Training Exercises

Exercise Setup

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

Exercise #1: Daily Emissions Inventory

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

Exercise #1: Notes

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

Exercise #1: Input 1 Tab

🛃 Emfac-HK V3.1 Editing data		
<u>File Run H</u> elp		
Environmental Protection Department The Government of the Hong Kong Special Administrative Region	permitted by Air Resources Board California	Calendar Year Selection
Emfac-HK V3.1 V3.1 20160104 Pr: Emfac-HK HK3.1		Available
. Input 1 Input 2 Mode and Output Tech/IM Base / Cal. Yr Basis		2030
Basic scenario data - Select Area, Calculation Method, Calendar Year, Alternate Base Year and Season Step 1 - Geographic Area Area Type: SAR SAR Hong Kong Image: SAR SAR Hong Kong Step 2a - Calendar Year Step 2b - Alternate Base Year Select Select Calendar year 2030 Selected Scenario Year for Output OPTIONAL: Selecting this option overrides EMFAC-HK default base year.		1937 2000 1939 2000 2001 = 2002 > 2003 2004 2005 <
Step 3 Season or Month		<u>Q</u> K <u>Cancel</u>
Cancel Next > Finish		

Exercise #1: Mode and Output Tab



Exercise #1: Main Screen After All Edits Applied

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	Above 15t-Diesel		14
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	** When checked, changes a	apply to all scenarios.	

#### Exercise #1: Output Generated

HK_2030_Burden.bcd.csv HK_2030_Burden.csv HK_2030_Burden.inp HK_2030_Burden.log

Microsoft Office Exc	11/3/2015 12:57 AM
Microsoft Office Exc	11/3/2015 12:57 AM
INP File	11/2/2015 11:33 PM
Text Document	11/3/2015 12:57 AM
	Microsoft Office Exc Microsoft Office Exc INP File Text Document

## Exercise #1: Format of the BURDEN Text File with *.CSV extension

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

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203	1986	2030	SAR Average	Hong Kong SAR Average	4	3	51	PC	NCAT	VOC	Run Exh	0.000104	Day	
203	30 1986	2030	SAR Average	Hong Kong SAR Average	4	3	51	PC	NCAT	CO2	Run Exh	0.010821	Day	
203	1986	2030	SAR Average	Hong Kong SAR Average	4	3	51	PC	NCAT	со	Start Ex	0.000351	Day	
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203	1986	2030	SAR Average	Hong Kong SAR Average	4	3	51	PC	NCAT	PM	Start Ex	0 [	Day	
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203	30 1986	2030	SAR Average	Hong Kong SAR Average	4	3	51	PC	NCAT	CO2	Start Ex	0.000884	Day	
203	30 1986	2030	SAR Average	Hong Kong SAR Average	4	3	51	PC	NCAT	CO	Hot Soak	0 [	Day	
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203	30 1986	2030	SAR Average	Hong Kong SAR Average	4	3	51	PC	NCAT	CO2	Hot Soak	0 0	Day	
203	30 1986	2030	SAR Average	Hong Kong SAR Average	4	3	51	PC	NCAT	CO	Running	0 [	Day	
203	30 1986	2030	SAR Average	Hong Kong SAR Average	4	3	51	PC	NCAT	NOx	Running	0 [	Day	
203	30 1986	2030	SAR Average	Hong Kong SAR Average	4	3	51	PC	NCAT	PM	Running	0 [	Day	
203	30 1986	2030	SAR Average	Hong Kong SAR Average	4	3	51	PC	NCAT	VOC	Running	0.000094	Day	
203	30 1986	2030	SAR Average	Hong Kong SAR Average	4	3	51	PC	NCAT	CO2	Running	01	Day	
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#### Exercise #1a: Processing BCD Output

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

#### Exercise #1a: Solution

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4	2030	1986	2030	SAR Average	Hong Kong SAR Average	1176000	783921	21887210	PC	CAT	NOX	Run Exh	0.227139	Day	-	
5	2030	1980	2030	SAR Average	Hong Kong SAR Average	72779	19192	7665956	TAYL	USL	NOX	Run Exh	1 9/1997	Day	-	_
7	2030	1986	2030	SAR Average	Hong Kong SAR Average	12/15	0	14	LGV3	NCAT	NOX	Run Exh	0.00005	Day	1	1
8	2030	1986	2030	SAR Average	Hong Kong SAR Average	7	2	96	LGV3	CAT	NOx	Run Exh	0.000148	Day	1	
9	2030	1986	2030	SAR Average	Hong Kong SAR Average	4011	1003	74275	LGV3	DSL	NOx	Run Exh	0.028923	Day	-	
10	2030	1986	2030	SAR Average	Hong Kong SAR Average	1	0	7	LGV4	NCAT	NOx	Run Exh	0.000025	Day		
11	2030	1986	2030	SAR Average	Hong Kong SAR Average	4230	1057	67122	LGV4	CAT	NOx	Run Exh	0.001887	Day		
12	2030	1986	2030	SAR Average	Hong Kong SAR Average	215287	53816	3549671	LGV4	DSL	NOx	Run Exh	1.442728	Day	-	
13	2030	1986	2030	SAR Average	Hong Kong SAR Average	106611	26653	2547737	LGV6	DSL	NOx	Run Exh	0.973116	Day	-	
14	2030	1986	2030	SAR Average	Hong Kong SAR Average	50919	12731	1055561	HGV7	DSL	NOX	Run Exh	1.012759	Day	-	- U
15	2030	1986	2030	SAR Average	Hong Kong SAR Average	6491	1623	485981	DIR	DSL	NOX	Run Exh	0.505804	Day	-	
17	2030	1986	2030	SAR Average	Hong Kong SAR Average	10891	2723	815425	PLB	LPG	NOx	Run Exh	0.450059	Day	-	
18	2030	1986	2030	SAR Average	Hong Kong SAR Average	1768	632	60388	PV4	CAT	NOx	Run Exh	0.002693	Day	1	
19	2030	1986	2030	SAR Average	Hong Kong SAR Average	1132	404	41023	PV4	DSL	NOx	Run Exh	0.031824	Day		
20	2030	1986	2030	SAR Average	Hong Kong SAR Average	7	2	106	PV5	CAT	NOx	Run Exh	0.000052	Day		
21	2030	1986	2030	SAR Average	Hong Kong SAR Average	6551	2340	183584	PV5	DSL	NOx	Run Exh	0.182131	Day	_	
22	2030	1986	2030	SAR Average	Hong Kong SAR Average	1869	668	49542	PV5	LPG	NOx	Run Exh	0.017966	Day	-	
23	2030	1986	2030	SAR Average	Hong Kong SAR Average	11/29	2932	34//15	NFB6	DSL	NOX	Run Exh	0.661266	Day	-	
24	2030	1986	2030	SAR Average	Hong Kong SAR Average	11833	2054	343951	NEB8	DSL	NOX	Run Exh	0.247004	Day	1	
26	2030	1986	2030	SAR Average	Hong Kong SAR Average	4140	388	72384	FBSD	DSL	NOx	Run Exh	0.060772	Day	1	
27	2030	1986	2030	SAR Average	Hong Kong SAR Average	57633	5403	1265799	FBDD	DSL	NOx	Run Exh	2.737143	Day	1	
28	2030	1986	2030	SAR Average	Hong Kong SAR Average	14684	2447	25492	MC	NCAT	NOx	Run Exh	0.015576	Day		
29	2030	1986	2030	SAR Average	Hong Kong SAR Average	409348	68218	1292455	MC	CAT	NOx	Run Exh	0.364088	Day		
30	-										-					
31	2030	1986	2030	SAR Average	Hong Kong SAR Average	2322688	1030631	45091454	ALL	ALL	NOx	Run Exh	13.622524	Day		
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# Exercise #1b: Processing Text/CSV Output

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

## Exercise #1b: Processing Text/CSV Output

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Run Date : 2016/01/07 17:14:00													
Scen Year: 2030 All model years in the range 1986 to 2030 select	ed												
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A MOC Emissions		0 4140	, ,	0	57633	0	57633	14684	409348	0	U	424033	2322690
4 VOC Emissions		0 0.0107			0.07502		0.07503	0.07161	0.2016		0	0.26221	1 60400
6 Start Ex		0 0.010/4			0.07503	0	0.07503	0.0/101	0.15005	0	0	0.30321	0.27622
7		0 0	,	, .			0	0.04040	0.13333	0	U	0.20042	0.37022
8													
9 Diumal		0 0	0	0	0	0	0	0.10322	0.17689	0	0	0.28011	0.58213
0 Hot Soak		0 0	) 0	0	0	0	0	0.2853	0.16545	0	0	0.45075	0.64633
1 Running		0 0	) 0	0	0	0	0	1.46785	0.41615	0	0	1.88401	2.18922
2 Resting		0 0	0 0	0	0	0	0	0.13957	0.17517	0	0	0.31474	0.82765
3													
4 Carbon Monoxide Emissions													
5 Run Exh		0 0.16886	5 0	0	2.41637	0	2.41637	0.63442	3.61199	0	0	4.24641	48.4395
6 Start Ex		0 0	0 0	0	0	0	0	0.13904	1.27459	0	0	1.41364	5.52489
7													
8 Oxides of Nitrogen Emissions													
9 Run Exh		0 0.06077	7 0	0	2.73714	0	2.73714	0.01558	0.36409	0	0	0.37966	13.62252
0 Start Ex		0 0	0	0	0	0	0	0.00537	0.07087	0	0	0.07625	0.2141
1													
2 Carbon Dioxide Emissions (000)													
3 Run Exh		0 0.06838	3 0	0	1.56388	0	1.56388	0.00234	0.16709	0	0	0.16943	14.75557
4 Start Ex	_	0 (	0 0	0	0	0	0	0.00087	0.01255	0	0	0.01341	0.10679
PMIDEMISSIONS		0 0.0010			0.1770		0.1770	0.00007	0.000770			0.00000	0.57027
A NILEXI		0 0.00423	0	0	0.1779	0	0.1779	0.00087	0.00272	0	0	0.00359	0.57027
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## Exercise #1c: Determine Fleet-Average Emissions

