Briefing on EMFAC-HK upgrade

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Outline

- Application of EMFAC-HK
- Changes made in EMFAC-HK Upgrade (V3.3)
- Comparison of emissions and fleet average emission factors (FAEF)
- Transitional Arrangement
- Meeting Air Quality Objectives

EMFAC-HK

- EMFAC-HK is a tool for estimating vehicle emissions with default vehicle emission factors and assumptions. As the emission factors and assumptions may change over time due to new data collected, some default data being outdated and policy changes, we will issue new version of EMFAC-HK when necessary and any updates will usually be made in the early part of the year.

- When using EMFAC-HK, users can apply other appropriate assumptions in estimating vehicle emissions to suit their projects/purpose. It is the user's responsibility to justify the assumptions used.

- The consultants should explain why the default values of EMFAC-HK are applicable to their case and how robust their assessments are.

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Changes in Implementation Dates of Vehicle Emission Standards

Current EMFAC-HK (V3.1.1)

Vehicle Class\ Fuel Type		Euro VI*		
		LPG	Petrol	Diesel
Private Car		NA	1.9.16	
Goods Vehicle	<= 3.5t		1.1.17	
	>3.5 t			
Bus (SD)	<= 7 t	NA	No schedule	
	>7 t		1.1.17	
Bus (DD)	--	NA	1.1.18	
Light Bus	<= 3.5t	1.1.17		
	>3.5 t	No schedule		
Taxi		1.9.16		NA

EMFAC-HK Upgrade (V3.3)

Vehicle Class\ Fuel Type		Euro VI*		
		LPG	Petrol	Diesel
Private Car		NA	1.7.17	
Goods Vehicle	<= 3.5t		1.1.18	
	>3.5 t			
Bus	<= 9 t	NA	No schedule	
	>9 t		1.1.18	
Light Bus	<= 3.5t	1.1.18		
	>3.5 t	No schedule		
Taxi		1.7.17		NA

Emfac-HK homepage, Appendix II

*Notes: * The implementation dates are for the purpose of assessment only.*

Changes in Exhaust Tech Group Indexes

Five Tech Groups: change in description

Vehicle Class	Fuel Type	Vehicle Emission Standards	EMFAC-HK V3.3	Model Year
Private car	Petrol	Euro 5~~ & 6~~	29	2012+
Taxi	LPG	Euro 5~~ & 6~~	27	2012+
	LPG	Euro 5 ~~& 6~~ CAT Replaced	21	2012+
	Petrol	Euro 5~~ & 6~~	29	2012+
Goods veh. <=2.5 t & 2.5 – 3.5 t	Petrol	Euro 5~~ & 6~~	30	2012+
Private light bus<=3.5 t	Petrol	Euro 5~~ & 6~~	31	2012+

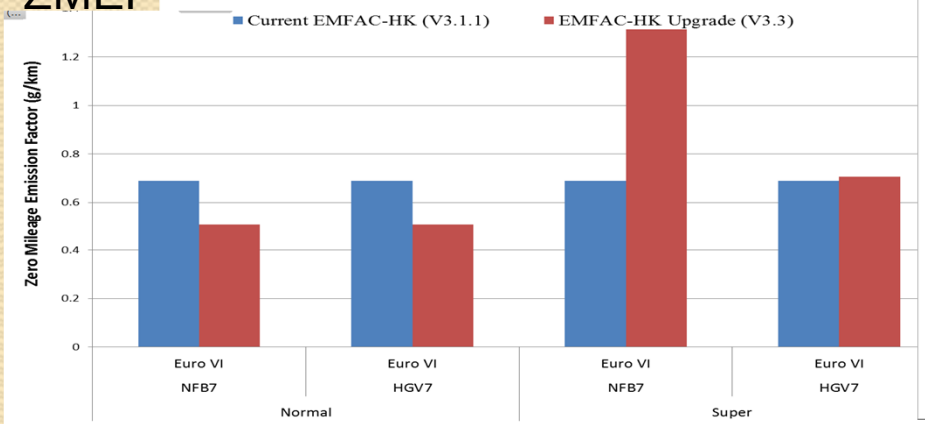
Four New Tech Groups

Vehicle Class	Fuel Type	Vehicle Emission Standards	EMFAC-HK V3.3	Model Year
Private car	Petrol	Euro 6	39	2017+
Taxi	LPG	Euro 6	47	2017+
	Petrol	Euro 6	39	2017+
Goods veh. <=2.5 t & 2.5-3.5 t	Petrol	Euro 6	38	2018+
Private light bus<=3.5 t	Petrol	Euro 6	41	2018+

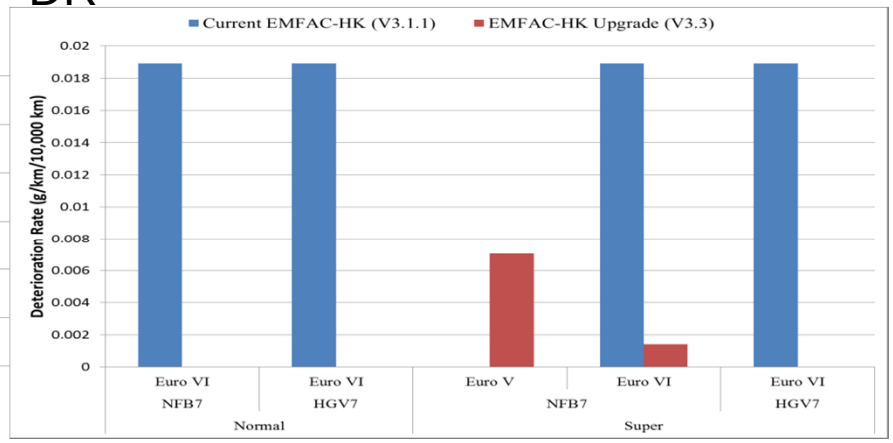
NOx Basic Emission Factors

Only NOx zero mile emission factors (ZMEFs) and deterioration rates (DR) for Euro VI goods vehicles (HGV7) and coaches (NFB7) of weight 5.5 – 15 t are different.

ZMEF



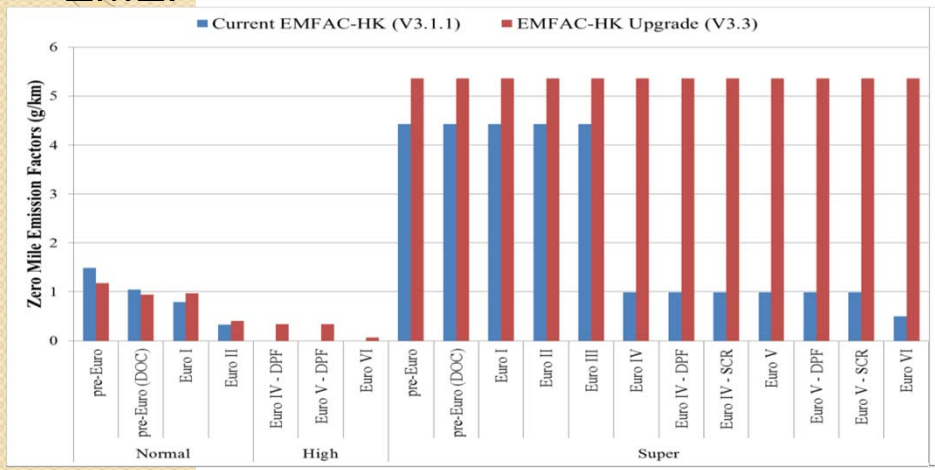
DR



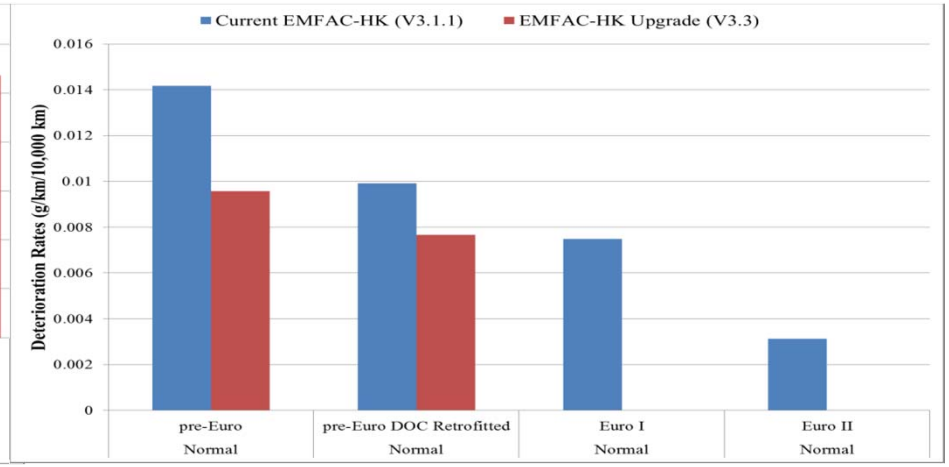
Only show those that are changed.

