DHC Progress Report

12 April 2011

EMPA, Duebendorf, Switzerland

WLTP-DHC Secretary

N. Ichikawa

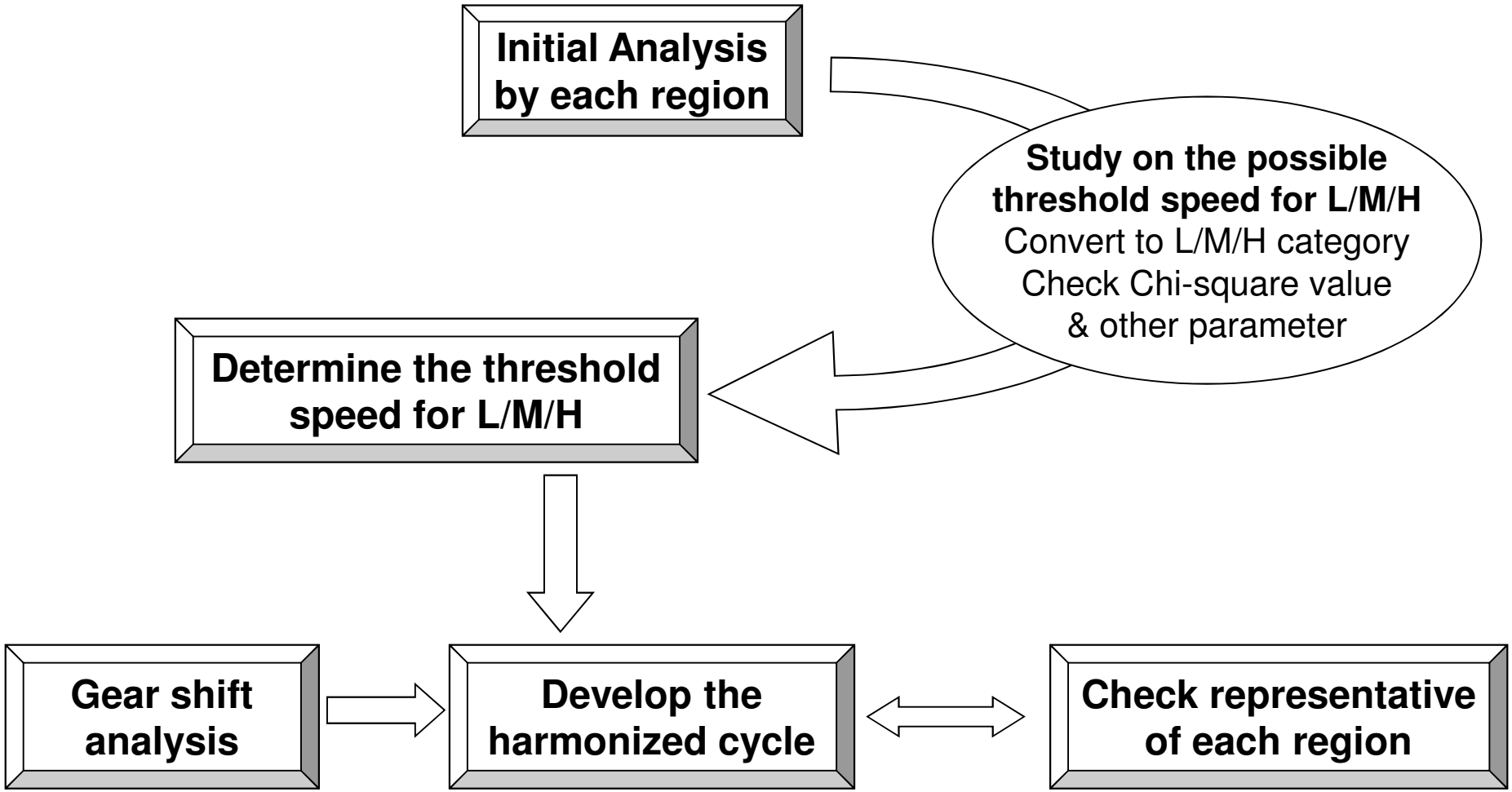
1. Current Status
2. Data Analysis Exercise
3. Open Issues
4. Next Actions