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

#### Exercise #1c: Solution

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2	CALYR	START MYR	END MYR	REGION	SAR	STARTS	POPULATION	VKI	VEH TYP	VEH TECH	POLLUTANI	PROCESS Pup Exh	EMISSIONS	BASIS	(g/km)	_
3	2030	1986	2030	SAR Average	Hong Kong SAR Average	1176000	782921	21887210	PC	CAT	NOX	Run Exh	0.000183	Day	0.0104	
5	2030	1986	2030	SAR Average	Hong Kong SAR Average	9170	6113	171471	PC	DSI	NOX	Run Exh	0.003731	Day	0.0218	
6	2030	1986	2030	SAR Average	Hong Kong SAR Average	72779	18193	7665956	TAXI	LPG	NOx	Run Exh	1,941897	Day	0.2533	
7	2030	1986	2030	SAR Average	Hong Kong SAR Average	1	0	14	LGV3	NCAT	NOx	Run Exh	0.00005	Day	3.5714	
8	2030	1986	2030	SAR Average	Hong Kong SAR Average	7	2	96	LGV3	CAT	NOx	Run Exh	0.000148	Day	1.5417	
9	2030	1986	2030	SAR Average	Hong Kong SAR Average	4011	1003	74275	LGV3	DSL	NOx	Run Exh	0.028923	Day	0.3894	
10	2030	1986	2030	SAR Average	Hong Kong SAR Average	1	0	7	LGV4	NCAT	NOx	Run Exh	0.000025	Day	3.5714	
11	2030	1986	2030	SAR Average	Hong Kong SAR Average	4230	1057	67122	LGV4	CAT	NOx	Run Exh	0.001887	Day	0.0281	
12	2030	1986	2030	SAR Average	Hong Kong SAR Average	215287	53816	3549671	LGV4	DSL	NOx	Run Exh	1.442728	Day	0.4064	
13	2030	1986	2030	SAR Average	Hong Kong SAR Average	106611	26653	2547737	LGV6	DSL	NOx	Run Exh	0.973116	Day	0.3820	
14	2030	1986	2030	SAR Average	Hong Kong SAR Average	50919	12731	1055561	HGV7	DSL	NOx	Run Exh	1.012759	Day	0.9595	
15	2030	1986	2030	SAR Average	Hong Kong SAR Average	137375	34347	2849234	HGV8	DSL	NOx	Run Exh	2.498596	Day	0.8769	
16	2030	1986	2030	SAR Average	Hong Kong SAR Average	6491	1623	485981	PLB	DSL	NOX	Run Exh	0.505804	Day	1.0408	
10	2030	1980	2030	SAR Average	Hong Kong SAR Average	10891	2/23	60200	PLB	CAT	NOX	Run Exh	0.45005	Day	0.5519	
10	2030	1986	2030	SAR Average	Hong Kong SAR Average	1132	404	41023	PV4	DSI	NOX	Run Exh	0.002033	Day	0.7758	_
20	2030	1986	2030	SAR Average	Hong Kong SAR Average	7	2	106	PV5	CAT	NOx	Run Exh	0.000052	Day	0,4906	
21	2030	1986	2030	SAR Average	Hong Kong SAR Average	6551	2340	183584	PV5	DSL	NOx	Run Exh	0.182131	Day	0.9921	
22	2030	1986	2030	SAR Average	Hong Kong SAR Average	1869	668	49542	PV5	LPG	NOx	Run Exh	0.017966	Day	0.3626	
23	2030	1986	2030	SAR Average	Hong Kong SAR Average	11729	2932	347715	NFB6	DSL	NOx	Run Exh	0.661266	Day	1.9017	
24	2030	1986	2030	SAR Average	Hong Kong SAR Average	8217	2054	239204	NFB7	DSL	NOx	Run Exh	0.247604	Day	1.0351	
25	2030	1986	2030	SAR Average	Hong Kong SAR Average	11833	2958	343951	NFB8	DSL	NOx	Run Exh	0.214364	Day	0.6232	
26	2030	1986	2030	SAR Average	Hong Kong SAR Average	4140	388	72384	FBSD	DSL	NOx	Run Exh	0.060772	Day	0.8396	
27	2030	1986	2030	SAR Average	Hong Kong SAR Average	57633	5403	1265799	FBDD	DSL	NOx	Run Exh	2.737143	Day	2.1624	
28	2030	1986	2030	SAR Average	Hong Kong SAR Average	14684	2447	25492	MC	NCAT	NOx	Run Exh	0.015576	Day	0.6110	
29	2030	1986	2030	SAR Average	Hong Kong SAR Average	409348	68218	1292455	MC	CAT	NOX	Run Exh	0.364088	Day	0.2817	
30	2020	1000	2020	SAP Average	Hong Kong SAP Average	2222600	1020621	45001454	ALL	ALL	NOv	Pup Eyk	12 633534	Dave	0.2021	
32	2030	1980	2030	SAN Average	Hong Kong SAK Average	2322088	1030631	43091454	ALL	ALL	NUX	Runexn	13.022524	Day	0.3021	
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# Exercise #2: Hourly Emissions Inventory

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

# Exercise #2: Hourly Emissions Estimates

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

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

Emfac-HK V3.1 E	diting data	Par la			
<u>File Run H</u> elp Environm The Governn Special Admi	ental Protection ment of the Hong Kon nistrative Region	on Department	~~~		permitted by Air Resources Board California
Emfac-h	Mode and Output	V3.1 20160104 Pr: E Tech/IM Base / Cal. Y fac - Area fleet average er	mfac-HK HK3. r Basis   .   . nissions   Calim	1   .     fac - Detailed vehic	sle data
Scenario Type: BURDEN Area-Specific Planning Emissions Inventory (tonnes/day)	BURDEN Inventory Detailed Emission MVEI7G (BCD) Weighted Model Detailed Outputs Model Yrs	Files and Reports  Estimates (CSV)  Year Activity (WT)  (BDN)  cch Groups Speeds	Output Fr Hour Output P. Total PM10 Output H TOG VOC Speed ca	equency C Day articulate As PM C PM2.5 ydrocarbons As C THC C CH4 stegories C 8 C 16 km/	ň
	Cancel	< Back	Edit Program Constants	Finish	

### Exercise #2: Output Generated

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

# Exercise #2a: Hourly Emission Rate

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

#### Exercise #2a: Solution

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+	79											0.151201	Hr01 Total	
+	104					1 1						0.113175	Hr02 Total	
+	129											0.093751	Hr03 Total	
+	154											0.099813	Hr04 Total	
+	180											0.162832	Hr05 Total	
+	207											0.367508	Hr06 Total	
+	235											0.731032	Hr07 Total	
+	263											1.128095	Hr08 Total	
+	291											1.120608	Hr09 Total	
+	319											0.765532	Hr10 Total	
+	347											0.725073	Hr11 Total	
+	375											0.678431	Hr12 Total	
+	403											0.696309	Hr13 Total	
+	431										ļ	0.729148	Hr14 Total	
+	459											0.745938	Hr15 Total	
+	487											0.756602	Hr16 Total	
+	515											1.080809	Hr17 Total	
+	543											0.920634	Hr18 Total	
+	571											0.742978	Hr19 Total	
+	599	-										0.436227	Hr20 Total	
+	627							-				0.402697	Hr21 Total	
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## Exercise #3: EMFAC Mode

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

# Exercise #3: EMFAC Mode

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

#### Exercise #3: Input 1 Tab (populated)

🔁 Emfac-HK V3.1 Editing data		
<u>File Run H</u> elp		
Environmental Protection Department The Government of the Hong Kong Special Administrative Region	HONG KONG Air Resou California	l by Irces Boar
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 Yea	ar and Season	
Step 1 - Geographic Area		
Area Type: SAR SAR		
Hong Kong 💌		
J SAR		
Step 2a - Calendar Year	7	
Select Select		
Calendar year 2030 Alternate Base Data		
selected Year INACTIVE		
Scenario Year for Output OPTIONAL: Selecting this		
option overrides EMFAC-HK default base year.		
Step 3 Season or Month		
Annual		
Cancel Next >	Finish	

### Exercise #3: Mode and Output Tab

💼 Emfac-HK V3.1 Editing data				
<u>File Run H</u> elp				
Environmental Prote The Government of the Hor Special Administrative Regin	ection Department		permitted by Air Resources Board California	
Emfac-HK V3.1 V3.1 20160104 Pr: Emfac-HK HK3.1				
. Input 1 Input 2 Mode and 0	Pert Technik Dase / Cal Y Dasis	.  .		
Burden - Area Emission Estimate	Emfac - Area fleet average emissions	Calimfac - Detailed vehi	cle data	
Scenario Type: EMFAC Area-s humidites, and speeds	pecific fleet average emissions (g/activity) fo	or selected temperatures, re	lative	
Configure EMFAC Outputs	Emfac Rate Files	Output Particulate As	s	
Temperatures			PM2.5	
Relative Humidities		Output Hydrocarbon	s As	
Speed	Detailed Impact Rates (RTL)	C TOG C C	THC CH4	
Cancel	< Back Edit Pro	ogram ants Finish		

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

🛃 Emfac-HK V3.1 Editing data		Select/Edit temperature for Emfa	ac calculations
<u>File Run H</u> elp			
Environmental Protection Department The Government of the Hong Kong Special Administrative Region	HONG KONG Air Resources Board California	Enter data for temperature. Click Enter values of speed and tem © Delete temperature 1	button to enable new value. perature C Enter temperature 13 C Enter temperature 14
Emfac-HK V3.1 V3.1 20160104 Pr: Emfac-HK HK3.		C Enter temperature 3	C Enter temperature 14
. Input 1 Input 2 Mode and Output Tech/IM Base / Cal. Yr Basis		C Enter temperature 5	C Enter temperature 17
Burden - Area Emission Estimate Emfac - Area fleet average emissions Calin	ifac - Detailed state	C Enter temperature 6	C Enter temperature 18
		C Enter temperature 7	C Enter temperature 19
Connection Turner EMEAC - Alexa annualities finale subscription and a dealth shell for annual		C Enter temperature 8	C Enter temperature 20
humidites, and speeds	ed temperatures, relative	C Enter temperature 9	C Enter temperature 21
		C Enter temperature 10	C Enter temperature 22
Configure EMFAC Outputs Emfac Rate Files	utput Particulate As	C Enter temperature 11	C Enter temperature 23
	Total PM	C Enter temperature 12	C Enter temperature 24
Relative Humidities	• PM10 C PM2.5	Sort the array (done after exit)	OK Cancel
	utput Hydrocarbons As		
Speed.	Стод Стнс	C.	
Detailed Impact Rates (RTL)	VOC C CH4		
Cancel < Back Constants	Finish		

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

Emfac-HK V3.1 Editing data		Select/Edit rel hum for Emfac calcula	tions
<u>File R</u> un <u>H</u> elp			
The Government of the Hong Kong Special Administrative Region	HONG KONG Air Resources Board California	Enter data for rel hum. Click button to Enter values of speed and tempera Delete rel hum 1	enable new value. ture C Enter rel hum 13
Emfac-HK V3.1 V3.1 20160104 Pr: Emfac-HK	(HK3.1	C Enter rel hum 2	C Enter rel hum 14
. Input 1 Input 2 Mode and Output Tech/IM Base / Cal. Yr Basis .		C Enter rel hum 4	C Enter rel hum 16
Burden - Area Emission Estimate Emfac - Area fleet average emissions	Calimfac - Detailed vehicle dat	C Enter rel hum 5	C Enterrel hum 17
		C Enter rel hum 6	C Enter rel hum 18
Scenario Type: EMFAC Area-specific fleet average emissions (g/activity) fo	or selected temperatures, relative	C Enter rel hum 7	C Enter rel hum 19
humidites, and speeds		C Enter rel hum 8	C Enter rel hum 20
Configure EMEAC Outputs - Emfac Bate Files	Output Particulate As	C Enter rel hum 9	C Enter rel hum 21
	C Total PM	C Enter rel hum 10	C Enter rel hum 22
Temperatures	@ PM10 C PM25	C Enter rel hum 11	C Enter rel hum 23
	5° FM10 5 FM2.5	C Enter rel hum 12	C Enter rel hum 24
Relative Humidities	Output Hydrocarbons As	,	,
Speed Detailed Impact Rates (RTL)	CTOG CTHC CVOC CCH4	✓ Sort the array (done after exit)	OK Cancel
		L	
1 Edit Pro	ogram		
Cancel < Back Const	ants Finish		

#### **Exercise #3: Output Generated**

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

# Exercise #4: Changing Technology Group Fractions

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

# Exercise #4: Changing TG Fractions

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

# Exercise #4: New LGV6 Exhaust TG Fractions to Apply

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

# Exercise #4: Exhaust TG Modification Tab

**Before Edit** 

#### **After Edit**



# Exercise #4: "Apply to Others – Model Year Only"

#### **Before Edit**

#### After Edit

Apply to Range?				
Apply This Profile to a     Range of Values?				
Parameters				
Vehicle Class				
V Model Year				
OK Cancel				



#### Exercise #4: "Apply to Others"

#### **Before Edit**

#### **After Edit**



Model Years Selections Available	Apply To: 2010 2011 2012 <<
-------------------------------------	-----------------------------------------

#### Exercise #4: Solution

1	I.	J	К	L	Μ	N	0	
	VEH TYPE 🖵	VEH TECH 🖵	POLLUTANT 🖵	PROCESS	EMISSIONS 👻	BASIS 👻	Case	
3	LGV6	DSL	NOx	Run Exh	0.973116	Day	Base Case	
3	LGV6	DSL	NOx	Run Exh	0.962865	Day	Euro V	
2								
3	LGV6	DSL	NOx		0.010251	Day	Difference	
4								
## Exercise #5: Changing VKT