PM Basic Emission Factors
Example: Heavy Goods Vehicles > 15 t

ZMEF



DR



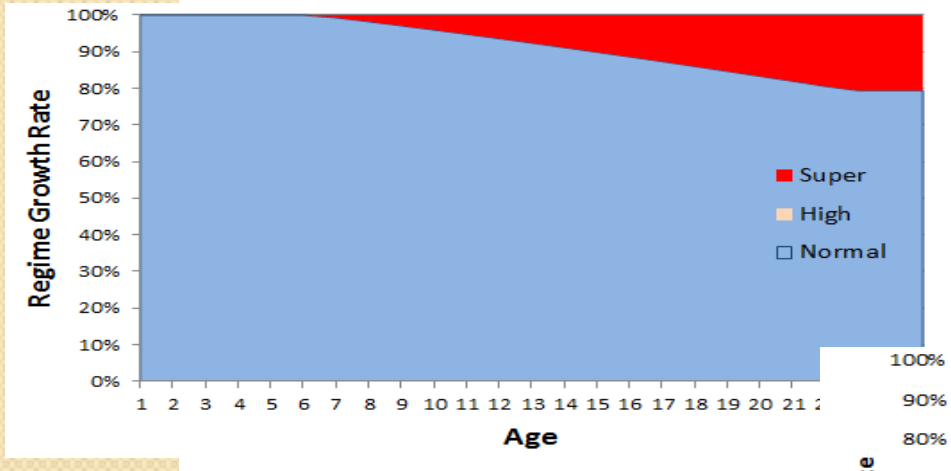
Only show those that are changed.

Occurrences of Different Emitters (Regime Growth Rates)

Current EMFAC-HK (V3.1.1)	EMFAC-HK Upgrade (V3.3)
2 PM regimes for diesel vehicles: normal & super	3 PM regimes for DPF diesel vehicles only: normal, high & super
Used smoky vehicle data to estimate regime growth rates for PM super emitters for up to pre-Euro IV	Used the same methodology for all Euro standards.
	Revised some of the PM regime growth rates
A bug in regime growth rates for pre-Euro & Euro 1petrol cars (super emitters only before I/M program)	Analyzed 2015 remote sensing data to estimate regime growth rates for LPG taxis and petrol cars.
Assumed certain percentage reductions for the regime growth rates of petrol and LPG vehicles due to I/M program (remote sensing program) from 2015	
NOx super regime of all SCR vehicles is assumed to be 18% (reference: CARB)	Lower value for new vehicles with constant increase to 18% at 10 years old
Assumed all Euro VI vehicles* are normal within vehicles' useful lives.	Euro VI in-service compliance regulation for vehicles only tests well-maintained vehicles. Therefore, included the super emitters within vehicles' useful lives.

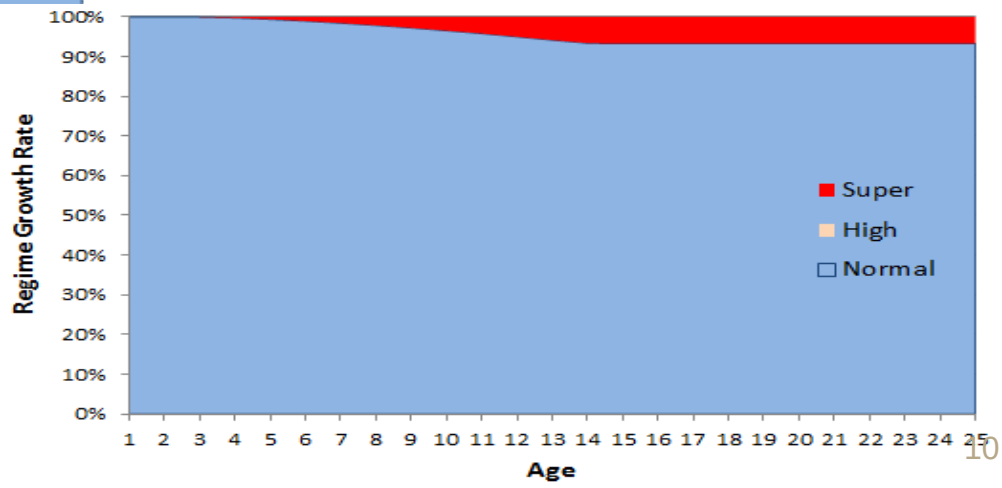
*excluding PM of private cars & private light buses <=3.5 t

Example: PM Regime Growth Rates for Goods Vehicles>15 t: pre-Euro to Euro III

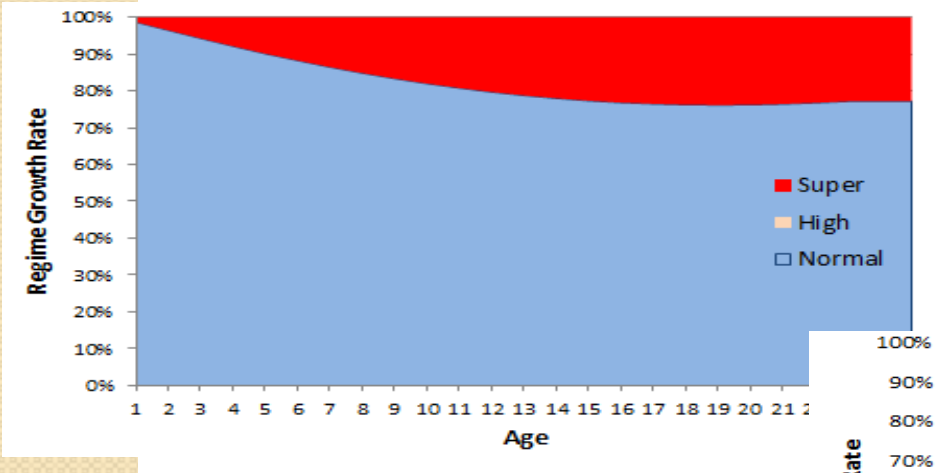


EMFAC-HK Upgrade (V3.3)

Current EMFAC-HK (V3.1.1)