(1) In-use Data Collection

	In-use Data	Traffic Statistical Information
China	On going (partial data by middle of April, then expect to complete by May. 2011)	Expect to submit by middle of April
EU	Completed (on going for more data acquisition)	Completed
India	Partial Data is available (additional data by middle of April, then expect to complete by April)	Expect to submit by middle of April
Japan	Completed	Completed
Korea	Completed	Completed (need traffic volume data)
USA	Completed	Completed

(2) Methodology → It was agreed by DHC group (refer to WLTP-DHC-06-03e.rev1)

(1) Analysis process



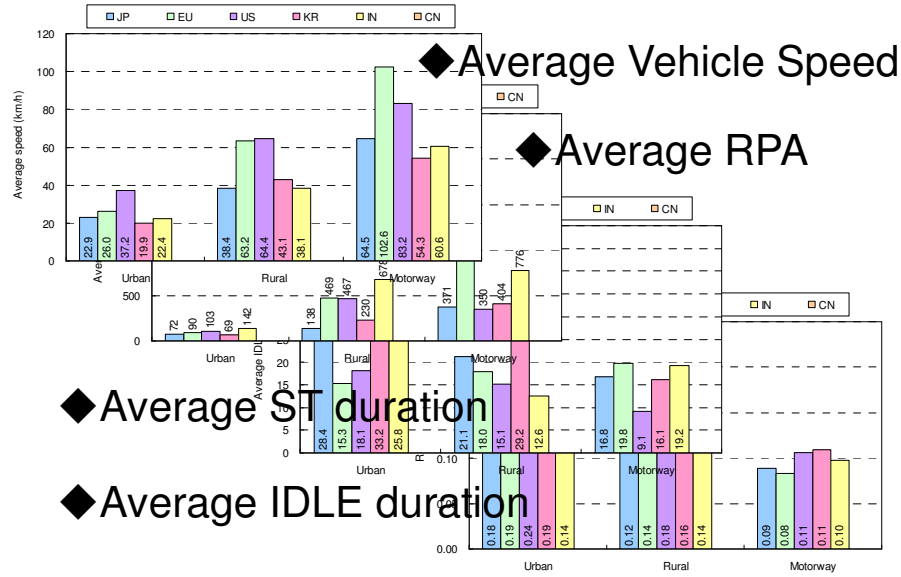
(2) Data used for analysis exercise

(Unit: km)

Region		Vehicle type	No. of vehicles	Urban	Rural	Motorway	Undefine (*)	Total	
Japan (JP)		PC	11	13,605	1,301	10,764		25,670	52,955
		LDCV	13	13,233	1,325	12,727		27,285	
Korea (KR)		PC	6	8,480	6,943	10,610		26,033	34,403
		LDCV	2	2,558	3,261	2,551		8,370	
India (IN)		PC	6	3,117	2,671	5,222		11,010	18,784
		LDCV	3	1,764	2,460	3,550		7,774	
China (CN)		PC	0	0	0	0		0	0
		LDCV	0	0	0	0		0	
U.S. (US)		PC	156				xx,xxx	0	29,538
		LDCV	20				xx,xxx	0	
		Chase car	-	7,538	2,365	19,635		29,538	
EU	Belgium (BE)	PC	11	4,986	24,667	21,292		50,945	172,289
		LDCV	0	0	0	0	121,345	121,345	
	Germany (DE)	PC	8	7,865	11,051	4,498		23,414	23,414
		LDCV	0	0	0	0		0	
	Spain (ES)	PC	6	800	729	1,090		2,619	9,666
		LDCV	4	2,815	4,093	140		7,047	
	France (FR)	PC	42	23,568	53,520	31,828		108,916	108,916
		LDCV	0	0	0	0		0	
	Italy (IT)	PC	8	9,827	23,964	23,854		57,646	57,646
		LDCV	0	0	0	0		0	
	Poland (PL)	PC	9	9,438	4,796	413		14,648	14,648
		LDCV	0	0	0	0		0	
	Slovenia (SL)	PC	18	14,662	24,351	9,920		48,934	48,934
		LDCV	0	0	0	0		0	
	Switzerland (CH)	PC	26	6,021	3,763	12,886		22,670	23,619
		LDCV	4	518	57	374		949	
	United Kingdom (UK)	PC	10	7,174	9,750	566		17,491	31,782
		LDCV	12	0	0	0	14,291	14,291	
	Sweden (SE)	PC	5				18,522	18,522	36,950
		LDCV	2				18,428	18,428	

