

# Hong Kong Environmental Protection Department Remote Sensing Test Study (Dec 28, 1999 to Jan 12, 2000)



Prepared by: Environmental Systems Products, Inc.  
Pioneer Environmental Systems Ltd.

# Work Objectives



- Remote sensing on petrol vehicles in Hong Kong at selected locations
- Investigate conditions of in-use vehicles
- Statistical Analysis

# Locations Tested



- Cotton Tree Drive
- Aberdeen Tunnel
- Lion Rock Tunnel
- Man Kam Road
- Sha Tau Kok
- Kwun Tong
- Yuen Long
- Tai Po

# Basic Equipment Functions



- Emissions Test
- Tamper Test
- Vehicle Replay
- Gas Calibration
- Mirror Alignment
- Camera Alignment
- Reset Car Counter

# RSD Results



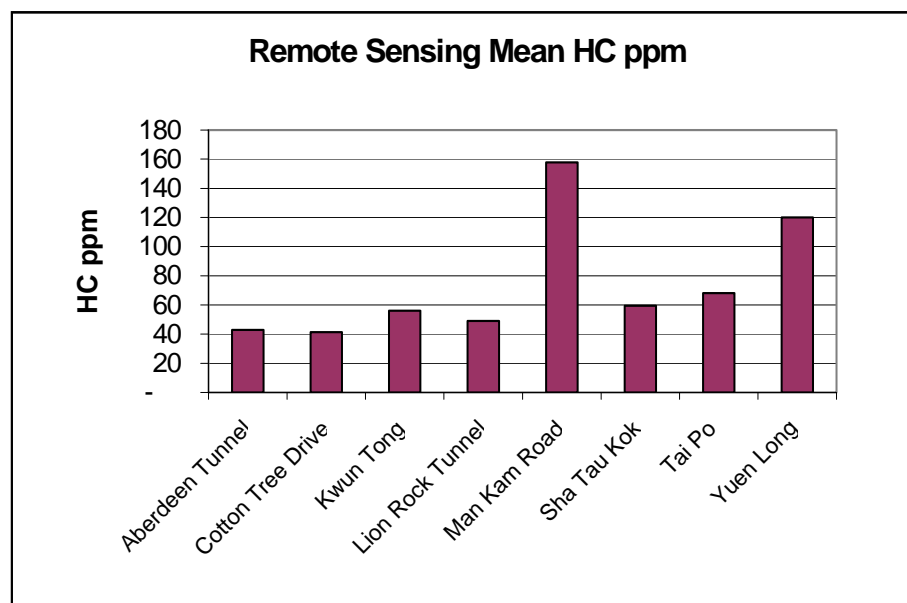
- This is a preliminary analysis only
- A few vehicles are producing much of the emissions (see decile charts)
- Light Goods Vehicles have higher emissions than private vehicles
- Emissions increase with age
- NO<sub>x</sub> on 90-94 LGV is especially high considering vehicle age