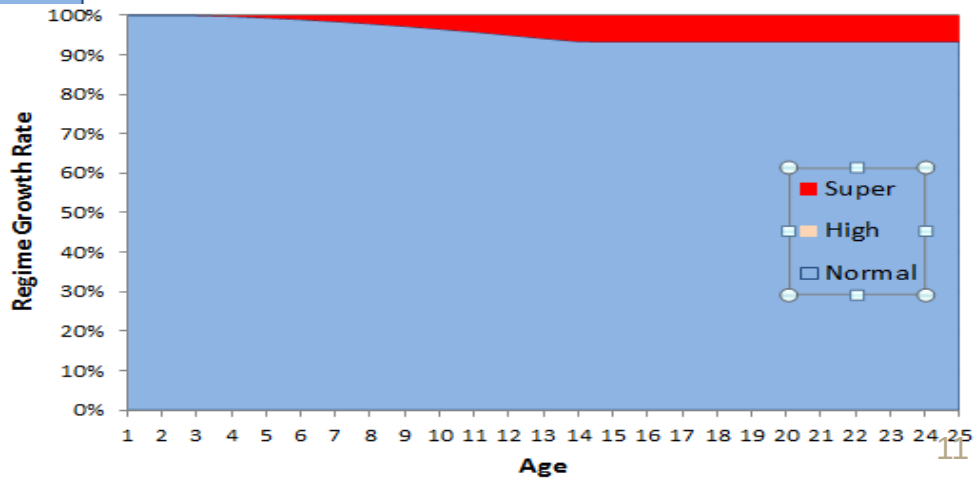


Example: PM Regime Growth Rates for Goods Vehicles>15 t: Euro IV & V without DPF

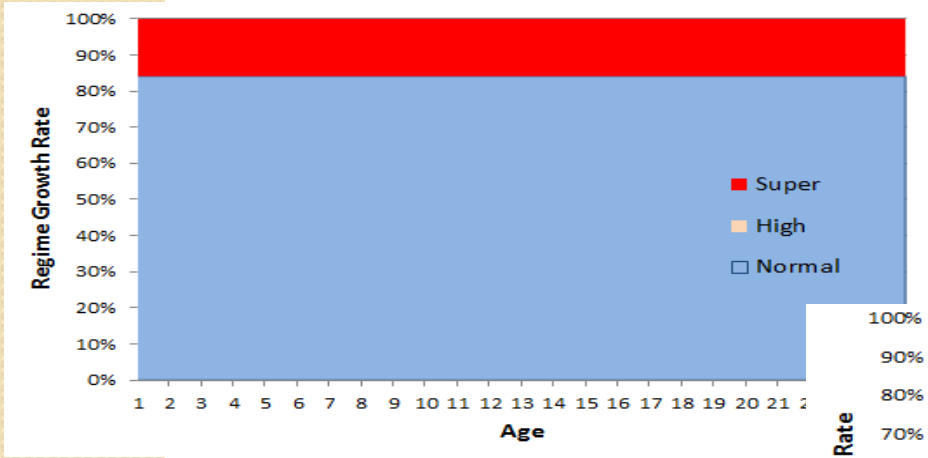


EMFAC-HK Upgrade (V3.3)

Current EMFAC-HK (V3.1.1)

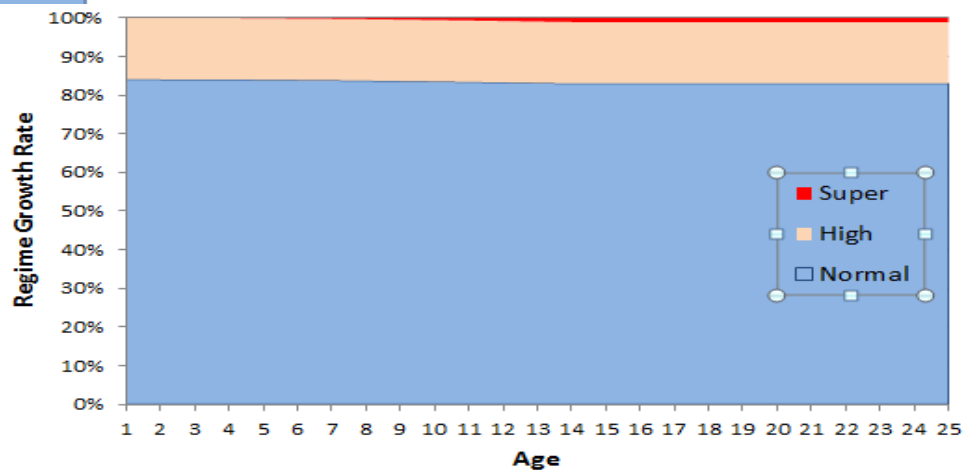


Example: PM Regime Growth Rates for Goods Vehicles>15 t: Euro IV & V with DPF

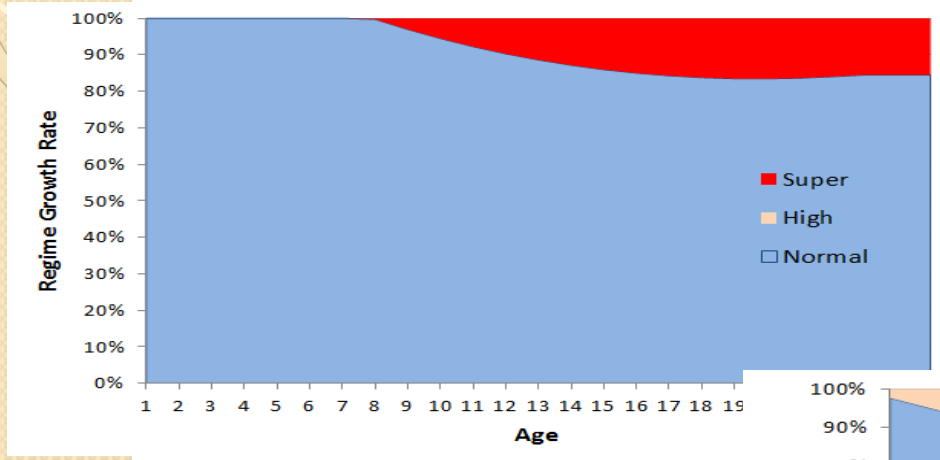


Current EMFAC-HK (V3.1.1)

EMFAC-HK Upgrade (V3.3)

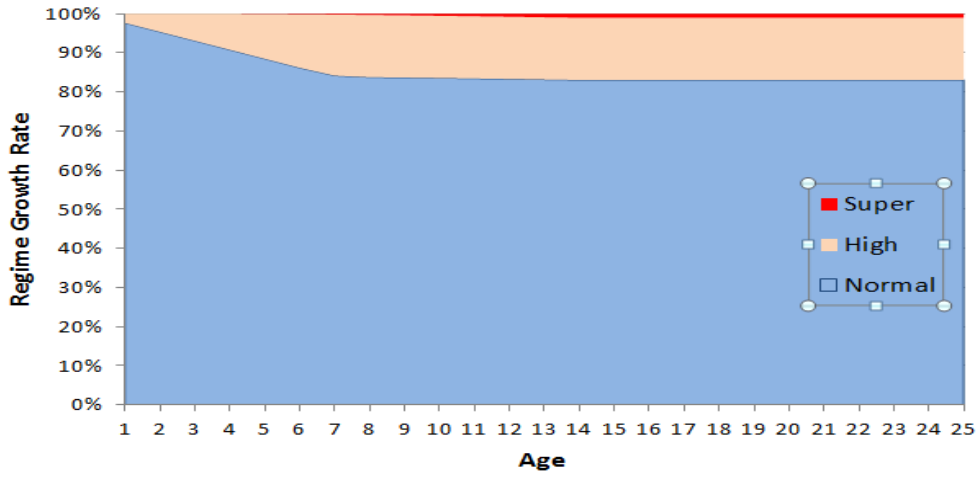


Example: PM Regime Growth Rates for Goods Vehicles>15 t: Euro VI



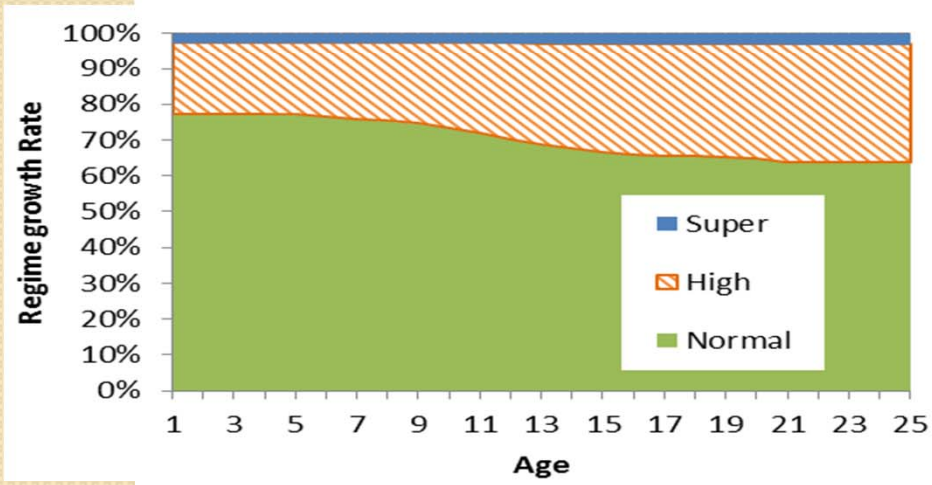
Current EMFAC-HK (V3.1.1)