Data without road category information was omitted for analysis exercise.

(3) Initial analysis by each region (Urban/Rural/Motorway base)

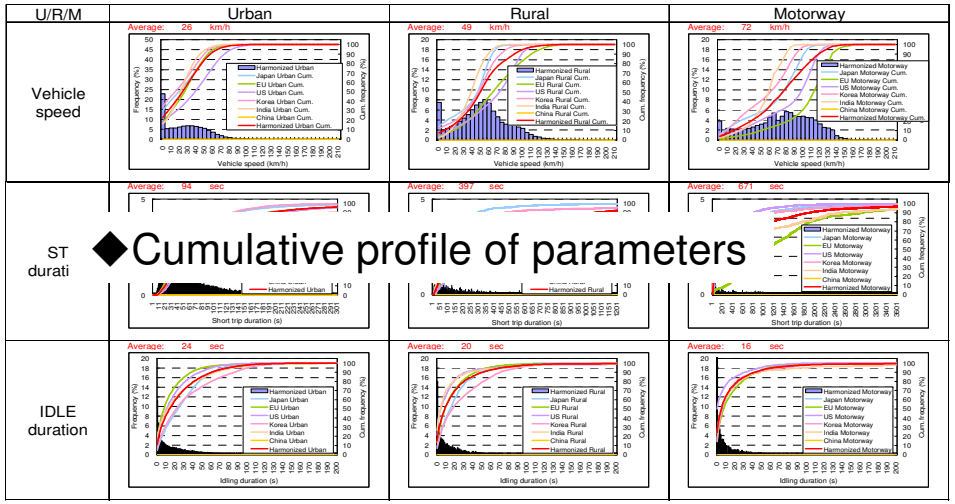


◆Average Vehicle Speed

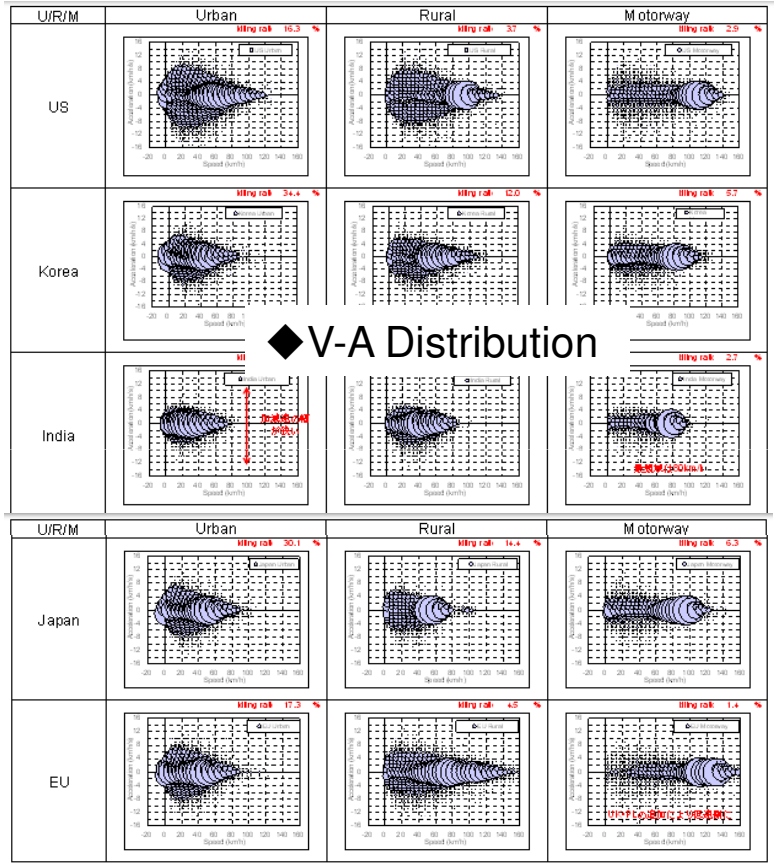
◆Average RPA

◆Average ST duration

◆Average IDLE duration



◆Cumulative profile of parameters



◆V-A Distribution

It was observed that driving profile under U/R/M road category is differ from each region.

(4) Study on the possible threshold speed for L/M/H

Possible Threshold

Criteria	Low						Middle						High						Ex High						Average
	JP	EU	US	KR	IN	AVE	JP	EU	US	KR	IN	AVE	JP	EU	US	KR	IN	AVE	JP	EU	US	KR	IN	AVE	
U/R/M	0.01	0.01	0.11	0.02	0.07	0.04	0.06	0.06	0.12	0.02	0.10	0.07	0.04	0.17	0.06	0.05	0.13	0.09							0.069
40/60	0.03	0.01	0.08	0.02	0.11	0.05	0.02	0.01	0.07	0.03	0.09	0.04	0.01	0.03	0.05	0.02	0.05	0.03							0.042
40/90	0.03	0.01	0.08	0.02	0.11	0.05	0.02	0.01	0.06	0.03	0.07	0.04	0.02	0.03	0.06	0.02	0.07	0.04							0.042
50/90	0.02	0.01	0.09	0.02	0.11	0.05	0.02	0.01	0.06	0.02	0.07	0.04	0.02	0.03	0.06	0.02	0.07	0.04							0.042