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

## Exercise #5: Changing VKT

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

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

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

## Exercise #5a: Notes

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

## Exercise #5a: Pop/Accrual Tab



## Exercise #5a: VKT/Trips Tab



### Exercise #5a: Base Case Values

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

			Copy with	Headings	Paste Data Only					
Hong Kong SAR										
diting Mode		Editing	Cal Pop (registered v	ehicles with adjustr	ments)					
Total Cal Pop By Vehicle Class By Vehi	cle and Fu	iel B V	ehicle/Fuel/Age							
		Fuel (1=Petrol/2=Diesel/3=LPG)								
			1	2	3					
01 - Private Cars (PC)		1	783924.3	6113.0	0.0					
02 · Taxi		2	0.0	0.0	18193.0					
03 - Light Goods Vehicles<=2.5t		3	1.9	1002.7	0.0					
04 - Lt Goods Vehicles 2.5-3.5t		4	1057.4	53816.4	0.0					
05 - Light Goods Vehicles>3.5t		5	0.0	26652.7	0.0					
06 · Medium _Heavy Goods Vehic		6	0.0	12730.9	0.0					
07 - Medium _Heavy Goods Vehicles>1		7	0.0	34347.2	0.0					
08 - Public Light Buses		8	0.0	1622.9	2723.1					
09 - Private Light Bus <=3.5t	5	9	631.6	404.4	0.0					
10 - Private Light Bus >3.5t	Clas	10	2.4	2340.0	667.6					
11 - Non-franchised Bus<=6.4t	le	11	0.0	2932.0	0.0					
12 - Non-franchised Bus 6.4-15t	hic	12	0.0	2054.0	0.0					
13 - Non-franchised Bus >15t	Ve	13	0.0	2958.0	0.0					
14 - Franchised Bus (SD)		14	0.0	388.0	0.0					
15 - Franchised Bus (DD)		15	0.0	5403.0	0.0					
16 - Motorcycles (MC)		16	70665.1	0.0	0.0					
17 - <placeholder (p1)=""></placeholder>		17	0.0	0.0	0.0					
18 - <placeholder (p2)=""></placeholder>		18	0.0	0.0	0.0					
19 - <placeholder (p3)=""></placeholder>		19	0.0	0.0	0.0					
20 - <placeholder (p4)=""></placeholder>		20	0.0	0.0	0.0					
21 · <placeholder (p5)=""></placeholder>		21	0.0	0.0	0.0					

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

otal VKT for area			Copy with	n Headings	Paste Data Only			
Hong Kong SAR								
diting Mode			Editing VKT (vehicle	km traveled per we	ekday)			
Total VKT By Vehicle Class By Vehicle a	and Fuel	By Veł	nicle/Fuel/Hour					
			Fuel (1=P	etrol/2=Diesel/3	/2=Diesel/3=LPG)			
			1	2	3			
01 - Private Cars (PC)		1	21887260.0	171471.0	0.0			
02 - Taxi		2	0.0	0.0	7665955.0			
03 - Light Goods Vehicles<=2.5t		3	109.9	74275.4	0.0			
04 - Lt Goods Vehicles 2.5-3.5t		4	67129.2	3549671.3	0.0			
05 - Light Goods Vehicles>3.5t		5	0.0	2547736.5	0.0			
06 - Medium _Heavy Goods Vehic	2	6	0.0	1055561.3	0.0			
07 · Medium _Heavy Goods Vehicles>1		7	0.0	2849234.3	0.0			
08 - Public Light Buses		8	0.0	485980.8	815425.1			
09 - Private Light Bus <=3.5t		9	60387.8	41022.6	0.0			
10 - Private Light Bus >3.5t	Clas	10	105.6	183583.6	49542.4			
11 · Non-franchised Bus<=6.4t	le	11	0.0	347714.9	0.0			
12 - Non-franchised Bus 6.4-15t	hic	12	0.0	239203.8	0.0			
13 - Non-franchised Bus >15t	N.	13	0.0	343950.8	0.0			
14 - Franchised Bus (SD)		14	0.0	72384.1	0.0			
15 - Franchised Bus (DD)		15	0.0	1265799.5	0.0			
16 - Motorcycles (MC)		16	1317946.8	0.0	0.0			
17 - <placeholder (p1)=""></placeholder>		17	0.0	0.0	0.0			
18 - <placeholder (p2)=""></placeholder>		18	0.0	0.0	0.0			
19 - <placeholder (p3)=""></placeholder>		19	0.0	0.0	0.0			
20 - <placeholder (p4)=""></placeholder>		20	0.0	0.0	0.0			
21 - <placeholder (p5)=""></placeholder>		21	0.0	0.0	0.0			
Apply	C	ancel		Done				

## Exercise #5a: VKT Adjustment using Population

• Find "base" population and VKT for vehicle class and fuel (PC petrol) for 2030:

- Population (2030): 783,924 vehicles

- VKT (2030 base): 21,887,260 kilometers
- Determine VKT adjustment factor:

- 1,609,000/ 21,887,260 = 0.0735

• Multiply population by factor:

- 783,924 * 0.0735 = 57,629

## Exercise #5a: Population Edits

### 2030 Population (Base Case)

			Copy with	Headings	Paste Data Onl
Hong Kong SAR					
liting Mode		Editing	Cal Pop (registered v	vehicles with adjustr	nents)
Total Cal Pop   By Vehicle Class By Vehic	le and Fu	el BV	ehicle/Fuel/Age		
			Fuel (1=Pe	trol/2=Diesel/3=	LPG)
			1	2	3
11 - Private Cars (PC)			783924.3	6113.0	0.0
12 - Taxi		2	0.0	0.0	18193.0
l3 - Light Goods Vehicles<=2.5t		3	1.9	1002.7	0.0
4 - Lt Goods Vehicles 2.5-3.5t		4	1057.4	53816.4	0.0
5 - Light Goods Vehicles>3.5t		5	0.0	26652.7	0.0
6 - Medium_Heavy Goods Vehic		6	0.0	12730.9	0.0
7 - Medium _Heavy Goods Vehicles>1		7	0.0	34347.2	0.0
I - Public Light Buses		8	0.0	1622.9	2723.1
9 - Private Light Bus <=3.5t ) - Private Light Bus >3.5t	lass	9	631.6	404.4	0.0
		10	2.4	2340.0	667.6
1 - Non-franchised Bus<=6.4t	le	11	0.0	2932.0	0.0
2 - Non-franchised Bus 6.4-15t	hic	12	0.0	2054.0	0.0
3 - Non-franchised Bus >15t	Ve	13	0.0	2958.0	0.0
I - Franchised Bus (SD)		14	0.0	388.0	0.0
5 - Franchised Bus (DD)		15	0.0	5403.0	0.0
6 - Motorcycles (MC)		16	70665.1	0.0	0.0
7 - <placeholder (p1)=""></placeholder>		17	0.0	0.0	0.0
8 - <placeholder (p2)=""></placeholder>		18	0.0	0.0	0.0
9 - <placeholder (p3)=""></placeholder>		19	0.0	0.0	0.0
:0 - <placeholder (p4)=""></placeholder>		20	0.0	0.0	0.0
		21	0.0	0.0	0.0

### 2030 Population (Edited for VKT Match)

otal Cal Pop for area Hong Kong SAR			Copy with	Headings	Paste Data Only
diting Mode		Editing	Cal Pop (registered v	ehicles with adjust	ments)
Total Cal Pop   By Vehicle Class	√ehicle and Fu		Vehicle/Fuel/Age		
			Fuel (1=Pet	rol/2=Diesel/3=	LPG)
				2	3
01 - Private Cars (PC)			57628.7	6113.0	0.0
)2 - Taxi		2	0.0	0.0	18193.0
13 - Light Goods Vehicles<=2.5t		3	1.9	1002.7	0.0
4 - Lt Goods Vehicles 2.5-3.5t		4	1057.4	53816.4	0.0
5 - Light Goods Vehicles>3.5t		5	0.0	26652.7	0.0
6 · Medium_Heavy Goods Vehic		6	0.0	12730.9	0.0
7 · Medium_Heavy Goods Vehicles>1		6 7	0.0	34347.2	0.0
8 - Public Light Buses		8	0.0	1622.9	2723.1
9 - Private Light Bus <=3.5t	52	9	631.6	404.4	0.0
) - Private Light Bus >3.5t	Clas	10	2.4	2340.0	667.6
1 - Non-franchised Bus<=6.4t	le	11	0.0	2932.0	0.0
2 - Non-franchised Bus 6.4-15t	hic	12	0.0	2054.0	0.0
3 - Non-franchised Bus >15t	Ve	13	0.0	2958.0	0.0
4 - Franchised Bus (SD)		14	0.0	388.0	0.0
5 - Franchised Bus (DD)		15	0.0	5403.0	0.0
6 · Motorcycles (MC)		16	70665.1	0.0	0.0
7 · <placeholder (p1)=""></placeholder>		17	0.0	0.0	0.0
8 - <placeholder (p2)=""></placeholder>		18	0.0	0.0	0.0
9 - <placeholder (p3)=""></placeholder>		19	0.0	0.0	0.0
U - <placeholder (p4)=""></placeholder>		20	0.0	0.0	0.0
I - < maceholder (P5J>		21	0.0	0.0	0.0
Apply	C	ancel		Done	

### Exercise #5a: Verify VKT Adjustment

### 2030 VKT (Base Case)

### 2030 VKT (After Pop Edit)

Editing VKT data for scenario 1: Hong Kong S/	AR An	nual CYr	2030 Default Tit	le		Editing VKT data for scenario 1: Hong Kor	ng SAR A	nnual CY	r 2030 Default Tit	le	
Total VKT for area			Copy with	Headings	Paste Data Only	Total VKT for area			Copy with	Headings	Paste Data Onlu
Hong Kong SAR			-			Hana Kana SAR			сору чи	ritedalings	T date D'did Only
			No ANCT Contrate			Hong Kong SAN					
Editing Mode		Ed	liting VKT (venicle	km traveled per we	зекаауј	Editing Mode		E	diting VKT (vehicle	km traveled per we	ekday)
Total VKT   By Vehicle Class By Vehicle and	Fuel	By Vehicl	le/Fuel/Hour			Total VKT By Vehicle Class By Vehicle	e and Fuel	By Vehi	icle/Fuel/Hour		
	$\wedge$	1001	Fuel (1=Pe	etrol/2=Diesel/3	=LPG)				Fuel (1=P	etrol/2=Diesel/3	=LPG)
				2	3				1	2	3
01 - Private Cars (PC)			21887260.0	171471.0	0.0	01 - Private Cars (PC)			1609000.1	171471.0	0.0
02 - Taxi		2	0.0	0.0	7665955.0	02 - Taxi		2	0.0	0.0	7665955.0
03 - Light Goods Vehicles<=2.5t		3	109.9	74275.4	0.0	03 - Light Goods Vehicles<=2.5t		3	109.9	74275.4	0.0
04 - Lt Goods Vehicles 2.5-3.5t		4	67129.2	3549671.3	0.0	04 - Lt Goods Vehicles 2.5-3.5t		4	67129.2	3549671.3	0.0
05 - Light Goods Vehicles>3.5t		5	0.0	2547736.5	0.0	05 - Light Goods Vehicles>3.5t		5	0.0	2547736.5	0.0
06 - Medium _Heavy Goods Vehic		6	0.0	1055561.3	0.0	06 - Medium _Heavy Goods Vehic		6	0.0	1055561.3	0.0
07 - Medium _Heavy Goods Vehicles>1		7	0.0	2849234.3	0.0	07 - Medium _Heavy Goods Vehicles>1		7	0.0	2849234.3	0.0
08 - Public Light Buses		8	0.0	485980.8	815425.1	08 - Public Light Buses		8	0.0	485980.8	815425.1
09 - Private Light Bus <=3.5t	S	9	60387.8	41022.6	0.0	09 - Private Light Bus <=3.5t	5	9	60387.8	41022.6	0.0
10 - Private Light Bus >3.5t	Cla	10	105.6	183583.6	49542.4	10 - Private Light Bus >3.5t	las	10	105.6	183583.6	49542.4
11 - Non-franchised Bus<=6.4t	le	11	0.0	347714.9	0.0	11 - Non-franchised Bus<=6.4t	e l	11	0.0	347714.9	0.0
12 - Non-franchised Bus 6.4-15t	hic	12	0.0	239203.8	0.0	12 - Non-franchised Bus 6.4-15t	hic	12	0.0	239203.8	0.0
13 - Non-franchised Bus >15t	1	13	0.0	343950.8	0.0	13 - Non-franchised Bus >15t	Ve	13	0.0	343950.8	0.0
14 - Franchised Bus (SD)		14	0.0	72384.1	0.0	14 - Franchised Bus (SD)		14	0.0	72384.1	0.0
15 - Franchised Bus (DD)		15	0.0	1265799.5	0.0	15 - Franchised Bus (DD)		15	0.0	1265799.5	0.0
16 - Motorcycles (MC)		16	1317946.8	0.0	0.0	16 - Motorcycles (MC)		16	1317946.8	0.0	0.0
17 - <placeholder (p1)=""></placeholder>		17	0.0	0.0	0.0	17 - <placeholder (p1)=""></placeholder>		17	0.0	0.0	0.0
18 - <placeholder (p2)=""></placeholder>		18	0.0	0.0	0.0	18 - <placeholder (p2)=""></placeholder>		18	0.0	0.0	0.0
19 - <placeholder (p3)=""></placeholder>		19	0.0	0.0	0.0	19 - <placeholder (p3)=""></placeholder>		19	0.0	0.0	0.0
20 - <placeholder (p4)=""></placeholder>		20	0.0	0.0	0.0	20 - <placeholder (p4)=""></placeholder>		20	0.0	0.0	0.0
21 - <placeholder (p5)=""></placeholder>		21	0.0	0.0	0.0	21 - <placeholder (p5)=""></placeholder>		21	0.0	0.0	0.0
Applu	C	ncel	1	Done		Apply		ancal	1	Done	
Арру	La	ncei		Done		Арру		aricei		Done	