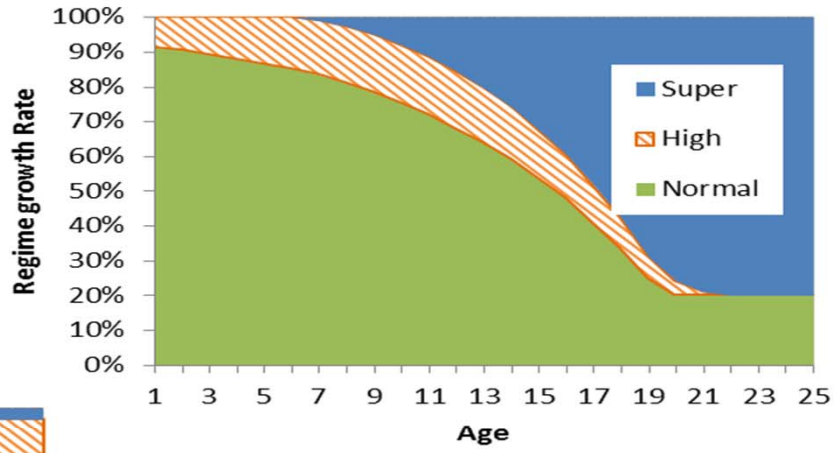
EMFAC-HK Upgrade (V3.3)



Regime Growth Rates for NOx for Petrol Cars

Current EMFAC-HK (V3.1.1)
Bug: assumed all pre-Euro & Euro 1 are super emitters before I/M program.
After I/M program, assumed 20% of high & super emitters changed to normal.

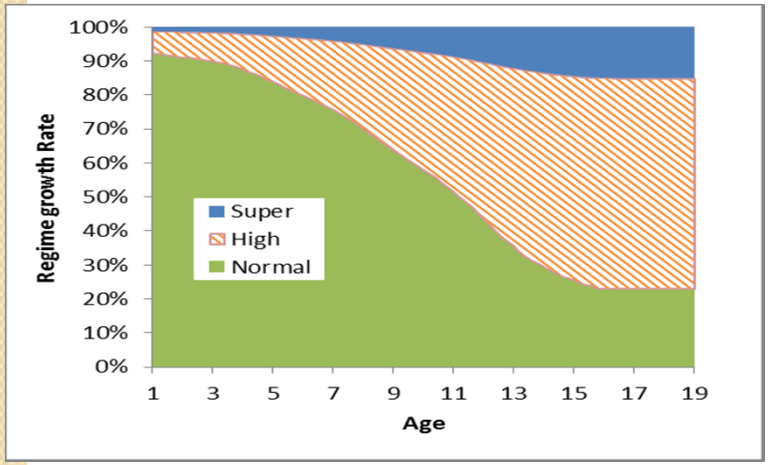


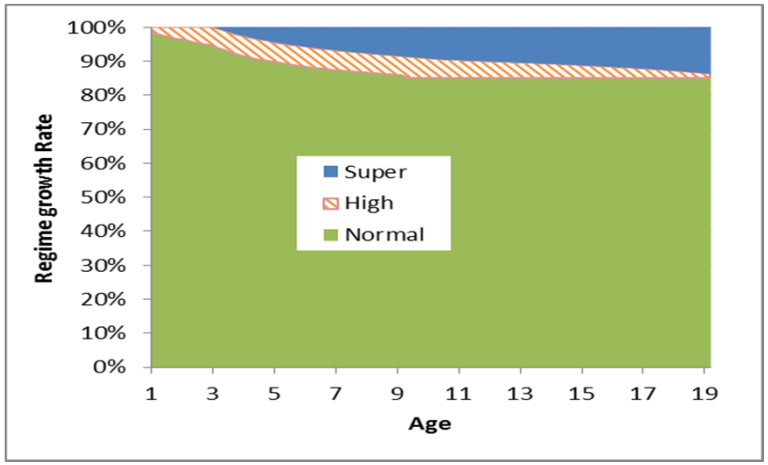


EMFAC-HK Upgrade (V3.3)
analyzing 2015 remote sensing data

Regime Growth Rates for NOx for LPG Taxis

Current EMFAC-HK (V3.1.1)
Remote sensing program (I&M) with assumption: 85% of high and super emitters have become normal emitters





EMFAC-HK Upgrade (V3.3)
analyzing 2015 remote sensing data

Comparison of Current EMFAC-HK V3.1.1 & EMFAC-HK Upgrade(V3.3)

Emission Factor Related

EMFAC-HK V3.1.1	EMFAC-HK V3.3
Updated Speed Correction Factors (SCF), zero mile emission factors (ZMEF) and deterioration rates (DR). More real-world vehicle emission data are used to determine these factors. Also, international emission factors are used as references.	Updated ZMEF and DR for • NOx for heavy duty vehicles with GVW of 5.5-15t • PM for diesel vehicles Updated PM SCFs for • High/Super regimes to be the same as the SCF for normal regimes
Used 2013 smoky vehicle data for PM super emitters for Pre-Euro IV vehicles	Used 2015 smoky vehicle data for PM super emitters for all Euro standards

Comparison of Current EMFAC-HK V3.1.1 & EMFAC-HK Upgrade(V3.3)

Modelling Methodology Related

EMFAC-HK V3.1.1	EMFAC-HK V3.3
Estimated regime growth rates in equation (same as EMFAC2007).	Used binning format for regime growth rates.
	Added 4 new tech groups to split Euro 5 & Euro 6 standards for petrol cars, goods vehicles <=3.5 t and LPG taxis

Comparison of Current EMFAC-HK V3.1.1 & EMFAC-HK Upgrade(V3.3)

Policy Related

EMFAC-HK V3.1.1	EMFAC-HK V3.3
Updated with Euro VI implemetation dates as of end of 2015	Updated with Euro VI implementation dates as of January 2017
Assumed SCR retrofit program for Euro II & III franchised buses only up to August 2015.	Revised SCR retrofit program according to the latest schedule.
Assumed the retirement rates in 2014+ for Ex-gratia Payment Scheme for pre-Euro IV diesel commercial vehicles (excluding franchised buses).	Used 2015 vehicle population distribution which reflected the latest status of the Ex-gratia Payment Scheme in 2015.
Assumed certain percentage reductions for the regime growth rates for different emitters of petrol and LPG vehicles due to I/M program (remote sensing program) from 2015.	Used vehicle emission and 2015 remote sensing data to estimate regime growth rates for different emitters for LPG taxis and petrol cars.