50/100	0.02	0.01	0.09	0.0									0.07	0.02	0.07	0.05									0.042
60/90	0.02	0.01	0.08	0.0									0.06	0.02	0.07	0.04									0.040
60/100	0.02	0.01	0.08	0.02	0.11	0.05	0.02	0.01	0.05	0.01	0.05	0.03	0.03	0.04	0.07	0.02	0.07	0.05							0.041
70/110	0.02	0.01	0.08	0.02	0.09	0.04	0.01	0.01	0.04	0.01	0.04	0.02	0.04	0.02	0.05	0.03	0.07	0.04							0.037
WMTC	0.02	0.00	0.06	0.02	0.07	0.04	0.02	0.02	0.04	0.02	0.05	0.03	0.05	0.05	0.03	0.04	0.12	0.06							0.042
40/60/100	0.03	0.01	0.08	0.02	0.11	0.05	0.02	0.01	0.07	0.03	0.09	0.04	0.01	0.02	0.05	0.01	0.05	0.03	0.03	0.04	0.07	0.02	0.07	0.05	0.041
50/90/110	0.02	0.01	0.09	0.02	0.11	0.05	0.02	0.01	0.06	0.02	0.07	0.04	0.02	0.03	0.05	0.01	0.07	0.04	0.04	0.02	0.05	0.03	0.07	0.04	0.042
60/90/110	0.02	0.01	0.08	0.02	0.11	0.05	0.02	0.01	0.05	0.02	0.05	0.03	0.02	0.03	0.05	0.01	0.07	0.04	0.04	0.02	0.05	0.02	0.07	0.04	0.040
60/90/120	0.02	0.01	0.08	0.02	0.11	0.05	0.02	0.01	0.05	0.02	0.05	0.03	0.02	0.02	0.07	0.02	0.08	0.04	0.03	0.02	0.05	0.05	0.08	0.05	0.042