## Exercise #5b: Changing VKT (Directly)

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

## Exercise #5b: Editing VKT Screen

### 2030 VKT (Base Case)

otal VKT for area			Copy with	n Headings	Paste Data Only
Hong Kong SAH					
diting Mode		E	Editing VKT (vehicle	km traveled per we	ekday)
Total VKT By Vehicle Class By Vehicle .	and Fuel	By Veh	icle/Fuel/Hour		
			Fuel (1=P	etrol/2=Diesel/3	=LPG)
			1	2	3
)1 - Private Cars (PC)			21887260.0	171471.0	0.0
02 - Taxi		2	0.0	0.0	7665955.0
03 - Light Goods Vehicles<=2.5t		3	109.9	74275.4	0.0
04 - Lt Goods Vehicles 2.5-3.5t		4	67129.2	3549671.3	0.0
15 - Light Goods Vehicles>3.5t		5	0.0	2547736.5	0.0
16 - Medium _Heavy Goods Vehic		6	0.0	1055561.3	0.0
17 - Medium _Heavy Goods Vehicles>1		7	0.0	2849234.3	0.0
18 - Public Light Buses		8	0.0	485980.8	815425.1
19 - Private Light Bus <=3.5t	5	9	60387.8	41022.6	0.0
0 - Private Light Bus >3.5t	Cla	10	105.6	183583.6	49542.4
1 - Non-franchised Bus<=6.4t	le	11	0.0	347714.9	0.0
2 - Non-franchised Bus 6.4-15t	hic	12	0.0	239203.8	0.0
3 - Non-franchised Bus >15t	A	13	0.0	343950.8	0.0
4 - Franchised Bus (SD)		14	0.0	72384.1	0.0
5 - Franchised Bus (DD)		15	0.0	1265799.5	0.0
6 - Motorcycles (MC)		16	1317946.8	0.0	0.0
7 - <placeholder (p1)=""></placeholder>		17	0.0	0.0	0.0
8 - <placeholder (p2)=""></placeholder>		18	0.0	0.0	0.0
9 - <placeholder (p3)=""></placeholder>		19	0.0	0.0	0.0
0 - <placeholder (p4)=""></placeholder>		20	0.0	0.0	0.0
.1 - <placeholder (p5)=""></placeholder>		21	0.0	0.0	0.0
		38	1	- 1	

### 2030 VKT (After VKT Edit)

tal VKT for	area			Copy wit	h Headings	Paste Data On
	Hong Kong SAR					
iting Mode			E	Editing VKT (vehicle	e km traveled per we	ekday)
[otal VKT ]	By Vehicle Class By Vehicle	e and Fuel	BuVeh	icle/Fuel/Hour		
			3, 101	Fuel (1=P	etrol/2=Diesel/3	=LPG)
				Tuci (T	2	3
1 - Private 0	Cars (PC)		1	1609000.0	171471.0	0.0
2 · Taxi			2	0.0	0.0	7665955.0
3 - Light Go	ods Vehicles<=2.5t		3	109.9	74275.4	0.0
4 - Lt Good	s Vehicles 2.5-3.5t		4	67129.2	3549671.3	0.0
5 - Light Go	ods Vehicles>3.5t	les>1	5	0.0	2547736.5	0.0
6 - Medium	Heavy Goods Vehic		6	0.0	1055561.3	0.0
7 - Medium	Heavy Goods Vehicles>1		7	0.0	2849234.3	0.0
8 - Public Li	ight Buses		8	0.0	485980.8	815425.1
9 - Private L	.ight Bus ≺=3.5t	2	9	60387.8	41022.6	0.0
0 - Private L	ight Bus >3.5t	las	10	105.6	183583.6	49542.4
1 - Non-fran	ichised Bus<=6.4t	le	11	0.0	347714.9	0.0
2 - Non-fran	ichised Bus 6.4-15t	hic	12	0.0	239203.8	0.0
3 - Non-fran	ichised Bus >15t	N°	13	0.0	343950.8	0.0
4 - Franchis	ed Bus (SD)		14	0.0	72384.1	0.0
5 - Franchis	ed Bus (DD)		15	0.0	1265799.5	0.0
6 - Motorcy	cles (MC)		16	1317946.8	0.0	0.0
7 - <placeh< td=""><td>older (P1)&gt;</td><td></td><td>17</td><td>0.0</td><td>0.0</td><td>0.0</td></placeh<>	older (P1)>		17	0.0	0.0	0.0
B - < Placeh	older (P2)>		18	0.0	0.0	0.0
3 - <placeh< td=""><td>older (P3)&gt;</td><td></td><td>19</td><td>0.0</td><td>0.0</td><td>0.0</td></placeh<>	older (P3)>		19	0.0	0.0	0.0
0 - <placeh< td=""><td>older (P4)&gt;</td><td></td><td>20</td><td>0.0</td><td>0.0</td><td>0.0</td></placeh<>	older (P4)>		20	0.0	0.0	0.0
I - <placeh< td=""><td>older (P5)&gt;</td><td></td><td>21</td><td>0.0</td><td>0.0</td><td>0.0</td></placeh<>	older (P5)>		21	0.0	0.0	0.0
			8			
	1	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1		1	1	

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

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

## Exercise #5c: Solution

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

### Notes:

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

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

## Exercise #6: Changing Trips

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

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

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

## Exercise #6a: Notes

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

### Exercise #6a: Base Case Values

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

Hong Kong SAR			Copy with	Headings	Paste Data Only				
diting Mode		Editing	Cal Pop (registered v	ehicles with adjust	ments)				
Total Cal Pop   By Vehicle Class   By Veh	icle and Fu	el Nu V	ehicle/Fuel/Age						
		Fuel (1=Petrol/2=Diesel/3=LPG)							
			1	2	3				
01 - Private Cars (PC)			783924.3	6113.0	0.0				
02 - Taxi		2	0.0	0.0	18193.0				
03 - Light Goods Vehicles<=2.5t		3	1.9	1002.7	0.0				
04 - Lt Goods Vehicles 2.5-3.5t		4	1057.4	53816.4	0.0				
05 - Light Goods Vehicles>3.5t		5	0.0	26652.7	0.0				
06 - Medium _Heavy Goods Vehic		6	0.0	12730.9	0.0				
07 · Medium_Heavy Goods Vehicles>1		7	0.0	34347.2	0.0				
08 - Public Light Buses	s	8	0.0	1622.9	2723.1				
09 - Private Light Bus <=3.5t		9	631.6	404.4	0.0				
10 - Private Light Bus >3.5t	Clas	10	2.4	2340.0	667.6				
11 - Non-franchised Bus<=6.4t	le	11	0.0	2932.0	0.0				
12 - Non-franchised Bus 6.4-15t	ehic	12	0.0	2054.0	0.0				
13 - Non-franchised Bus >15t	A	13	0.0	2958.0	0.0				
14 - Franchised Bus (SD)		14	0.0	388.0	0.0				
15 - Franchised Bus (DD)		15	0.0	5403.0	0.0				
16 - Motorcycles (MC)		16	70665.1	0.0	0.0				
17 · <placeholder (p1)=""></placeholder>		17	0.0	0.0	0.0				
18 - <placeholder (p2)=""></placeholder>		18	0.0	0.0	0.0				
13 - < Flaceholder (F3)>		19	0.0	0.0	0.0				
20 - < Placeholder (P4)>		20	0.0	0.0	0.0				
21 · < Flaceholder (F5)>		21	0.0	0.0	0.0				

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

Total Trips-pe	r-Day for area			Copy with	Headings	Paste Data Onl
	Hong Kong SAR					
Editing Mode			-	Editing Trips-pe	r-Day (starts per wee	ekday)
Total Trips-	per-Day By Vehicle Class By	Vehicle a	nd Fuel	B Vehicle/Fuel/H	our	
		$\square$		Fuel (1=Pe	trol/2=Diesel/3=	LPG)
				1	2	3
01 - Private	Cars (PC)		1	1176004.1	9170.4	0.0
02 - Taxi			2	0.0	0.0	72779.3
03 - Light Go	oods Vehicles<=2.5t		3	7.8	4011.3	0.0
04 - Lt Good	s Vehicles 2.5-3.5t		4	4230.2	215287.3	0.0
05 - Light Go	oods Vehicles>3.5t		5	0.0	106610.7	0.0
06 - Medium	_Heavy Goods Vehic		6	0.0	50918.7	0.0
07 - Medium	_Heavy Goods Vehicles>1		7	0.0	137375.0	0.0
08 - Public L	ight Buses		8	0.0	6491.0	10891.2
09 - Private I	Light Bus <=3.5t	S	9	1768.4	1132.1	0.0
10 - Private I	Light Bus >3.5t	Clas	10	6.6	6551.4	1869.2
11 - Non-fram	nchised Bus<=6.4t	le (	11	0.0	11729.2	0.0
12 - Non-fran	nchised Bus 6.4-15t	hic	12	0.0	8216.8	0.0
13 - Non-fran	nchised Bus >15t	Ve	13	0.0	11833.2	0.0
14 - Franchis	sed Bus (SD)		14	0.0	4140.4	0.0
15 - Franchis	sed Bus (DD)		15	0.0	57632.7	0.0
16 - Motorcy	cles (MC)		16	424032.8	0.0	0.0
17 - <placeh< td=""><td>iolder (P1)&gt;</td><td></td><td>17</td><td>0.0</td><td>0.0</td><td>0.0</td></placeh<>	iolder (P1)>		17	0.0	0.0	0.0
18 - <placeh< td=""><td>older (P2)&gt;</td><td></td><td>18</td><td>0.0</td><td>0.0</td><td>0.0</td></placeh<>	older (P2)>		18	0.0	0.0	0.0
19 - <placeh< td=""><td>iolder (P3)&gt;</td><td></td><td>19</td><td>0.0</td><td>0.0</td><td>0.0</td></placeh<>	iolder (P3)>		19	0.0	0.0	0.0
20 - <placeh< td=""><td>older (P4)&gt;</td><td></td><td>20</td><td>0.0</td><td>0.0</td><td>0.0</td></placeh<>	older (P4)>		20	0.0	0.0	0.0
21 - <placeh< td=""><td>older (P5)&gt;</td><td></td><td>21</td><td>0.0</td><td>0.0</td><td>0.0</td></placeh<>	older (P5)>		21	0.0	0.0	0.0
	Annlu	C	ancel		Done	
	0999		uniosi		DONO	