# Average HC,CO,NOx by Day

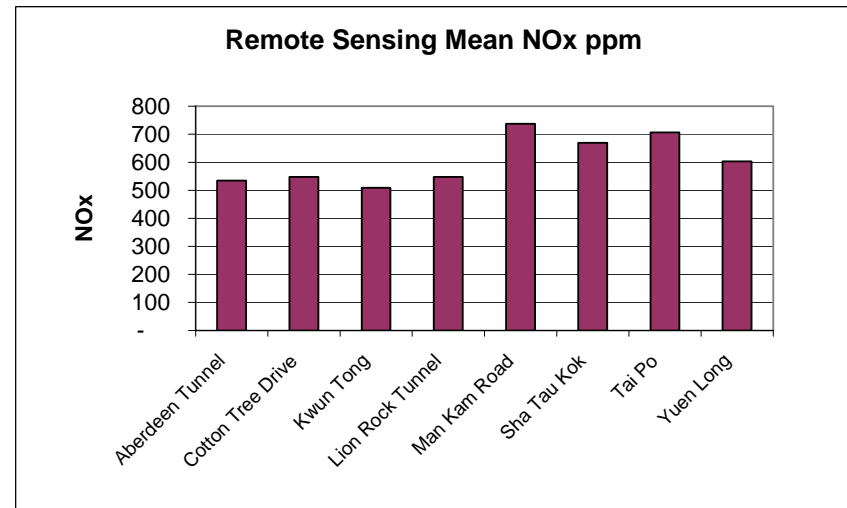
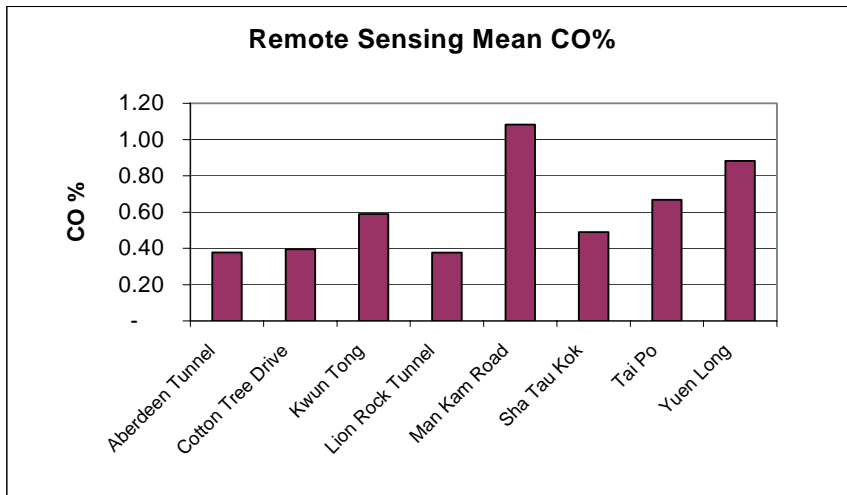
Date	Tests	Valid HC	Valid CO	Valid NOx	Valid Speed	All Valid	Average HC	Average CO	Average NOx
December 28, 1999	955	88%	89%	87%	97%	84%	42	0.43	561
December 29, 1999	919	91%	91%	87%	80%	69%	38	0.33	526
December 30, 1999	1050	78%	83%	80%	92%	72%	43	0.39	545
January 3, 2000	2853	76%	80%	76%	82%	60%	53	0.39	534
January 4, 2000	3668	78%	84%	80%	83%	62%	46	0.34	545
January 5, 2000	122	61%	67%	63%	69%	39%	130	0.84	865
January 6, 2000	118	65%	68%	64%	79%	50%	163	0.99	618
January 7, 2000	262	90%	91%	90%	78%	71%	63	0.47	736
January 8, 2000	1057	66%	69%	67%	90%	59%	57	0.56	511
January 10, 2000	587	47%	50%	47%	82%	36%	131	0.78	639
January 11, 2000	534	71%	73%	70%	83%	57%	101	0.90	614
January 13, 2000	823	68%	70%	67%	88%	60%	67	0.68	736

# Remote Sensing Mean HC, CO, NOx By Location

Site	Valid Tests	HC (ppm)	CO %	NOx (ppm)	Avg Speed (kph)	Accel (kph/s)
Aberdeen Tunnel	755	43	0.38	535	53	1.42
Cotton Tree Drive	1434	41	0.39	548	32	(0.70)
Kwun Tong	622	56	0.59	509	36	0.98
Lion Rock Tunnel	3963	49	0.38	548	26	0.51
Man Kam Road	106	158	1.08	737	30	0.21
Sha Tau Kok	185	59	0.49	670	41	(1.07)
Tai Po	495	68	0.67	707	50	0.31
Yuen Long	518	120	0.88	603	42	0.31
All	8078	55	0.46	562	33	0.35