Comparison of Current EMFAC-HK V3.1.1 & EMFAC-HK Upgrade(V3.3)

Activity Related

EMFAC-HK V3.1.1	EMFAC-HK V3.3
Used 2013 vehicle population distribution	Used 2015 vehicle population distribution
Used 2013 VKT from TD	Used 2015 VKT from TD
Used 2013 survey on vehicle classification on 100 road segments from TD;	Used 2015 survey on vehicle classification on 100 road segments from TD;
Conducted local surveys in 2004-07 & 2010-13 on vehicle classifications to supplement TD's data (from 11 p.m. to 7 a.m.) and 64 additional road segments	Conducted local surveys in 2004-07 & 2010-15 on vehicle classifications to supplement TD's data (from 11 p.m. to 7 a.m.) and 64 additional road segments
Used 2013 speed limits from TD & HyD	Used 2015 speed limits from TD & HyD
Used 2013 speed surveys from TD	Used 2015 speed surveys from TD
Used 2013 ambient temperature & relative humidity from HKO	Used 2015 ambient temperature & relative humidity from HKO
Used 2013 mileage and age relationship from EPD's own surveys	Used 2015 mileage and age relationship from EPD's own surveys

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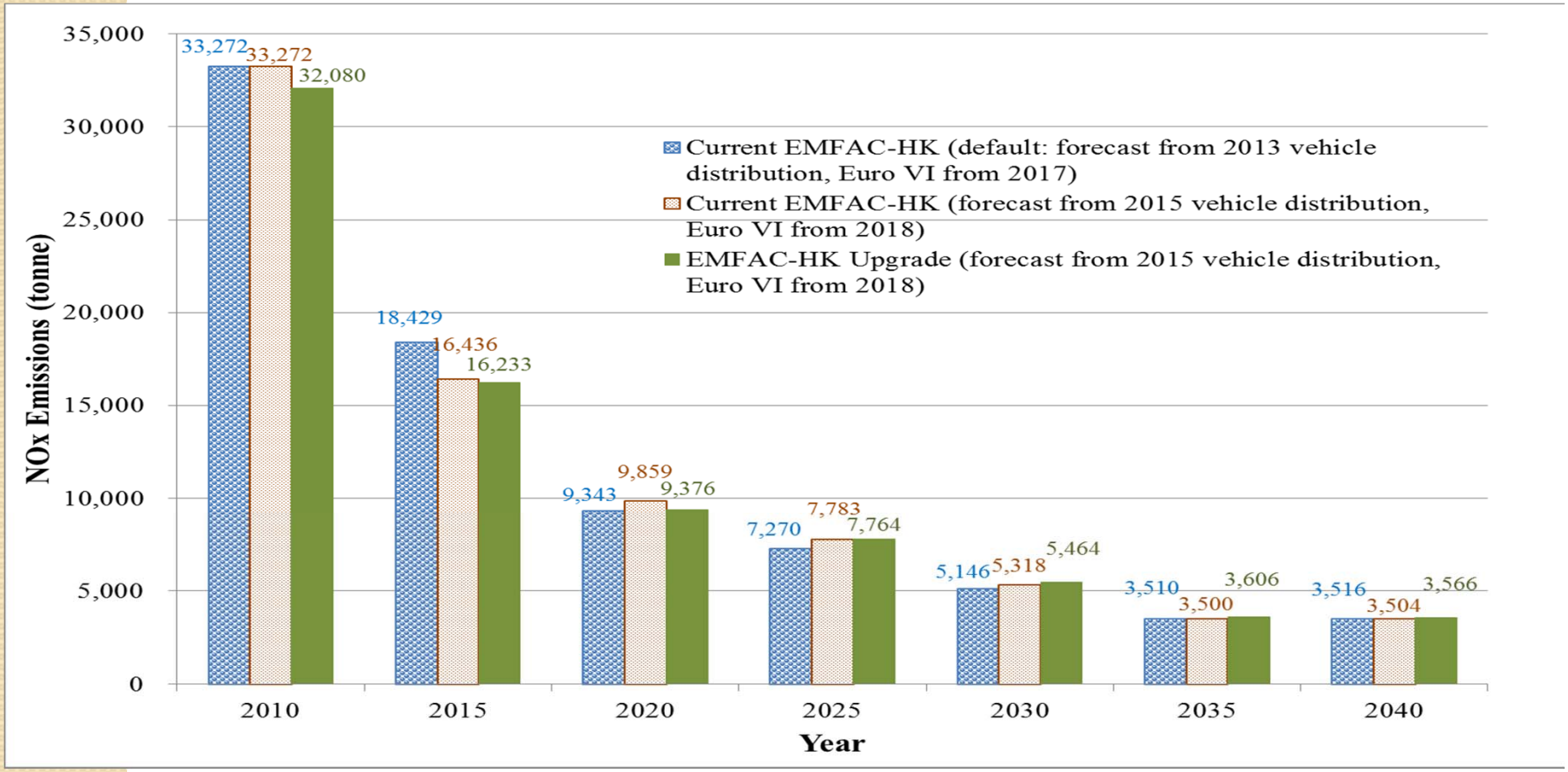
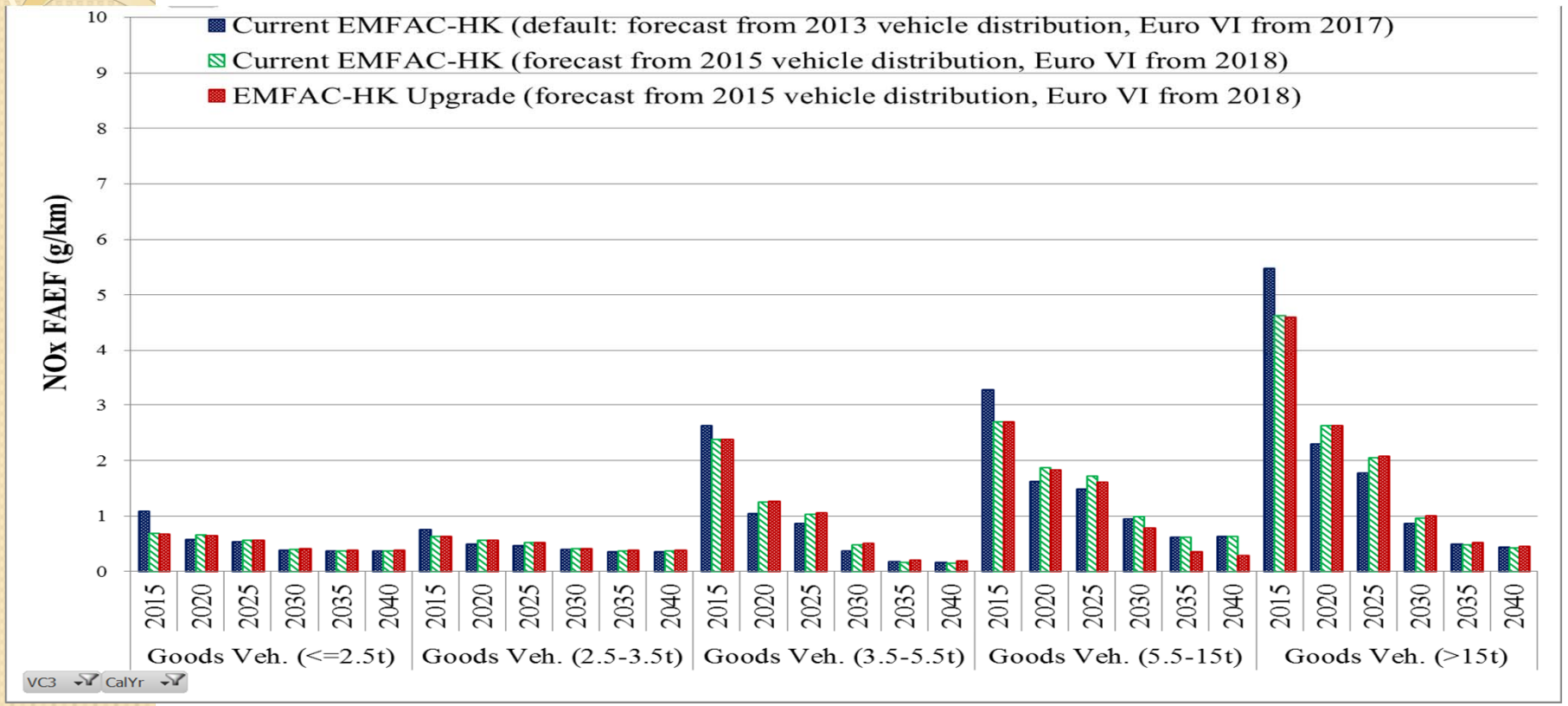
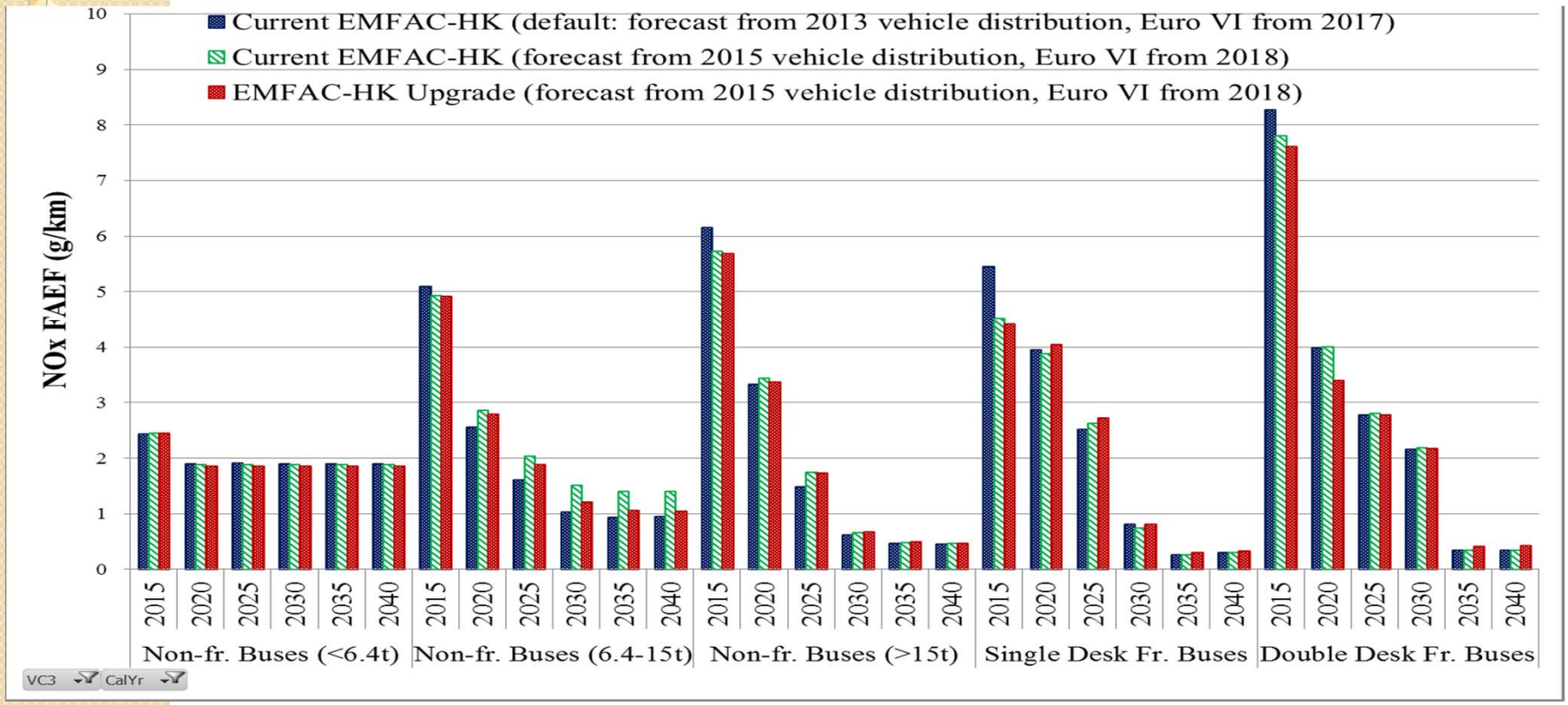
Comparison of Territory-wide NOx Emissions in Current (V3.1.1) and EMFAC-HK Upgrade(V3.3)