# Exercise #6a: Trips Adjustment using Population

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

- 783,924 x 0.2126 = 166,650 vehicles

## Exercise #6a: Population Edits

### 2030 Population (Base Case)

otal Cal Pop for area			Copy with	Headings	Paste Data Only
Hong Kong SAH					
diting Mode		Editing	Cal Pop (registered v	vehicles with adjustr	nents)
Total Cal Pop   By Vehicle Class By Vehic	cle and Fu	el ByV	ehicle/Fuel/Age		
		/	Fuel (1=Pe	trol/2=Diesel/3=	LPG)
			1	2	3
)1 - Private Cars (PC)		1	783924.3	6113.0	0.0
12 · Taxi		2	0.0	0.0	18193.0
3 - Light Goods Vehicles<=2.5t		3	1.9	1002.7	0.0
4 - Lt Goods Vehicles 2.5-3.5t		4	1057.4	53816.4	0.0
5 - Light Goods Vehicles>3.5t		5	0.0	26652.7	0.0
6 - Medium _Heavy Goods Vehic		6	0.0	12730.9	0.0
7 · Medium_Heavy Goods Vehicles>1		7	0.0	34347.2	0.0
8 - Public Light Buses		8	0.0	1622.9	2723.1
9 - Private Light Bus <=3.5t		9	631.6	404.4	0.0
0 - Private Light Bus >3.5t	Clas	10	2.4	2340.0	667.6
1 · Non-franchised Bus<=6.4t	le	11	0.0	2932.0	0.0
2 - Non-franchised Bus 6.4-15t	hic	12	0.0	2054.0	0.0
3 - Non-franchised Bus >15t	Ve	13	0.0	2958.0	0.0
4 · Franchised Bus (SD)		14	0.0	388.0	0.0
5 - Franchised Bus (DD)		15	0.0	5403.0	0.0
6 · Motorcycles (MC)		16	70665.1	0.0	0.0
7 · <placeholder (p1)=""></placeholder>		17	0.0	0.0	0.0
8 - <placeholder (p2)=""></placeholder>		18	0.0	0.0	0.0
9 - <placeholder (p3)=""></placeholder>		19	0.0	0.0	0.0
U - <placeholder (p4)=""></placeholder>		20	0.0	0.0	0.0
1 · <placeholder [p5]=""></placeholder>		21	0.0	0.0	0.0
	_				
1			1	1	

### 2030 Population (Edited for Trips Match)

			Copy with	Headings	Paste Data
Hong Kong SAR					
ing Mode		Editing Ca	al Pop (registered v	vehicles with adjustr	nents)
otal Cal Pop By Vehicle Class By Vehicle ar	nd Fue	ByVeh	nicle/Fuel/Age		
		107.0	Fuel (1=Pe	trol/2=Diesel/3=	(PG)
			1	2	3
Private Cars (PC)		1	166650.0	6113.0	0.0
- Taxi		2	0.0	0.0	18193.0
- Light Goods Vehicles<=2.5t		3	1.9	1002.7	0.0
- Lt Goods Vehicles 2.5-3.5t	-	4	1057.4	53816.4	0.0
- Light Goods Vehicles>3.5t		5	0.0	26652.7	0.0
- Medium _ Heavy Goods Vehic		6	0.0	12730.9	0.0
- Medium_Heavy Goods Vehicles>1		7	0.0	34347.2	0.0
Public Light Buses		8	0.0	1622.9	2723.1
<ul> <li>Private Light Bus &lt;=3.5t</li> </ul>	5	9	631.6	404.4	0.0
- Private Light Bus >3.5t	las	10	2.4	2340.0	667.6
<ul> <li>Non-franchised Bus&lt;=6.4t</li> </ul>	le	11	0.0	2932.0	0.0
Non-franchised Bus 6.4-15t	hic	12	0.0	2054.0	0.0
- Non-franchised Bus >15t	Ve	13	0.0	2958.0	0.0
- Franchised Bus (SD)		14	0.0	388.0	0.0
<ul> <li>Franchised Bus (DD)</li> </ul>		15	0.0	5403.0	0.0
- Motorcycles (MC)		16	70665.1	0.0	0.0
< <placeholder (p1)=""></placeholder>		17	0.0	0.0	0.0
< <placeholder (p2)=""></placeholder>		18	0.0	0.0	0.0
< <placeholder (p3)=""></placeholder>		19	0.0	0.0	0.0
< <placeholder (p4)=""></placeholder>		20	0.0	0.0	0.0
<ul> <li>Placeholder (P5)</li> </ul>		21	0.0	0.0	0.0

### Exercise #6a: Verify Trips Adjustment

### 2030 Trips (Base Case)

### Editing Trips-per-Day data for scenario 1: Hong Kong SAR Annual CYr 2030 Default Title Total Trips-per-Day for area Copy with Headings Paste Data Only Hong Kong SAR Editing Mode Editing Trips-per-Day (starts per weekday) By Vehicle and Fuel Total Trips-per-Day By Vehicle Class y Vehicle/Fuel/Hour Fuel (1=Petrol/2=Diesel/3=LPG) 2 3 01 · Private Cars (PC) 1176004.1 9170.4 0.0 02 · Taxi 0.0 2 0.0 72779.3 03 - Light Goods Vehicles<=2.5t 3 7.8 4011.3 0.0 04 - Lt Goods Vehicles 2.5-3.5t 4 4230.2 215287.3 0.0 05 - Light Goods Vehicles>3.5t 5 0.0 106610.7 0.0 06 - Medium Heavy Goods Vehic 6 0.0 50918.7 0.0 07 · Medium _ Heavy Goods Vehicles>1 7 0.0 137375.0 0.0 08 - Public Light Buses 8 0 0 6491.0 10891.2 09 - Private Light Bus <=3.5t 9 1768.4 1132.1 0.0 Vehicle Class 10 - Private Light Bus > 3.5t 10 6.6 6551.4 1869.2 11 · Non-franchised Bus<=6.4t 11 11729.2 0.0 0.0 12 - Non-franchised Bus 6.4-15t 12 8216.8 0.0 0.0 13 - Non-franchised Bus >15t 13 11833.2 0.0 0.0 14 - Franchised Bus (SD) 14 0.0 4140.4 0.0 15 - Franchised Bus (DD) 15 57632.7 0.0 0.0 16 · Motorcycles (MC) 16 424032.8 0.0 0.0 17 · < Placeholder (P1)> 17 0.0 0.0 0.0 18 - < Placeholder (P2)> 18 0.0 0.0 0.0 19 · < Placeholder (P3)> 19 0.0 0.0 0.0 20 · <Placeholder (P4)> 20 0.0 0.0 0.0 21 - <Placeholder (P5)> 21 0.0 0.0 0.0 Cancel Done

### 2030 Trips (After Pop Edit)

		Copy with	Headings	Paste Data On
	-	Editing Trips-pe	r-Day (starts per wee	ekday)
Vehicle a	nd Fuel	By Vehicle/Fuel/H	our	
$\overline{\mathbf{N}}$		Fuel (1=Pe	trol/2=Diesel/3=	LPG)
			2	3
		250000.0	9170.4	0.0
	2	0.0	0.0	72779.3
	3	7.8	4011.3	0.0
	4	4230.2	215287.3	0.0
	5	0.0	106610.7	0.0
	6	0.0	50918.7	0.0
	7	0.0	137375.0	0.0
	8	0.0	6491.0	10891.2
5	9	1768.4	1132.1	0.0
las	10	6.6	6551.4	1869.2
le	11	0.0	11729.2	0.0
hic	12	0.0	8216.8	0.0
Ve	13	0.0	11833.2	0.0
	14	0.0	4140.4	0.0
	15	0.0	57632.7	0.0
	16	424032.8	0.0	0.0
	17	0.0	0.0	0.0
	18	0.0	0.0	0.0
	19	0.0	0.0	0.0
	20	0.0	0.0	0.0
	21	0.0	0.0	0.0
	Vehicle Class	Vehicle and Fuel	Licpy with Editing Trips-pe Vehicle and Fuel By Vehicle/Fuel/H Fuel (1=Pe 250000.0 2 0.0 3 7.8 4 4230.2 5 0.0 6 0.0 7 0.0 8 0.0 9 1768.4 10 6.6 11 0.0 12 0.0 13 0.0 14 0.0 15 0.0 16 424032.8 17 0.0 18 0.0 19 0.0 20 0.0 20 0.0 20 0.0 19 0.0 19 0.0 20 0.0 20 0.0 19 0.0 10	Lopy with Headings           Editing Trips-per-Day (starts per were           Vehicle and Fuel         By Vehicle/Fuel/Hour           Fuel (1=Petrol/2=Diesel/3=           1         2           2         0.0           3         7.8           4         4230.2           5         0.0           3         7.8           4         4230.2           5         0.0           10         6.6           9         1768.4           11         0.0           12         0.0           13         0.0           14         0.0           15         0.0           17         0.0           18         0.0           19         0.0           12         0.0           13         0.0           14         0.0           17         0.0           18         0.0           19         0.0           10         0.0

## Exercise #6a: VKT Adjustment after Population Adjustment

### 2030 VKT (Base Case)

### 2030 VKT (After Pop Edit)

Editing Mode Total VKT By Vehicle Class By Vehicle and Fuel 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 >1 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 <= 6.4t	E By Vehi 1 2 3 4 5 6 7 8 9	diting VKT (vehicle icle/Fuel/Hour 1 21887260.0 0.0 109.9 67129.2 0.0 0.0 0.0 0.0	trol/2=Diesel/3 2 171471.0 0.0 74275.4 3549671.3 2547736.5 1055561.3 2849234.3	=LPG) 3 0.0 7665955.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0	Editing Mode Total VKT 01 - Private C 02 - Taxi 03 - Light Gor 04 - Lt Goods 05 - Medium
Editing Mode       Total VKT     By Vehicle Class       01 - Private Cars (PC)       02 - Taxi       03 - Light Goods Vehicles<=2.5t	1 2 3 4 5 6 7 8 9	atting VKT (venicle icle/Fuel/Hour) Fuel (1=P 1 21887260.0 0.0 109.9 67129.2 0.0 0.0 0.0 0.0 0.0	etrol/2=Diesel/3 2 171471.0 0.0 74275.4 3549671.3 2547736.5 1055561.3 2849234.3	=LPG) 3 0.0 7665955.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0	01 - Private C 02 - Taxi 03 - Light Gor 04 - Lt Goods 05 - Marting
Total VKT     By Vehicle Class     By Vehicle and Fuel       01 - Private Cars (PC)     02 - Taxi       03 - Light Goods Vehicles<=2.5t	2 3 4 5 6 7 8 9	Fuel/Hour           Fuel (1=P           1           21887260.0           0.0           109.9           67129.2           0.0           0.0           0.0           0.0           0.0           0.0	etrol/2=Diesel/3 2 171471.0 0.0 74275.4 3549671.3 2547736.5 1055561.3 2849234.3	=LPG) 3 0.0 7665955.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0	Total VKT 01 - Private C 02 - Taxi 03 - Light Gov 04 - Lt Goods 05 - Light Gov
01 - Private Cars (PC)         02 - Taxi           03 - Light Goods Vehicles<=2.5t	1 2 3 4 5 6 7 8 9	Fuel (1=P 1 21887260.0 109.9 67129.2 0.0 0.0 0.0 0.0 0.0	etrol/2=Diesel/3 2 171471.0 0.0 74275.4 3549671.3 2547736.5 1055561.3 2849234.3	=LPG) 3 0.0 7665955.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0	01 - Private C 02 - Taxi 03 - Light Gov 04 - Lt Goods 05 - Light Gov
01 - Private Cars (PC)         02 - Taxi           03 - Light Goods Vehicles <= 2.5t	1 2 3 4 5 6 7 8 9	1 21887260.0 109.9 67129.2 0.0 0.0 0.0 0.0	2 171471.0 0.0 74275.4 3549671.3 2547736.5 1055561.3 2849234.3	3 0.0 7665955.0 0.0 0.0 0.0 0.0 0.0	01 - Private C 02 - Taxi 03 - Light Gor 04 - Lt Goods 05 - Light Gor
01 - Private Cars (PC)           02 - Taxi           03 - Light Goods Vehicles <= 2.5t	1 2 3 4 5 6 7 8 9	21887260.0 0.0 109.9 67129.2 0.0 0.0 0.0 0.0	171471.0 0.0 74275.4 3549671.3 2547736.5 1055561.3 2849234.3	0.0 7665955.0 0.0 0.0 0.0 0.0 0.0	01 - Private C 02 - Taxi 03 - Light Goo 04 - Lt Goods 05 - Light Goo
02 - Taxi 03 - Light Goods Vehicles <= 2.5t 04 - Lt Goods Vehicles 2.5-3.5t 05 - Light Goods Vehicles 3.3 5t 06 - Medium _Heavy Goods Vehic 07 - Medium _Heavy Goods Vehicles >1 08 - Public Light Buss 09 - Private Light Buss <= 3.5t 10 - Private Light Bus <= 3.5t 11 - Non-franchised Bus <= 6.4t 12 - Non-franchised Bus 6.4-15t	2 3 4 5 6 7 8 9	0.0 109.9 67129.2 0.0 0.0 0.0 0.0	0.0 74275.4 3549671.3 2547736.5 1055561.3 2849234.3	7665955.0 0.0 0.0 0.0 0.0 0.0	02 - Taxi 03 - Light God 04 - Lt Goods 05 - Light God
03 - Light Goods Vehicles <= 2.5t 04 - Lt Goods Vehicles 2.5-3.5t 05 - Light Goods Vehicles 3.3.5t 06 - Medium _Heavy Goods Vehic 07 - Medium _Heavy Goods Vehicles >1 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	3 4 5 6 7 8 9	109.9 67129.2 0.0 0.0 0.0 0.0	74275.4 3549671.3 2547736.5 1055561.3 2849234.3	0.0 0.0 0.0 0.0 0.0	03 - Light Goo 04 - Lt Goods 05 - Light Goo
04 - Lt Goods Vehicles 2.5-3.5t 05 - Light Goods Vehicles>3.5t 06 - Medium _Heavy Goods Vehicles>1 07 - Medium _Heavy Goods Vehicles>1 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	4 5 6 7 8 9	67129.2 0.0 0.0 0.0 0.0	3549671.3 2547736.5 1055561.3 2849234.3	0.0 0.0 0.0	04 - Lt Goods 05 - Light Goo
05 - Light Goods Vehicles>3.5t 06 - Medium _Heavy Goods Vehicles>1 07 - Medium _Heavy Goods Vehicles>1 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 14	5 6 7 8 9	0.0 0.0 0.0 0.0	2547736.5 1055561.3 2849234.3	0.0 0.0 0.0	05 - Light Goo
06 - Medium_Heavy Goods Vehic 07 - Medium_Heavy Goods Vehicles>1 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 14	6 7 8 9	0.0 0.0 0.0	1055561.3 2849234.3	0.0	06 - Medium
07 - Medium, Heavy Goods Vehicles>1           08 - Public Light Busses           09 - Private Light Bus <=3.5t	7 8 9	0.0	2849234.3	0.0	00 · Mediani
08 - Public Light Buses         99 - Private Light Bus <=3.5t	8	0.0			07 · Medium
09 - Private Light Bus <=3.5t	9		485980.8	815425.1	08 - Public Lig
10 - Private Light Bus > 3.5t         9           11 - Non-franchised Bus         -6.4t           12 - Non-franchised Bus 6.4-15t         9		60387.8	41022.6	0.0	09 - Private L
11 - Non-franchised Bus<=6.4t 12 - Non-franchised Bus 6.4-15t	10	105.6	183583.6	49542.4	10 - Private L
12 - Non-franchised Bus 6.4-15t	11	0.0	347714.9	0.0	11 - Non-fran
	12	0.0	239203.8	0.0	12 - Non-fran
13 - Non-franchised Bus >15t 🔰 🎽	13	0.0	343950.8	0.0	13 - Non-fran
14 - Franchised Bus (SD)	14	0.0	72384.1	0.0	14 - Franchise
15 - Franchised Bus (DD)	15	0.0	1265799.5	0.0	15 - Franchise
16 - Motorcycles (MC)	16	1317946.8	0.0	0.0	16 - Motorcyc
17 - <placeholder (p1)=""></placeholder>	17	0.0	0.0	0.0	17 - <placeho< td=""></placeho<>
18 - <placeholder (p2)=""></placeholder>	18	0.0	0.0	0.0	18 - <placeho< td=""></placeho<>
19 - <placeholder (p3)=""></placeholder>	19	0.0	0.0	0.0	19 - <placeho< td=""></placeho<>
20 - <placeholder (p4)=""></placeholder>	20	0.0	0.0	0.0	20 - <placeho< td=""></placeho<>
21 - <placeholder (p5)=""></placeholder>	21	0.0	0.0	0.0	21 - <placeho< td=""></placeho<>
		1	1		