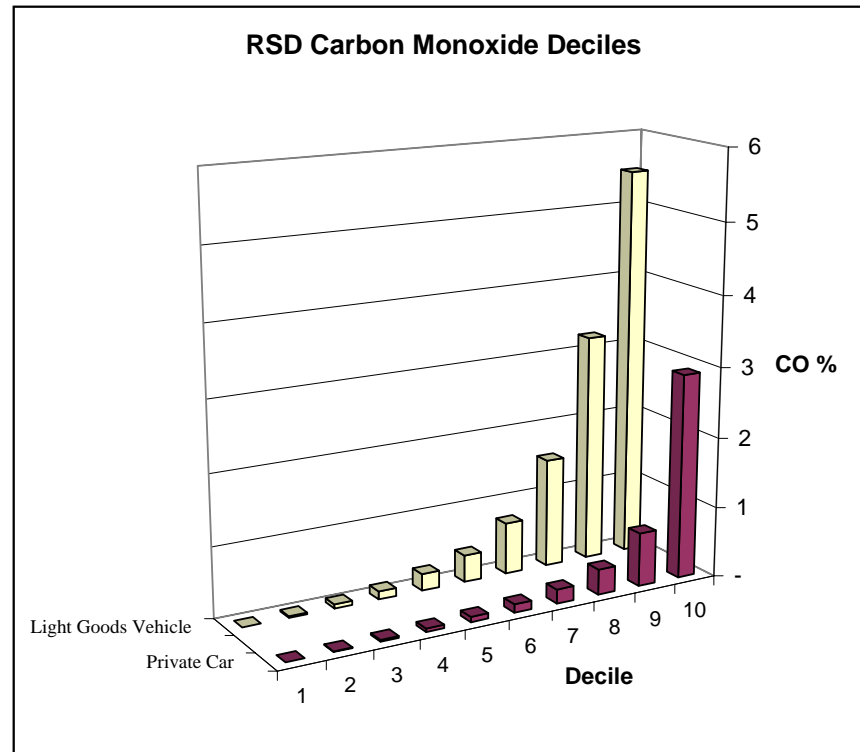
# Remote Sensing Mean HC, CO, NOx By Location