◆Chi-square value

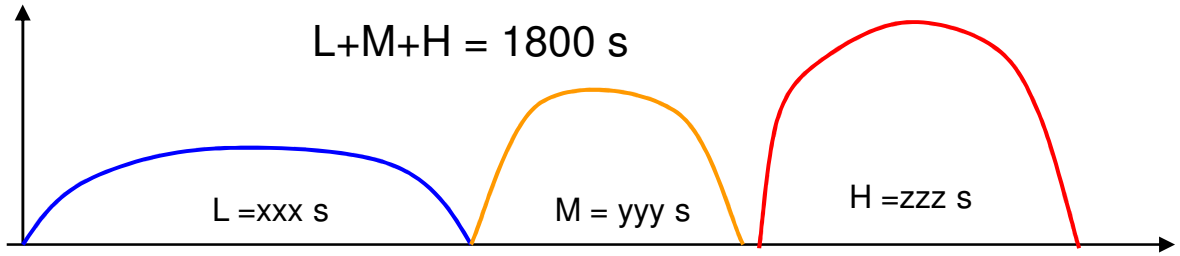
Criteria		50/80/110	50/80/120	50/90/110	50/90/120	60/80						
Low	JP	13.4	13.4	13.4	13.4							
	EU	15.4	15.4	15.4	15.4							
	US	16.2	16.2	16.2	16.2							
	KR	13.5	13.5	13.5	13.5							
	IN	17.4	17.4	17.4	17.4							
	CN											
	AVE	15.2	15.2	15.2	15.2							
	SD	1.7	1.7	1.7	1.7							
	RSD	11.2	11.2	11.2	11.2							
	⊿MAX-MIN	3.9	3.9	3.9	3.9							
Middle	JP	35.7	35.7	36.2	36.2							
	EU	35.7	35.7	38.4	38.4							
	US	34.1	34.1	36.8	36.8							
	KR	29.0	29.0	30.8	30.8							
	IN	36.6	36.6	38.0	38.0	41.1	41.1	42.8	42.8	47.0	47.0	48.0
	CN											
	AVE	34.2	34.2	36.0	36.0	38.4	38.4	40.5	40.5	45.0	45.0	47.2
	SD	3.1	3.1	3.1	3.1	2.9	2.9	2.6	2.6	2.2	2.2	1.6
	RSD	8.9	8.9	8.5	8.5	7.6	7.6	6.3	6.3	4.9	4.9	3.4
	⊿MAX-MIN	7.6	7.6	7.6	7.6	7.0	7.0	6.2	6.2	4.7	4.7	4.4
High	JP	62.9	64.7	71.1	73.6	62.9	64.7	71.1	73.6	71.1	73.6	80.5
	EU	54.9	57.9	58.						58.4	62.1	66.0
	US	57.1	62.3	63.						63.2	69.2	75.2
	KR	53.9	54.7	60.						60.0	60.7	64.6
	IN	52.7	52.7	67.						67.1	67.1	65.8
	CN											
	AVE	56.3	58.5	64.0	66.5	56.8	58.5	63.9	66.5	64.0	66.5	70.4
	SD	4.0	5.0	5.2	5.3	4.0	5.0	5.2	5.3	5.2	5.3	7.1
	RSD	7.2	8.6	8.1	7.9	7.2	8.6	8.2	8.0	8.1	7.9	10.1
	⊿MAX-MIN	10.2	12.0	12.7	12.9	10.2	12.0	12.9	12.9	12.7	12.9	15.9
Ex High	JP	86.2	91.4	86.2	91.4	86.2	91.4	91.4	91.4	86.2	91.4	91.4
	EU	83.0	87.6	83.0	87.6	83.0	87.6	87.5	87.6	83.0	87.6	87.6
	US	89.7	95.0	89.7	95.0	89.7	95.0	95.0	95.0	89.7	95.0	95.0
	KR	67.6	72.7	67.6	72.7	67.6	72.7	72.7	72.7	67.6	72.7	72.7
	IN	66.2	67.0	66.2	67.0	66.2	67.0	67.0	67.0	66.2	67.0	67.0
	CN											
	AVE	78.5	82.7	78.5	82.7	78.6	82.7	82.7	82.7	78.5	82.7	82.7
	SD	10.9	12.2	10.9	12.2	10.9	12.2	12.2	12.2	10.9	12.2	12.2
	RSD	13.9	14.8	13.9	14.8	13.9	14.8	14.8	14.8	13.9	14.8	14.8
	⊿MAX-MIN	23.4	28.0	23.4	28.0	23.4	28.0	28.0	28.0	23.4	28.0	28.0
Average SD		21.8	23.1	22.1	23.2	21.8	23.1	23.1	23.1	22.1	23.2	23.5
Average RSD		10.28	10.88	10.41	10.59	9.47	10.07	9.64	9.58	9.49	9.67	9.84