			Copy with	h Headings	Paste Data Only
Hong Kong SAR					
diting Mode		E	diting VKT (vehicle	km traveled per we	ekday)
Total VKT By Vehicle Class By Vehicle	and Fuel	P Veh	icle/Fuel/Hour		
	K		Fuel (1=P	etrol/2=Diesel/3	=LPG)
				2	3
01 - Private Cars (PC)		1	4652888.0	171471.0	0.0
02 - Taxi		2	0.0	0.0	7665955.0
)3 - Light Goods Vehicles<=2.5t		3	109.9	74275.4	0.0
04 - Lt Goods Vehicles 2.5-3.5t		4	67129.2	3549671.3	0.0
)5 - Light Goods Vehicles>3.5t		5	0.0	2547736.5	0.0
06 - Medium _Heavy Goods Vehic		6	0.0	1055561.3	0.0
)7 · Medium_Heavy Goods Vehicles>1		7	0.0	2849234.3	0.0
08 - Public Light Buses		8	0.0	485980.8	815425.1
)9 - Private Light Bus <=3.5t	Class	9	60387.8	41022.6	0.0
0 - Private Light Bus >3.5t		10	105.6	183583.6	49542.4
1 - Non-franchised Bus<=6.4t	le	11	0.0	347714.9	0.0
2 - Non-franchised Bus 6.4-15t	hic	12	0.0	239203.8	0.0
3 - Non-franchised Bus >15t	A	13	0.0	343950.8	0.0
4 - Franchised Bus (SD)		14	0.0	72384.1	0.0
5 - Franchised Bus (DD)		15	0.0	1265799.5	0.0
6 - Motorcycles (MC)		16	1317946.8	0.0	0.0
7 - <placeholder (p1)=""></placeholder>		17	0.0	0.0	0.0
18 - <placeholder (p2)=""></placeholder>		18	0.0	0.0	0.0
9 - <placeholder (p3)=""></placeholder>		19	0.0	0.0	0.0
20 - < Placeholder (P4)>		20	0.0	0.0	0.0
21 · < Flaceholder (FDJ>		21	0.0	0.0	0.0

## Exercise #6b: Changing Trips (Directly)

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

## Exercise #6b: Editing Trips Screen

### 2030 Trips (Base Case)

### Editing Trips-per-Day data for scenario 1: Hong Kong SAR Annual CYr 2030 Default Title Total Trips-per-Day for area Copy with Headings Paste Data Only 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) 1 2 3 01 - Private Cars (PC) 1 1176004.1 9170.4 0.0 02 · Taxi 2 0.0 72779.3 03 - Light Goods Vehicles<=2.5t 3 7.8 4011.3 0.0 04 - Lt Goods Vehicles 2.5-3.5t 4 4230.2 215287.3 0.0 05 · Light Goods Vehicles>3.5t 5 0.0 106610.7 0.0 06 - Medium Heavy Goods Vehic 6 0.0 50918.7 0.0 07 · Medium_Heavy Goods Vehicles>1 7 0.0 137375.0 0.0 08 - Public Light Buses 8 0.0 6491.0 10891.2 09 - Private Light Bus <=3.5t 9 1768.4 1132.1 0.0 Vehicle Class 10 - Private Light Bus > 3.5t 10 6551.4 6.6 1869.2 11 · Non-franchised Bus<=6.4t 11 0.0 11729.2 0.0 12 · Non-franchised Bus 6.4-15t 12 0.0 8216.8 0.0 13 · Non-franchised Bus >15t 13 0.0 11833.2 0.0 14 - Franchised Bus (SD) 14 0.0 4140.4 0.0 15 - Franchised Bus (DD) 15 0.0 57632.7 0.0 16 - Motorcycles (MC) 16 424032.8 0.0 0.0 17 - < Placeholder (P1)> 17 0.0 0.0 0.0 18 - < Placeholder (P2)> 18 0.0 0.0 0.0 19 · < Placeholder (P3)> 19 0.0 0.0 0.0 20 · < Placeholder (P4)> 20 0.0 0.0 0.0 21 · <Placeholder (P5)> 21 0.0 0.0 0.0 Apply Cancel Done

### 2030 Trips (After Trips Edit)

otal Trips-pe	r-Day for area Hong Kong SAR			Copy with	Headings	Paste Data On
diting Mode				Editing Trips-pe	r-Day (starts per wee	ekday)
Total Trips-	per-Day By Vehicle Class By	Vehicle a	nd Fuel	By Vehicle/Fuel/H	our	
				Fuel (1=Pe	etrol/2=Diesel/3=	LPG)
					2	3
01 - Private	Cars (PC)		6	250000.0	9170.4	0.0
12 - Taxi			2	0.0	0.0	72779.3
)3 - Light G	oods Vehicles<=2.5t		3	7.8	4011.3	0.0
)4 - Lt Good	ds Vehicles 2.5-3.5t		4	4230.2	215287.3	0.0
)5 - Light G	oods Vehicles>3.5t		5	0.0	106610.7	0.0
06 - Medium	_Heavy Goods Vehic		6	0.0	50918.7	0.0
)7 - Medium	_Heavy Goods Vehicles>1		7	0.0	137375.0	0.0
8 - Public L	ight Buses		8	0.0	6491.0	10891.2
9 - Private	Light Bus <=3.5t	52	9	1768.4	1132.1	0.0
0 - Private	Light Bus >3.5t	las	10	6.6	6551.4	1869.2
1 - Non-fra	nchised Bus<=6.4t	le	11	0.0	11729.2	0.0
2 - Non-fra	nchised Bus 6.4-15t	hic	12	0.0	8216.8	0.0
3 - Non-fra	nchised Bus >15t	Ve	13	0.0	11833.2	0.0
4 - Franchi	sed Bus (SD)		14	0.0	4140.4	0.0
5 - Franchi	sed Bus (DD)		15	0.0	57632.7	0.0
6 - Motorcy	voles (MC)		16	424032.8	0.0	0.0
7 - < Placeł	nolder (P1)>		17	0.0	0.0	0.0
8 - < Placel	nolder (P2)>		18	0.0	0.0	0.0
9 - <placel< td=""><td>nolder (P3)&gt;</td><td></td><td>19</td><td>0.0</td><td>0.0</td><td>0.0</td></placel<>	nolder (P3)>		19	0.0	0.0	0.0
20 - <placeł< td=""><td>nolder (P4)&gt;</td><td></td><td>20</td><td>0.0</td><td>0.0</td><td>0.0</td></placeł<>	nolder (P4)>		20	0.0	0.0	0.0
21 - <placeł< td=""><td>nolder (P5)&gt;</td><td></td><td>21</td><td>0.0</td><td>0.0</td><td>0.0</td></placeł<>	nolder (P5)>		21	0.0	0.0	0.0
	Applu	C	ancel		Done	

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

- Problem: determine difference in NOx running and starting exhaust emissions output from Exercises #6a and #6b for PC petrol cars.
- Purpose: examine results from alternate trip edit approaches
- Extract/compare NOx running and starting exhaust emissions from Test/*.CSV. Use values for the day.

- Note: you'll need to add results for NCAT and CAT

## Exercise #6c: Solution

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

Notes:

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

## Exercise #7: Speed Distributions

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

## Exercise #7: Speed Distributions

- Problem: Determine change in emissions in 2015 for HGV7 (Vehicle Class 6) and HGV8 (Vehicle Class 7) given the revised speed distribution below.
- Scenario data:
  - Geographic Area: Hong Kong SAR
  - Calendar Years: 2015
  - Season: Annual
  - Scenario Type: BURDEN
  - Output File types: Text (CSV), BCD
  - Output Frequency: daily
  - Pollutants: PM₁₀, VOC
- Speed Fractions:

5% of the VKT occurs at average speed 1-8 km/hr (Speed Bin #1); 25% at 24-32 km/hr (Speed Bin #4); 20% at 48-56 km/hr (Speed Bin #7); 25% at 56-64 km/hr (Speed Bin #8) and 25% at 64-72 km/hr (Speed Bin #9).

