGroup
  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
      87.25001 81.40001 82.99999 84.2 82.00001 85.1 82.5 83.9 83.89999 82.49999 78.5 77.3 73.8 76.1 74. 75.1 75.09999 78.3 82.1 81. 81.10001 83.1
    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
      82.75001 74.2 77.5 78.2 76.80001 75.80001 76.4 73.6 76.09999 69.6 64.8 63.7 63.4 61.5 61.5 62.3 64. 65.99999 70.5 71.6 73.5 74.5 74. 74.1
    End-Real-Array
  End-Data-Item
```

- Update data row for each month from RH.XLS

# Exercise # 7: Changing RH


```
HK_2015_Burden_edit RH.inp - Notepad
File Edit Format View Help
EmfachK41-Header
Version 4 1 0 0
Scenario-Count 1
HK-IM Y 0 0 2020 0 0 2020 0 0 2020 0 0 2020 0 0 2020 0 0 2020 0 0 2020 0 0 2020 0 0 2020 0 0 2020 0 0 2020 0 0 2020
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. 80.5 78.2 75.4 72.9 70.1 68.6 67.4 67. 67.5 68.6 72.6 76.3 77.6 78.4 79.1 79.3 79.5 80.
  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
      81.6 82.1 82. 82.1 83.2 83.5 83. 81.1 77.4 71.5 68.2 66.2 64.7 66.6 67.6 68. 70.5 75.2 77.8 78.1 79.6 81. 80.4 81.2
  End-Real-Array
```

- 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 : 2018**
  - Burden; CSV output; Day; PM<sub>10</sub>; VOC;
- Alter alternate base year population by 2018\_Pop.XLS

# Exercise # 8: Alternate Base Year

- Alternate Base Year Selection: **2018**

Emfac-HK 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

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~~

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

Alternate Base Year Selection

Available	Included
2002	
2003	
2004	
2005	
2006	
2007	
2008	
2009	
2010	
2011	
2012	
2013	
2014	
2015	
2016	
2017	
2018	
2019	
2020	
2021	

All All


No Alternate base data year


OK Cancel

# Exercise # 8: Alternate Base Year

Emfac-HK    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

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 2018 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


The screenshot shows the Emfac-HK software interface. The window title is "Emfac-HK<sup>1</sup> Editing data". The menu bar includes "File", "Run", and "Help". The header area features the Environmental Protection Department logo (The Government of the Hong Kong Special Administrative Region) and the HONG KONG logo, along with a blue banner stating "permitted by Air Resources Board, California". The main window has a blue header with "Emfac-HK" and a tabbed interface with tabs for "Input 1", "Input 2", "Mode and Output", "Tech/IM", "Base Yr Basis (2018)", and "Population". The active tab is "Base Yr Basis (2018)". The main content area is titled "Editing - Calendar Year Basis for Activity" and contains the text "Select the calendar year basis for editing activity data:". Below this text is a list box with three options: "2018 (Alt. Base Pop)", "2030 (Calendar Year)", and "2018 (Alt. Base Pop)". The first option is selected and highlighted in blue. To the right of the list box are two radio buttons: "Active" (selected) and "Options". At the bottom of the window are four buttons: "Cancel", "< Back", "Next >", and "Finish".


- Select “2018 (Alt. Base Pop)”

# Exercise # 8: Alternate Base Year

Emfac-HK 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

Input 1 | Input 2 | Mode and Output | Tech/IM | Base Yr Basis (2018) | **Population** | . | .

Editing Program Constants - Population for Alternate Base year 2018

Edit the vehicle population

Edit the odometer accrual \*

\* Accrual rates are the same in respect to the change of calendar year

# 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**

**Grid Control Removed/Deactivated (Replaced with 5-step process).**

- > 1. Press "Copy with Headings" button to copy data to clipboard.
- > 2. Open spreadsheet and paste clipboard contents to spreadsheet for viewing/editing.
- > 3. Perform edits.
- > 4. Highlight Data Only portion in spreadsheet and copy to clipboard.
- > 5. Press "Paste Data Only" to paste edits back into program.

Fuel Type: Petrol, Diesel, LPG

Buttons: Apply, Cancel, Done

- Select Fuel Type, Click “Copy with Headings”
- Paste value from 2018\_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

Editing Mode     Editing Base Pop (registered vehicles with adjustments)

**Grid Control Removed/Deactivated (Replaced with 5-step process).**

- > 1. Press "Copy with Headings" button to copy data to clipboard.
- > 2. Open spreadsheet and paste clipboard contents to spreadsheet for viewing/editing.
- > 3. Perform edits.
- > 4. Highlight Data Only portion in spreadsheet and copy to clipboard.
- > 5. Press "Paste Data Only" to paste edits back into program.
- > 6. **PASTE SUCCESSFUL.**

Fuel Type

*Successful Paste.  
Apply Changes*

- Repeat for the rest fuel type
- Save as HK\_2030\_AltBYr\_2018\_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 older than 15 years old are replaced with brand new
  2. All buses older than 15 years 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 NOx running exhaust 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

- Given the link information obtained for two links:
  - Compile NO<sub>x</sub> emission factor for each vehicle class at target speed bin from RTL output;
  - Calculate the emission in gram;

Note that in this example, only running exhaust emission is calculated for simplicity. In similar fashion, other types of emissions e.g. start emissions and evaporative emissions can also be calculated with the emission factors in RTL output.

Thank you