◆other parameter

Determine the threshold speed for L/M/H

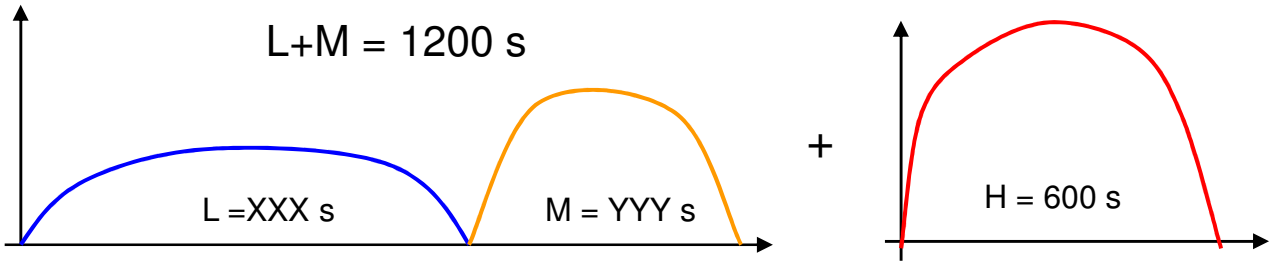
(5) Develop the harmonized cycle -1

Mode construction

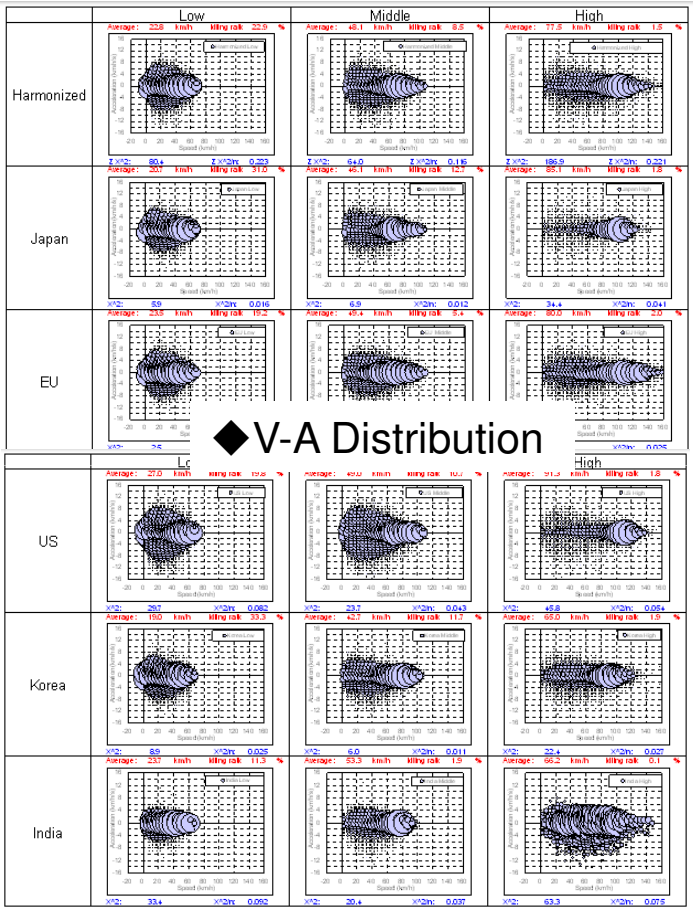


L : M : H = based on traffic volume

If high phase duration is not enough long for stable sampling, divide into L+M and H mode construction.