## Exercise #7: Profiles/Speed Tab



## Exercise #7: Editing Speed Fractions

2015 Speed Fractions (HGV7)

About to Copy Edits from Spreadsheet

### 2015 Speed Fractions (HGV7) **Base Case**

a: I Ho	Hong Ko	long SAR			Scena	nio Year: 2010	) <u>Copy with</u>	Headings	Paste Data On	Scenario Year: 2030 <u>Copy with Headings</u> <u>E</u>	Paste Data
T۰۷	/eighte	ed Average	Basis:	8 KPH	16 KPP	Vehicle Clas	06: Heavy	Goods Vehic	:les (5.5-15t) 💌	Basis: 8 KPH 16 KPH Vehicle Class: 06: Heavy Goods Vehic	les (5.5-15t)
					nour (1 to	24)			1	Hour (1 to 24)	
Ì		1	2	3	4	5	6	7	8	2 3 4 5 6 7	8
	1	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	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	0.0000 0.0000 0.0000 0.0000 0.0000	0.000
	3	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 0.0000 0.0000 0.0000 0.0000	0.000
	4	0.2682	0.2682	0.2682	0.2682	0.2682	0.2682	0.2682	0.1915	Editing speed fractions	0.191
	5	0.0374	0.0374	0.0374	0.0374	0.0374	0.0374	0.0374	0.0401	0374	0.040
	6	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0000	0.000
	7	0.3277	0.3277	0.3277	0.3277	0.3277	0.3277	0.3277	0.2579	3277	0.257
	8	0.0197	0.0197	0.0197	0.0197	0.0197	0.0197	0.0197	0.0310	Paste 24 hours of speed fractions data?	0.03
	9	0.3469	0.3469	0.3469	0.3469	0.3469	0.3469	0.3469	0.4795	3469	0.47
	10	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0000	0.00
	11	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.000
	12	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	<u>Y</u> es <u>N</u> o	0.00
_	13	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0000	0.00
_	14	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 0.0000 0.0000 0.0000 0.0000	0.00
	15	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 0.0000 0.0000 0.0000 0.0000	0.000
L	16	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 0.0000 0.0000 0.0000 0.0000	0.000
L	17	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 0.0000 0.0000 0.0000 0.0000	0.000
	18	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 -	0.0000 0.0000 0.0000 0.0000 0.0000	0.000
	Tota	ul 100 % in ea hour	ach	Apply	Can	cel	Done	App	y to Others	each Apply Cancel Done App	ly to Oth

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

### Exercise #7: Editing Speed Fractions

### 2015 Speed Fractions (HGV7) Base Case

										_
(1.)	Weighte	ed Average	Basis:	8 KPH	16 KPH	Vehicle Class	< 06: Heavy	Goods Vehic	:les (5.5-15t)	•
					Hour (1 to	24)				1
		1	2	3	4	5	6	7	8	
	1	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	-
	2	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
	3	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	۲
	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	
2	6	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
Ξl	7	0.3277	0.3277	0.3277	0.3277	0.3277	0.3277	0.3277	0.2579	
I	8	0.0197	0.0197	0.0197	0.0197	0.0197	0.0197	0.0197	0.0310	
4	9	0.3469	0.3469	0.3469	0.3469	0.3469	0.3469	0.3469	0.4795	
3	10	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
Ĩ	11	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
2	12	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
ě	13	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
2	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	
C									•	
	Tet	al 100 % in es	ch /	unolu I	Can	cel I	Done	And And	u to Others	
	100	hour	,,	Abbia	Can		Done		ny to Others	_

### 2015 Speed Fractions (HGV7) Edits Applied

rea: H	Hong I ong Ko	Kong SAR ng SAR			Scena	nio Year: 2015	Copy with	Headings	Paste Data I
<t-\< th=""><th>Veight</th><th>ed Average</th><th>Basis:</th><th>8 KPH</th><th>16 KPH</th><th>Vehicle Class</th><th>06: Heavy</th><th>Goods Vehic</th><th>les (5.5-15t)</th></t-\<>	Veight	ed Average	Basis:	8 KPH	16 KPH	Vehicle Class	06: Heavy	Goods Vehic	les (5.5-15t)
					Hour (1 to	24)	- 31		
Ì		1	2	2	4	c	6	7	8
4	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
18	6	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
3	7	0.0000	0.2000	0.2000	0.2000	0.2000	0.2000	0.2000	0.2000
1	8	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500
	-	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500
7.	10	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
E	11	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
9	12	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
bee	13	0.0000	0.0000	0.0000	0.0000	0.0000	0.000	0.0000	0.0000
n	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	0.000	0.0000	0.0000
	16	0.0000	0.0000	0.0000	0.0000	0.0000	0.000	0.0000	0.0000
	17	0.0000	0.0000	0.0000	0.0000	0.0000	0.000	0.000	0.0000
	18	0.0000	0.0000	0.0000	0.0000	0.0000	0.000	0.0000	0.0000
		III.							۲.
	Tot	al 100 % in e hour	ach 🦳 🧷	Apply	Can	cel	Done	App	ly to Others

# Exercise #7: Apply Speed Fraction Edits to Other Hours

### Speed Fractions by Scenario Year and Vehicle Class Area: Hong Kong SAR Scenario Year: 2030 Copy with Headings Paste Data Only Hong Kong SAR 8 KPH 16 KPH Vehicle Class: VKT-Weighted Average Basis: 06: Heavy Goods Vehicles (5.5-15ť 👻 Hour (1 to 24) 2 7 1 3 6 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 0.0 Apply to Range? 3 0 0000 0 0000 0 0000 4 0.2000 0.2 0.2000 0.2000 5 0.0000 0.0 0.0000 0.0000 Apply This Profile to a 8.16.24 10:18 6 0.0000 0.0 0.0000 0.0000 Range of Values? 7 0.2500 0.2 0.2500 0.2500 8 0.2500 0.2500 0.2 0.2500 Parameters 9 0.2500 0.2 0.2500 0.2500 ✓ Vehicle Class 10 0.0000 0.0 0.0000 0.0000 11 0.0000 0 0 0 0000 0.0000 Bin 12 0.0000 0.0000 0.0000 0.0 13 0.0000 0.0 0.0000 0.0000 OK Cancel 14 0.0000 0.0 0.0000 0.0000 15 0.0000 0.0 0.0000 0.0000 16 0 0000 0 0000 0 0000 0 0 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 Apply to Others Total 100 % in each Cancel Done hour

### **Apply Edit to Another Veh Class**

### **Apply Edit to HGV8**



### Exercise #7: Solution

X	1 🖬 🤊 -	(	-	No. of Concession, name		Ex7.x	lsx - Microsof	t Excel	_	-	-	-		(IC		X
	File H	lome D	eveloper	Insert Page	e Layout Formulas [	Data F	Review Vie	w De	eveloper	Acrobat				2	<b>?</b> -	67 X
	From Acce From Web	ss From Oth Sources Set External	ner Existi • Connec Data	ing ctions Refresh All +	Connections     2↓     2.	t Filte	r K Clear Reapply r Advance Filter	ed Colu	to Remo	Data Tools	ta Validation nsolidate hat-If Analysis	Group	Ungroup Su Outline	btotal	igt Inhol Inhol	
	D14	L .	<b>-</b> (°	f.x.												*
	A	В	С	D	E	F	G	Н	- I	J	K	L	М	N	0	
1	Base	START MYR	END MYR	REGION	SAR	STARTS	POPULI ATION	VKT	VEH TYPE	VEH TECH	POLILITANT	PROCESS	EMISSIONS	BASIS		
3	2015	1971	2015	SAR Average	Hong Kong SAR Average	47248	11813	980825	HGV7	DSL	NOx	Run Exh	3.221954	Day		
4	2015	1971	2015	SAR Average	Hong Kong SAR Average	127473	31871	2646047	HGV8	DSL	NOx	Run Exh	14.517085	Day		
5																
6	TDM															
7	CALYR	START MYR	END MYR	REGION	SAR	STARTS	POPULATION	VKT	VEH TYPE	VEH TECH	POLLUTANT	PROCESS	EMISSIONS	BASIS		
8	2015	1971	2015	SAR Average	Hong Kong SAR Average	47248	11813	980825	HGV7	DSL	NOx	Run Exh	3.401024	Day		
9	2015	1971	2015	SAR Average	Hong Kong SAR Average	127473	31871	2646047	HGV8	DSL	NOx	Run Exh	15.19208	Day		
10																-
11	4 + + 5	heet1 /S	heet2 / Sl	neet3 / 🔁 /								1111			<u></u>	
R	eady 🛅												u 85% —			÷

## Exercise #8: Changing RH

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

## Exercise #8: Entering Different Relative Humidity Values

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

## Exercise #8: Changing RH

### **RH Annual (Default)**

### **RH Annual from RH.XLS**

			VK	Are -Weigh	a: Hong Month: ted Ave	g Kong S Annual grage of	AR 1 Sub-a	reas		1		}	
Hong Ko	ng SAR												F
Belative	Humiditu	(%)					Cop	y with H	eadings	Paste	Data O	nly	<u> </u>
11010170	. romony	(-9)			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		
	□ Mo	odify Val	ues for F	lange o	f Hours								
			to					Consta	nt Value	for Rar	nge		
		1	1		c.,	and I	1				1		

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

Suggested steps:

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

💼 Emfac-HK V3.1 Editing data			
<u>File R</u> un <u>H</u> elp		HONE	
Environmental Protection D The Government of the Hong Kong Special Administrative Region	epartment		permitted by Air Resources Board California
Emfac-HK V3.1 v3.	1 20160104 Pr: Emfac-HK HK3	3.1	
[MAIN]. ]. ]. ]. ]. ].			
List of Available Scenarios		No file or sce	enario
	Current Scenario Data		
	Number: 0 of 0 Name:		
	Calendar Year:		
	Season:		
	Туре:		
	IM Program Parameters	Save	
		Save As	
	Add New Scenario	Run	
	Edit Sconario	Finish Editing	
	Delete Scenario	Cancel	
* Denotes currently active scenario	Regime Size Change Data		1
	🔽 Apply	Regime Changes **	
	%	Reduction Start	
	Category-Fuel His	ghs Supers Year	
	Tavid PG	20 20 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 a	apply to all scenarios.	
		••••	

4) On Tab "INPUT1", under *Step 2a - Target Years*, click "**Select**"

5) On the "Target Year Selection" screen, click "**2030**" in the *Available* column; then, click ">". The target year 2030 should appear in the "Included" column. Click "**OK**".



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

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

💼 Emfac-HK V3.1 Editing data	
<u>File Run H</u> elp	
The Government of the Hong Kong Special Administrative Region	HONG KONG Air Resources Board California
Emfac-HK V3.1 V3.1 20160104 Pr: Emfac-HK HK3.1	
. Input 1 Input 2	
Basic scenario data - Select Area, Calculation Method, Calendar Year, Alternate Base Yea	Alternate Base Year Selection
Step 1 - Geographic Area	Available Included
Area Type: SAR SAR	
SAR     Hong Kong       Step 2a - Calendar Year     Step 2b - Alternate Base Year       Select     Select       Calendar year 2030     Selected       Scenario Year for Output     OPTIONAL: Selecting this option overrides EMFAC-HK default base year.	2002 ▲ 2014 2003 2004 2005 2006 2006 2009 2009 2010 2011 2012 2013 2015 2016 2017 2018 2019 2020 2021 -
Step 3 Season or Month	All All No Alternate base data year
	<u>D</u> K <u>C</u> ancel
Cancel Next >	Finish