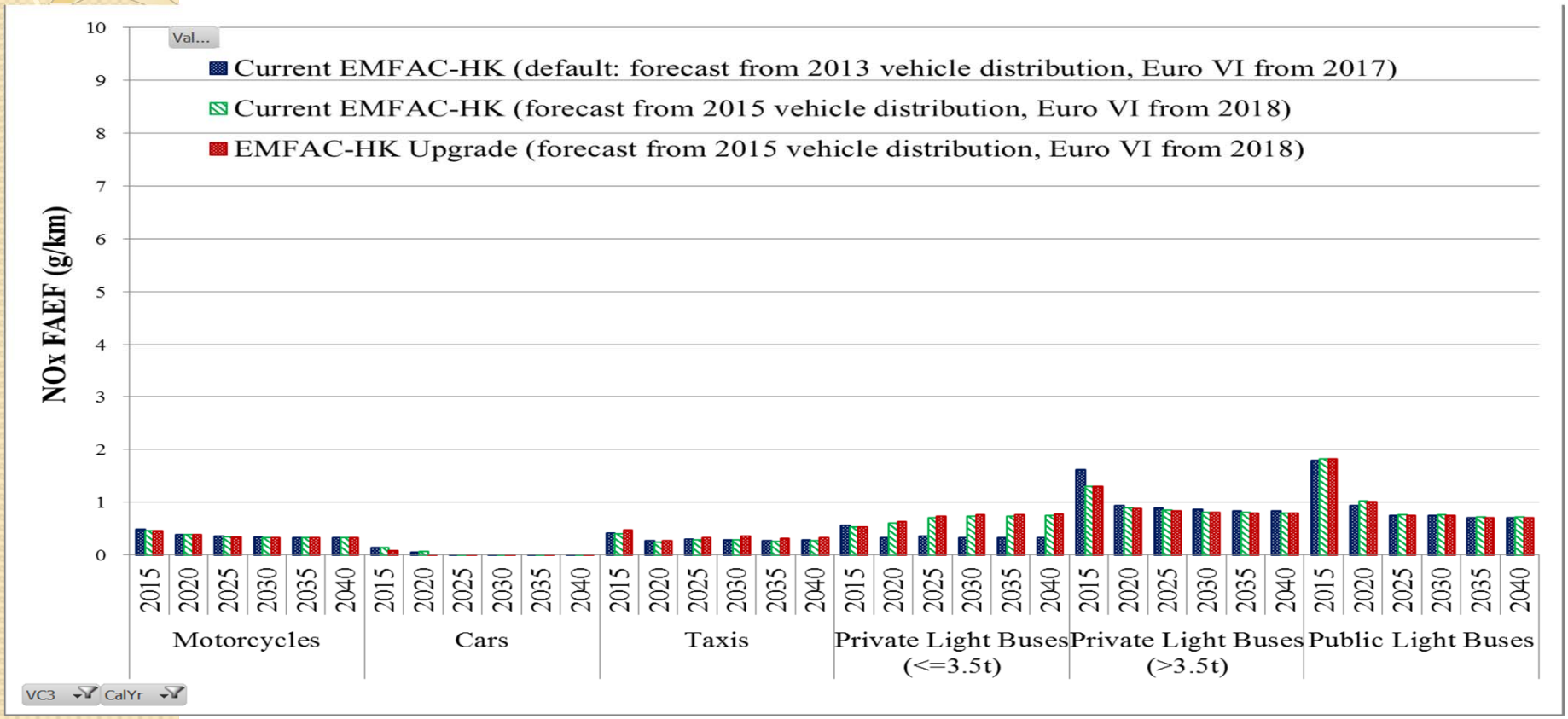
Comparison of NOx FAEF – Goods Vehicles



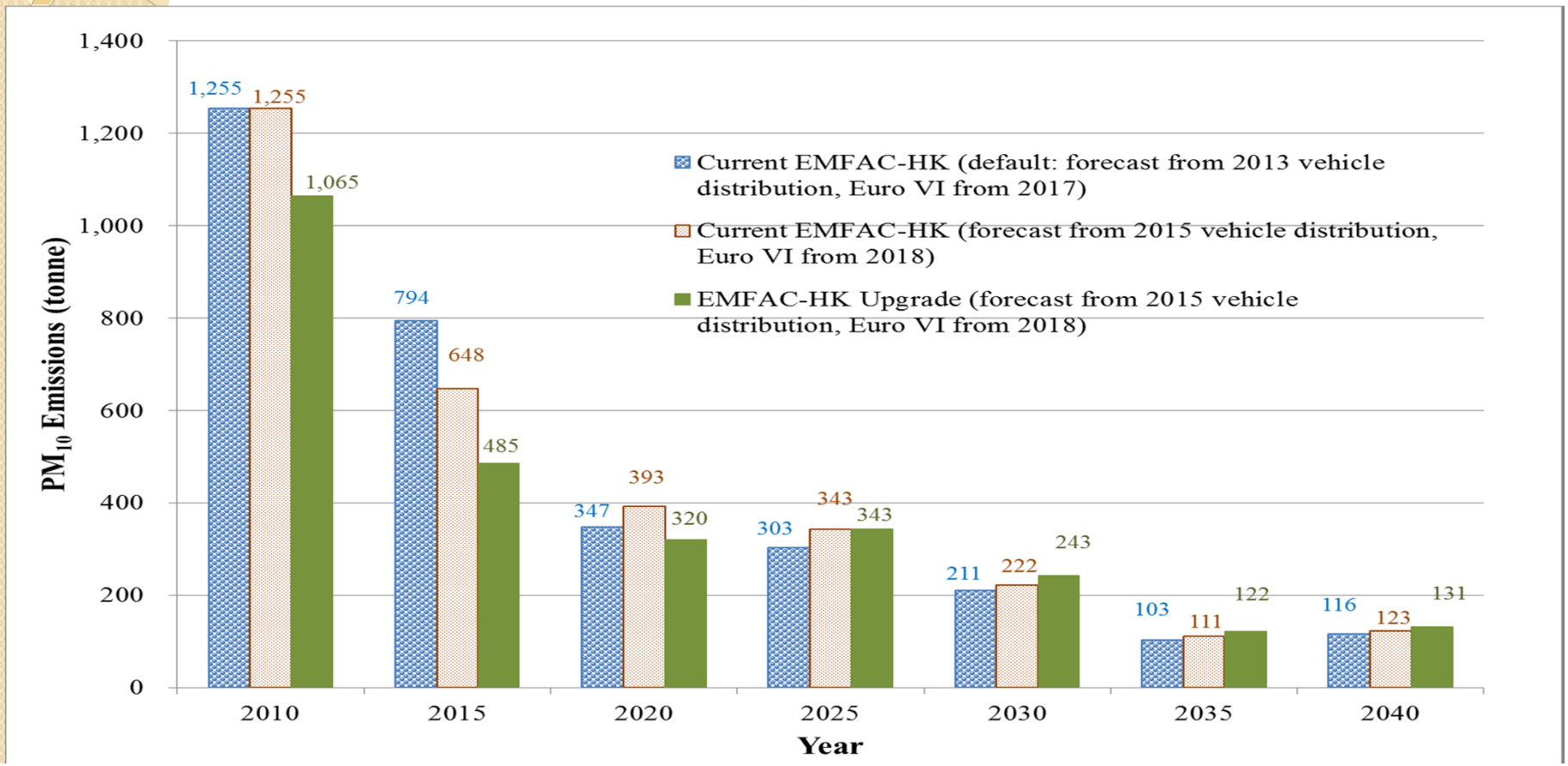
Comparison of NOx FAEF – Buses



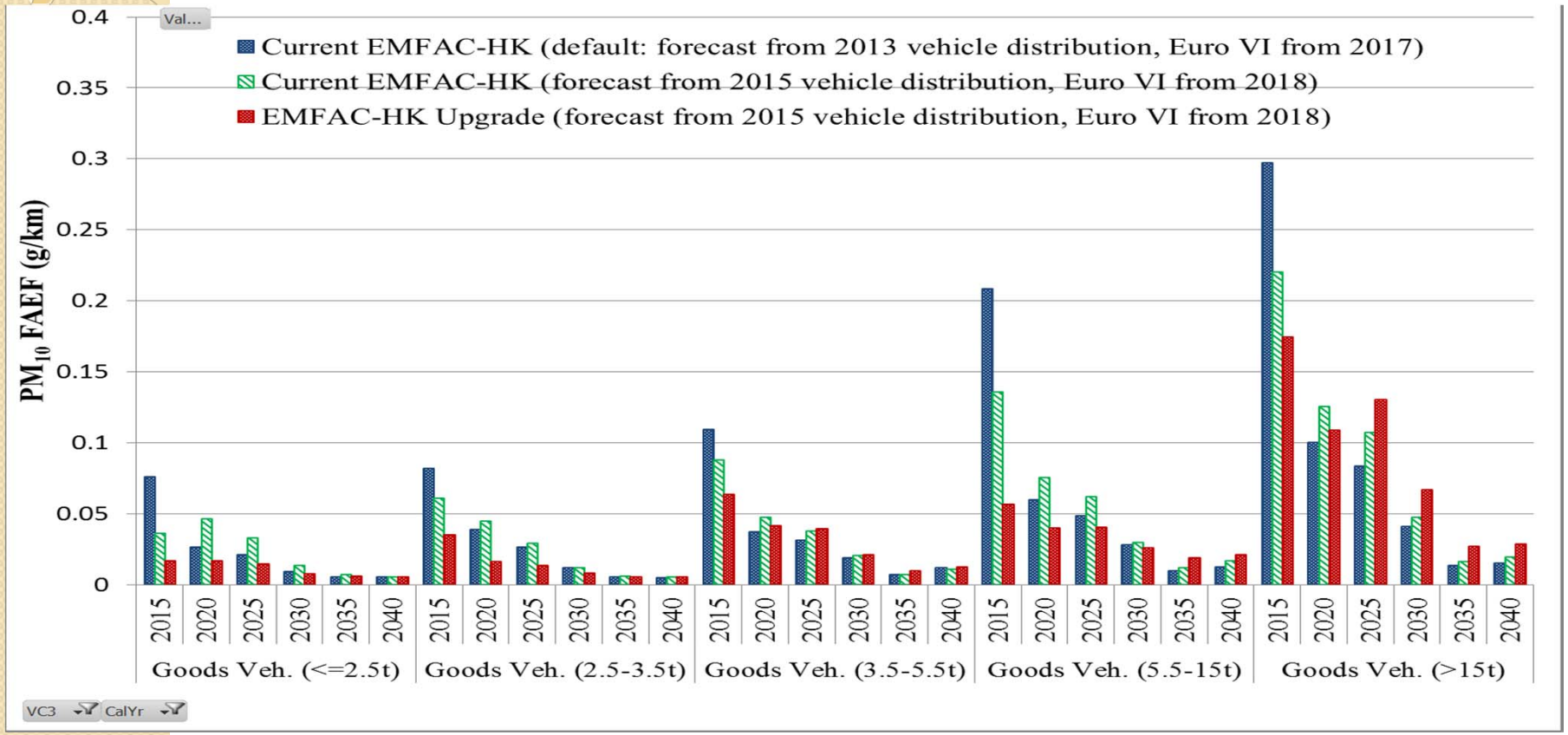
Comparison of NOx FAEF – Others



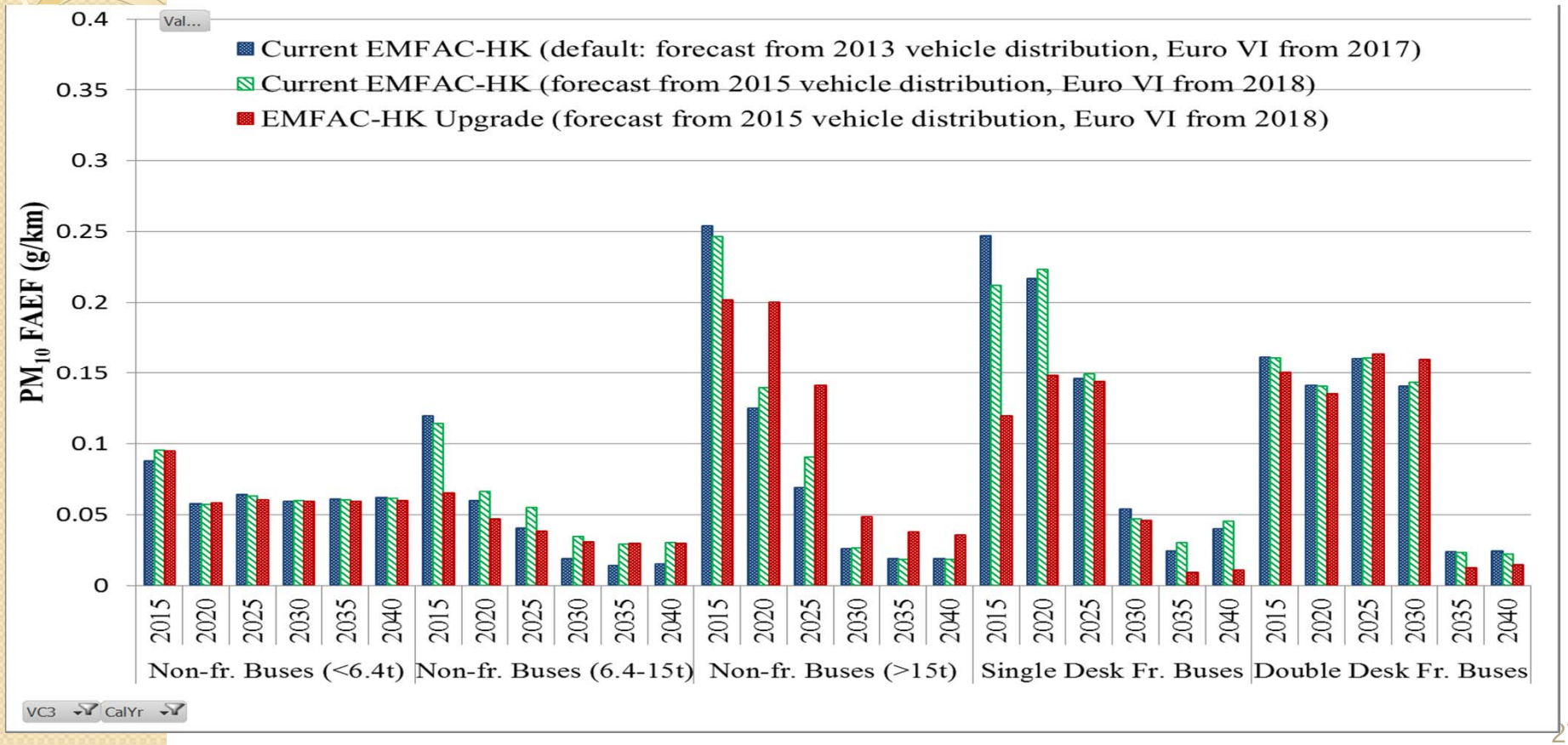
Comparison of Territory-wide PM_{10} Emissions in Current (V3.1.1) and EMFAC-HK Upgrade(V3.3)



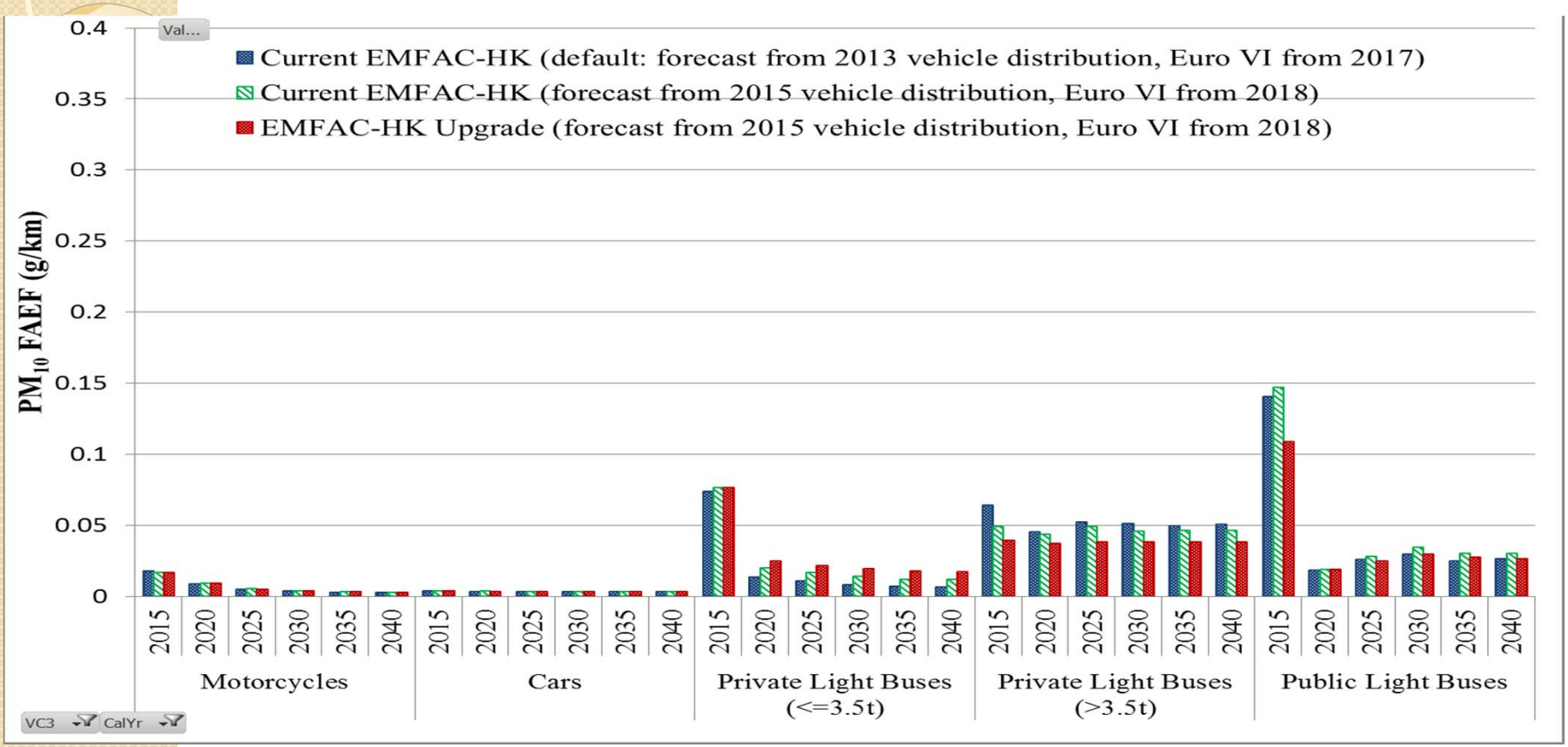
Comparison of PM_{10} FAEF – Goods Vehicles



Comparison of PM_{10} FAEF - Buses



Comparison of PM_{10} FAEF - Others



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Transitional Arrangement

- Provision of 6-month transition period for EIA studies being conducted for adaption to the new model and reduction of abortive work

- During the transition period, EIA reports submitted under Section 6 of the EIAO may continue to use the previous old model version for the air quality impact assessment. After the transition period, all EIA report submissions must use the new model version

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Meeting Air Quality Objectives

- **Air Quality Objectives (AQOs) are the principal air quality standards** in determining the acceptability of air quality impacts of development projects

- Annex 4 of the Technical Memorandum on EIA Process (TM) issued under the EIAO sets out the criteria for evaluating air quality impact in EIA studies. The key criterion is that AQOs and other standards established under the Air Pollution Control Ordinance have to be met. The same criterion applies to non-EIAO case.

Meeting Air Quality Objectives

- Project proponents need to demonstrate that, by means of various mathematical air quality assessment models, upon inclusion of the impacts caused by the project, the **cumulative air pollutant concentration** at identified air sensitive receivers would **comply with the AQOs** during the **construction and operation phases** of the project.

- Meeting the annual concentration standard of NO2, i.e. 40ug/m3, is challenging in urban districts and at the vicinity of trunk roads

- Appropriate **mitigation measures** have to be adopted to **control and prevent non-compliance**, if necessary.

34