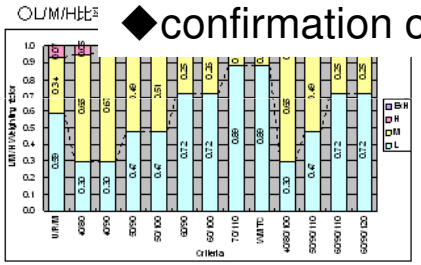
(5) Develop the harmonized cycle -2

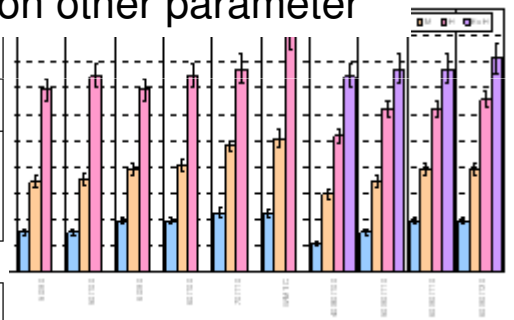


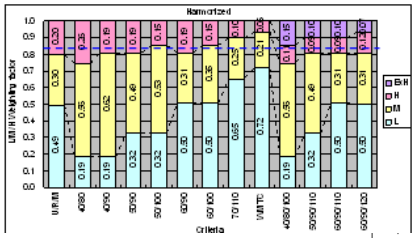
◆V-A Distribution

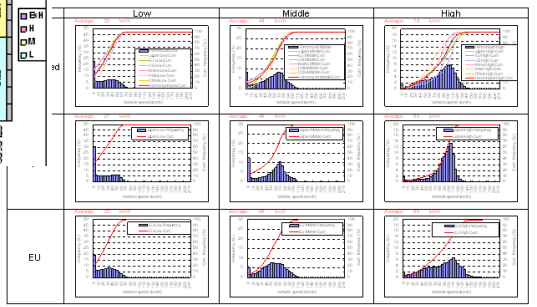
Criteria	Low						Middle						High						ExHigh						Average
	JP	EU	US	KR	IN	AVE	JP	EU	US	KR	IN	AVE	JP	EU	US	KR	IN	AVE	JP	EU	US	KR	IN	AVE	
U/R/M	0.18	0.12	1.51	0.35	0.72	0.57	0.97	1.13	1.76	0.36	1.43	1.13	0.75	3.33	1.08	0.91	2.18	1.65							1.12
40/80	0.44	0.08	0.25	0.21	0.83	0.36	0.26	0.14	0.51	0.58	0.92	0.48	0.22	0.54	0.88	0.28	0.98	0.58							0.47
40/90	0.44	0.08	0.25	0.21	0.83	0.36	0.31	0.13	0.41	0.49	0.71	0.41	0.29	0.66	1.10	0.31	1.33	0.74							0.50
50/90	0.38	0.08	0.26	0.30	0.92	0.39	0.34	0.14	0.33	0.47	0.78	0.41	0.29	0.66	1.10	0.31	1.33	0.74							0.51
50/100	0.38	0.08	0.26	0.30	0.92	0.39	0.37	0.14	0.31	0.37	0.68	0.37	0.48	0.75	1.22	0.36	1.39	0.84							0.53
60/90	0.34	0.11	0.31	0.41	0.95	0.42	0.35	0.20	0.25	0.31	0.68	0.36	0.29	0.66	1.10	0.31	1.33	0.74							0.51
60/100	0.34	0.11	0.31	0.41	0.95	0.42	0.38	0.20	0.25	0.26	0.66	0.35	0.48	0.74	1.22	0.36	1.39	0.84							0.54
70/110	0.30	0.13	0.41	0.47	0.80	0.42	0.22	0.23	0.23	0.17	0.64	0.30	0.55	0.46	1.01	0.43	0.90	0.67							0.46
WMTC	0.32	0.09	0.26	0.42	0.68	0.35	0.40	0.25	0.19	0.30	0.99	0.43	0.67	0.90	0.63	0.65	2.50	1.07							0.62
40/60/100	0.44	0.08	0.25	0.21	0.83	0.36	0.26	0.14	0.51	0.58	0.92	0.48	0.13	0.39	0.24	0.19	0.88	0.37	0.48	0.74	1.22	0.36	1.39	0.84	0.51
50/60/110	0.38	0.08	0.26	0.30	0.92	0.39	0.34	0.14	0.33	0.47	0.78	0.41	0.34	0.61	0.45	0.11	1.54	0.61	0.55	0.46	1.01	0.43	0.90	0.67	0.52
60/60/110	0.34	0.11	0.31	0.41	0.95	0.42	0.35	0.20	0.25	0.31	0.68	0.36	0.34	0.61	0.45	0.11	1.54	0.61	0.65	0.43	0.96	0.42	0.85	0.66	0.51
60/60/120	0.34	0.11	0.30	0.42	0.95	0.42	0.35	0.20	0.25	0.32	0.68	0.36	0.35	0.46	1.05	0.25	1.70	0.76	0.57	0.45	0.89	0.75	1.19	0.77	0.58