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

Elie Bun Help         Environmental Protection Department         be Government of the Hong Kong         special Administrative Region         CEMEAC-HIK V3.1 V3.1 20160104 Pr: Emfac-HK HK3.1         Input 1 Input 2         Input 1 Input 2         Step 1 - Geographic Area         Area Type: SAR         SAR         Hong Kong         Step 2a - Calendar Year         Area Type: SAR         Step 2a - Calendar Year         Calendar year 2030         selected         Scenario Year for Dutput         OPTIONAL: Selecting this         option xer selected         Scenario Year for Dutput	🞦 Emfac-HK V3.1 Editing data	
Environmental Protection Department       Image: Comparison of the Hong Kong Special Administrative Region         Emfac-HK V3.1 v3.1 20160104 Pr: Emfac:HK HK3.1         Imput 1       Input 2         Imput 1       Input 2         Step 1 - Geographic Area         Area Type: SAR         SAR             Step 2 - Calendar Year         Step 2 - Calendar Year	<u>File Run H</u> elp	
Emfac-HK V3.1 v3.1 20160104 Pr: Emfac-HK HK3.1	Environmental Protection Department The Government of the Hong Kong Special Administrative Region	permitted by Air Resources Board California
Basic scenario data - Select Area, Calculation Method, Calendar Year, Alternate Base Year and Season          Step 1 - Geographic Area         Area Type: SAR         SAR         Hong Kong         Step 2a - Calendar Year         Calendar Year         Select         Calendar year 2030         selected         Scenario Year for Output	Emfac-HK V3.1 V3.1 20160104 Pr: Emfac-HK HK3.1	
Basic scenario data - Select Area, Calculation Method, Calendar Year, Alternate Base Year and Season          Step 1 - Geographic Area         Area Type: SAR       SAR         Hong Kong         SAR         Hong Kong         Step 2a - Calendar Year         Actrivate Base Year         Actrivate Base Year         Activate Base Year         Atternate Base Year         Atternate Base Year         OPTIONAL: Selecting this         Option overrides EMFAC-HK         default base year.	. Input 1 Input 2	
Step 1 - Geographic Area Area Type: SAR SAR SAR Hong Kong SAR Step 2a - Calendar Year Select Calendar year 2030 selected Scenario Year for Output Step 2 - Searce or Month	Basic scenario data - Select Area, Calculation Method, Calendar Year, Alternate Base Year and Season	
Area Type: SAR SAR Hong Kong SAR Hong Kong SAR Sar Sar Sar Sar Step 2a - Calendar Year Select Calendar year 2030 selected Scenario Year for Output Step 2a - Calendar Year Calendar year 2030 selected Scenario Year for Output Step 2a - Calendar Year Calendar year 2030 selected Scenario Year for Output Step 2a - Calendar Year Calendar year 2030 selected Scenario Year for Output Step 2a - Calendar Year Calendar year 2030 selected Scenario Year for Output Step 2a - Calendar Year Calendar year 2030 selected Scenario Year for Output Step 2a - Calendar Year Calendar year 2030 selected Scenario Year for Output Step 2a - Calendar Year Calendar year 2030 selected Scenario Year for Output Step 2a - Calendar Year Step 2a - Calendar Year Activity Selecting this option overrides EMFAC-HK default base year.	Step 1 - Geographic Area	
SAR     Hong Kong       Step 2a - Calendar Year     Step 2b - Alternate Base Year       Select     ACTIVATED       Calendar year 2030 selected     Alternate Base data year 2014 selected       Scenario Year for Output     OPTIONAL: Selecting this option overrides EMFAC-HK default base year.	Area Type: SAR SAR	
Step 2a - Calendar Year Select Calendar year 2030 selected Scenario Year for Output Step 2b - Alternate Base Year ACTIVATED Alternate Base data year 2014 selected OPTIONAL: Selecting this option overrides EMFAC-HK default base year.	Hong Kong 🗸	
Step 2a - Calendar Year         Select         Calendar year 2030         selected         Scenario Year for Output         OPTIONAL: Selecting this option overrides EMFAC-HK default base year.		
Step 2a - Calendar Year         Select         Calendar year 2030         selected         Scenario Year for Output    Selecting this option overrides EMFAC-HK default base year.		
Step 2a - Calendar Year <u>Select</u> Calendar year 2030 selected Scenario Year for Output Step 2b - Alternate Base Year <u>ACTIVATED</u> Alternate Base data year 2014 selected OPTIONAL: Selecting this option overrides EMFAC-HK default base year.		
Step 2a - Calendar Year       Step 2b - Alternate Base Year         Select       ACTIVATED         Calendar year 2030       Alternate Base data         selected       Scenario Year for Output         OPTIONAL: Selecting this option overrides EMFAC-HK         default base year.		
Step 2a - Lalendar Year     Step 2b - Alternate Base Year       Select     ACTIVATED       Calendar year 2030     Alternate Base data       selected     Scenario Year for Output       OPTIONAL: Selecting this       option overrides EMFAC-HK       default base year		
Select       ACTIVATED         Calendar year 2030 selected       Alternate Base data year 2014 selected         Scenario Year for Output       OPTIONAL: Selecting this option overrides EMFAC-HK default base year.	Step 28 - Calendar Year	
Calendar year 2030 selected Scenario Year for Output Scenario Year for Output	Select	
Scenario Year for Output OPTIONAL: Selecting this option overrides EMFAC-HK default base year.	Calendar year 2030 Alternate Base data selected year 2014 selected	
option overrides EMFAC-HK default base year.	Scenario Year for Output OPTIONAL: Selecting this	
- Step 2 - Season or Month-	option overrides EMFAC-HK default base year.	
- Step 2 - Season or Month		
Step 5 * Season of Month	Step 3 Season or Month	
Annual	Annual	
Cancel Next > Finish	Cancel Next > Finish	

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

Environmental Pro	tection Department	HONG	
Special Administrative Re	ong Kong gion	KONG	permitted by Air Resources E California
mfac-HK V	<b>3. 1</b> V3.1 20160104 Pr: En	nfac-HK HK3.1	
Input 1 Input 2 Mode and	Output	. ]. ]	
Basic scenario data - Select or Entr	er Scenario Lifle		_
- Step 4 - Scenario Title for Repor	ts		
Hong Kong SAR Annual CYr 20	30 Default Title	Default Title	
			2
In Emfac Impact	Hate reports, titles over 40 characters	s will be truncated!	
Step 5 - Model Years	Step 6 - Vehicle Classes	Step 7 - I/M Program Sched	ule
All model years selected	MODIFIED: All vehicle classes selected	Standard I/M schedules	
All	All	Default	
Modify	Maditu	Madilu	
	Modily	Modify	

15) Click "Next" and proceed to the Mode and Output screen.

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

<u>R</u> un <u>H</u> elp			HONG	
The Governm Special Admi	ental Prot ent of the Ho nistrative Regi	ection Department ng Kong on	KONG	permitted by Air Resources I California
mfac-H	IK V3	<b>1</b> V3.1 20160104 Pi	: Emfac-HK HK3.1	
Input 1 Input 2	2 Mode and 0	utput   Tech/IM   Base / Ca	I. Yr Basis	search 1
Scenario Type: BURDEN	- BURDEN Inv	entory Files and Reports	C Hour C Day	
<ul> <li>Area-Specific</li> <li>Planning</li> <li>Emissions</li> <li>Inventory</li> </ul>	Detailed E	mission Estimates (CSV)	C Total PM PM10 C PM25	;
(tonnes/day) 	Weighted	BCD( Model Year Activity (WT)	Output Hydrocarbons As C TOG C THC © VOC C CH4	
	Detailed 0	utputs (BDN) s Tech Groups 🗖 Spee	ds Speed categories	ı/h
			1 Edit Program	

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

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

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

🗈 Emfac-HK V3.1 Editing data
<u>File Run H</u> elp
Environmental Protection Department The Government of the Hong Kong Special Administrative Region
Emfac-HK V3.1 V3.1 20160104 Pr: Emfac-HK HK3.1
.   Input 1   Input 2   Mode and Output   Tech/IM   Base Yr Basis (2014)   Population   .   .
Editing - Calendar Year Basis for Activity
Select the calendar year basis for editing activity data: 2014 (Alt. Base Pop) Active
Cancel < Back Next > Finish

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

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

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

💼 Emfac-HK V3.1 -	- Editing data			
<u>File R</u> un <u>H</u> elp				
The Government of Special Action	nmental Protectio rnment of the Hong Kor dministrative Region	n Department	HONG per KONG Air Cal	mitted by Resources Board ifornia
Emfac-	<u>HK V3.1</u>	V3.1 20160104 Pr: Emfac-HK HK3.1		
. Input 1 Inp	out 2 Mode and Output	Tech/IM   Base Yr Basis (2014) Population		
	Editing Program Cons	tants - Population for Alternate Base year 2014		
(	Population	Edit the vehicle population		
	Accrual	Edit the odometer accrual *		
		Info * Accrual is independent of cale	indarwear	
			Notice the "Adbutton is gray	ed out.
	Cancel	<back next=""></back>	Finish	

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

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

25) Select "Copy with Headings".

diting Base Pop data for scenario 1: Hong Kong SAR Annual CYr 2030 Default Title							
Tota	Base Pop	p for area			Copy with Headin	ngs Paste Data Only	
		Hong Kong SAR	Í.				
Editir	s with adjustments)						
Total Base Pop   Bu Vehicle Class   Bu Vehicle and Fuel   Bu Vehicle/Fuel/Age							
	Adi Dase i	op   by verileie ele	Vehicle Cla	ee		•	
		10	19	20	21	-	
	25	10	19	20	21		
	26	0.0	0.0	0.0	0.0		
	27	0.0	0.0	0.0	0.0	Fuel Type	
	28	0.0	0.0	0.0	0.0	Petrol	
	29	0.0	0.0	0.0	0.0		
	30	0.0	0.0	0.0	0.0	Diesel	
	31	0.0	0.0	0.0	0.0	100	
	32	0.0	0.0	0.0	0.0		
	33	0.0	0.0	0.0	0.0		
e	34	0.0	0.0	0.0	0.0		
A	35	0.0	0.0	0.0	0.0		
	36	0.0	0.0	0.0	0.0		
	37	0.0	0.0	0.0	0.0		
	38	0.0	0.0	0.0	0.0		
	39	0.0	0.0	0.0	0.0	-	
	40	0.0	0.0	0.0	0.0	-	
	41	0.0	0.0	0.0	0.0		
	42	0.0	0.0	0.0	0.0		
	43	0.0	0.0	0.0	0.0		
	44	0.0	0.0	0.0	0.0		
	45	0.0	0.0	0.0	0.0		
•							
		Apply		Cancel	Done		

26) Open a Microsoft Excel blank spreadsheet. Paste data into Cell A1. Paste data again at Cell C24 (a formula will be used to edit this portion of the data)

27) Adjust column width of "A", so vehicle class label can be seen.

28) At Cell B25, enter the formula "=**B2*1.05**". Copy this formula to the data range (C25:AT45). Values highlighted below in yellow with "blue" text illustrate the formula cells.



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

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

Edit	Editing Base Pop data for scenario 1: Hong Kong SAR Annual CYr 2030 Default Title							
T	otal	Base Pop	o for area			Copy with Heading	s Paste Data Only	
			Hong Kong SAR	1				
E	ditin	a Mode			F	diting Base Pop (u:	ser-entered data)	
-	T	-10				Euel/Age		
l í	100	al Base F	rop   By Venicle Li	ass   By Venicle and F	uel by vehicle/	li l		
			~ 1	Vehicle Class	s		- Î I	
			1	2	3	4		
		1	41843.5	0.0	0.0	52.4		
		2	44911.1	0.0	0.0	75.1	- Fuel Type	
		3	43858.5	0.0	2.1	1/6.5	Petrol	
		4 c	42001.8	0.0	0.0	100.7		
		6	27712 9	0.0	0.0	282.4	Diesel	
		7	34322 1	0.0	0.0	97.3		
		8	32342.7	0.0	0_0	341.5	LPG	
		9	26464.0	0.0	1.0	133.5		
	e	10	25150.8	0.0	0.0	126.7		
	Ag	11	24582.2	0.0	0.0	68.0		
		12	18960.0	0.0	0.0	63.5		
		13	22777.8	0.0	5.0	48.9		
		14	22604.5	0.0	4.0	67.2		
		15	18997.9	0.0	2.0	94.8		
		16	13383.5	0.0	1.0	25.1		
		17	11510.6	0.0	0.0	11.4		
		18	10548.9	0.0	0.9	2.8		
		19	3310.0	0.0	2.8	0.9		
		20	2210.0	0.0	13.7	1.8		
		21	2022.9	0.0	4.5	0.9	<b>v</b>	
	•	III				+		
-		-/						
			Apply	Ca	ncel	Done		

17) Click "Finish"

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

Exercise #10: Future Projections (Accelerated Retirement)

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

## Exercise #10: Future Projections

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

### Exercise #11 – HK Expressway



## Exercise #11 – HK Expressway Emission Factor

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

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

## Exercise #11 – Expressway Fleet Profile

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

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

### Exercise #11 – Expressway Link (cont.)

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

### Exercise #11 – Expressway Link (cont.)

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

# Exercise #11 (cont.)

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

# Exercise #12: Build/No-Build

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

## Exercise #12: Build/No-Build

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

# Exercise #13: EIA Example

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

### Exercise #13: Road Extent Example



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

# Exercise #13 – EIA Example

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

# Exercise #13: Simplifications

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

## Exercise #13: EIA Example

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