◆confirmation on other parameter









It was observed that Low/Middle phase are well represent the all region, however, high phase need additional treatment due to different characteristics.

(6) Summary

- ✓ Proposed methodology (refer to WLTP-DHC-06-03e.rev1) works well to develop the harmonized cycle.
- ✓ Data conversion to L/M/H category is MUST to have similarity of each region.
- ✓ Difference in high phase is still observed among US/EU and other regions. →supplemental treatment is required.
- ✓ Proposals for OIL 2, 3 and 4 will be presented during next DHC meeting (on 16 May @ ACEA office in Brussels).
- ✓ Initial harmonized cycle can be developed no later than the middle of July once OIL 2, 3 and 4 were fixed during next WLTP-IG (in June @ Geneva).
- ✓ Regional weighting factors for L/M/H phase might be necessary to represent each region driving behavior.

	Issues	Discussion points	Proposed Actions
1	Deadline for submission of driving data	a) India and China requested deadline be extended to May	CPs to submit as much data by end of Jan as possible. Propose to AC3 that only data submitted by deadline be used ??. Compress possible work elements to accommodate delay.
2	Regional Weighting when developing the WLTC	a) traffic volume b) same weighting	Wait for initial analysis, then make a decision during 7th DHC meeting
3	Threshold Speed for L/M/H	a) according to DHC-06-03 b) CP's requirement	
4	High Phase Cycle Construction (US&EU versus other regions)	a) only ONE unified cycle b) possess TWO types of High phase cycle	Wait for initial analysis, then further discussion is necessary before developing the 1st WLTC
5	Mode Construction	a) cold start test only b) cold start & hot soak start	After developing the 1st WLTC, further analysis is necessary during the validation 1

	Issues	Discussion points	Proposed Actions
6	Unique Weighting Factor for L/M/H Phase	a) harmonized weighting factors b) permit regional weighting factors	After developing the 1st WLTC, check the representativeness for each region.
7	Gear Shift Points	a) fixed points b) based on vehicle specification c) others	JARI, JRC and Mr. Steven work together to finalize the method before developing the 1st WLTC.
8	How to treat the vehicles which are not able to follow the prescribed cycle	a) continue to drive with wide-open-throttle b) exempt the H (or M&H) phase(s) c) others	Develop the proposal during validation 1 tests.
9	Check the driving profile based on the vehicle characteristic		Analyze the in-use data based on vehicle characteristic (i.e. power to mass ratio)

4. Next Actions