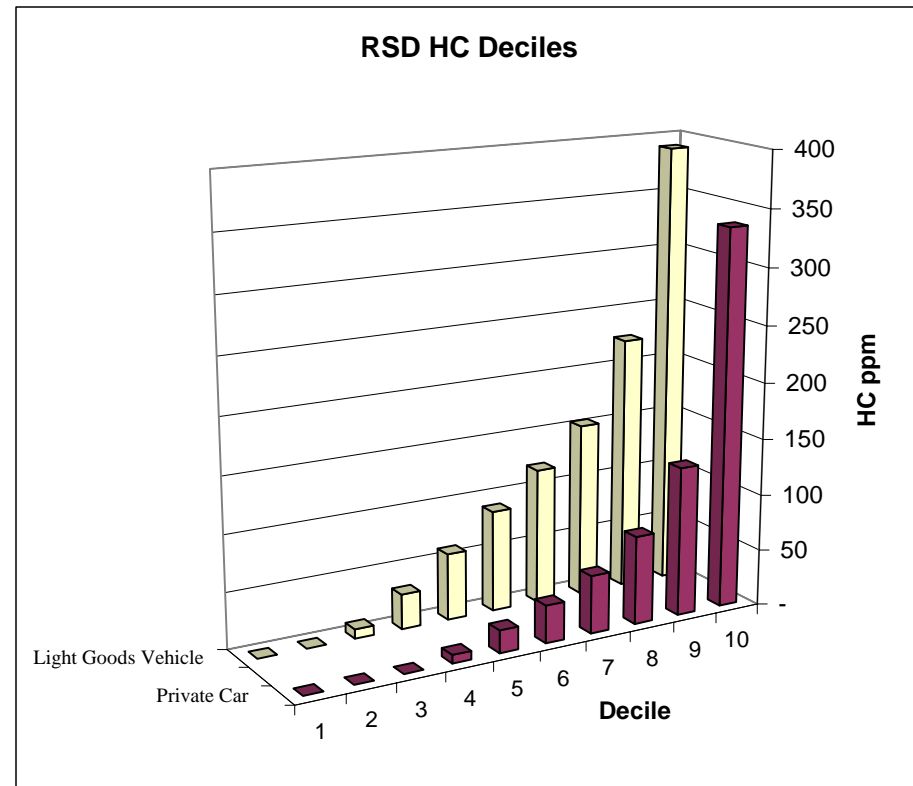
# RSD Carbon Monoxide Deciles

Carbon Monoxide		
Decile	Private Car	Light Goods Vehicle
1	(0.03)	(0.04)
2	0.01	0.02
3	0.03	0.06
4	0.05	0.11
5	0.07	0.24
6	0.12	0.39
7	0.20	0.74
8	0.36	1.55
9	0.76	3.22
10	2.91	5.50



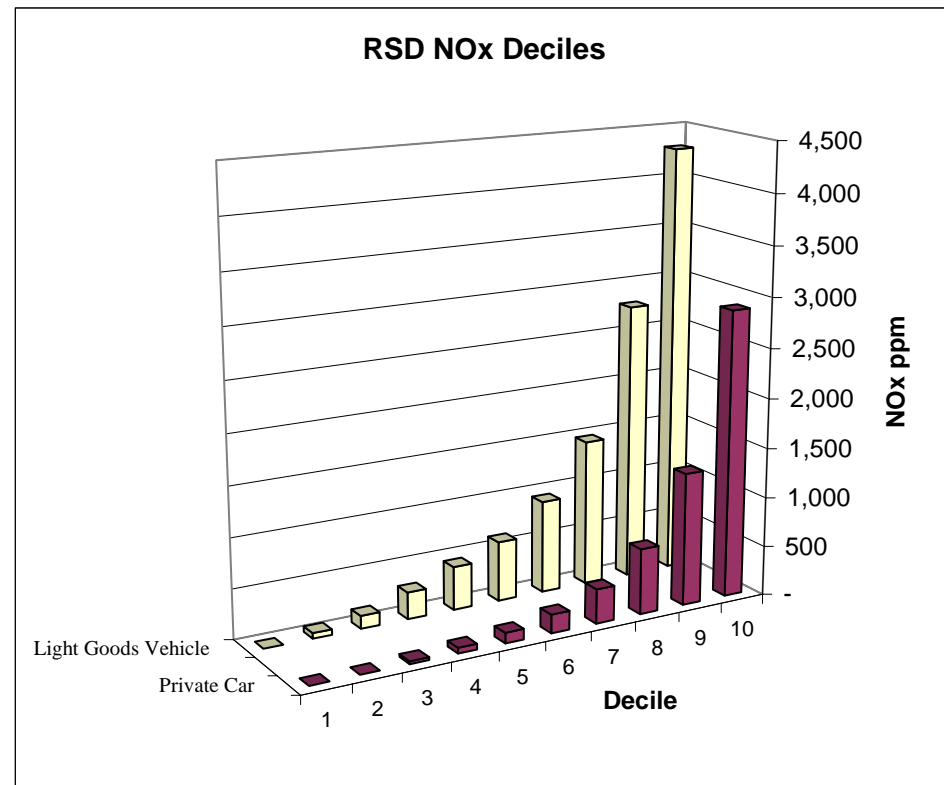
# RSD HC Deciles

HC			
	Decile	Private Car	Light Goods Vehicle
	1	(79)	(99.7)
	2	(28)	(35.5)
	3	(6)	8.3
	4	7	31.0
	5	20	59.3
	6	34	89.9
	7	51	120.2
	8	78	153.7
	9	132	224.6
	10	335	390.0



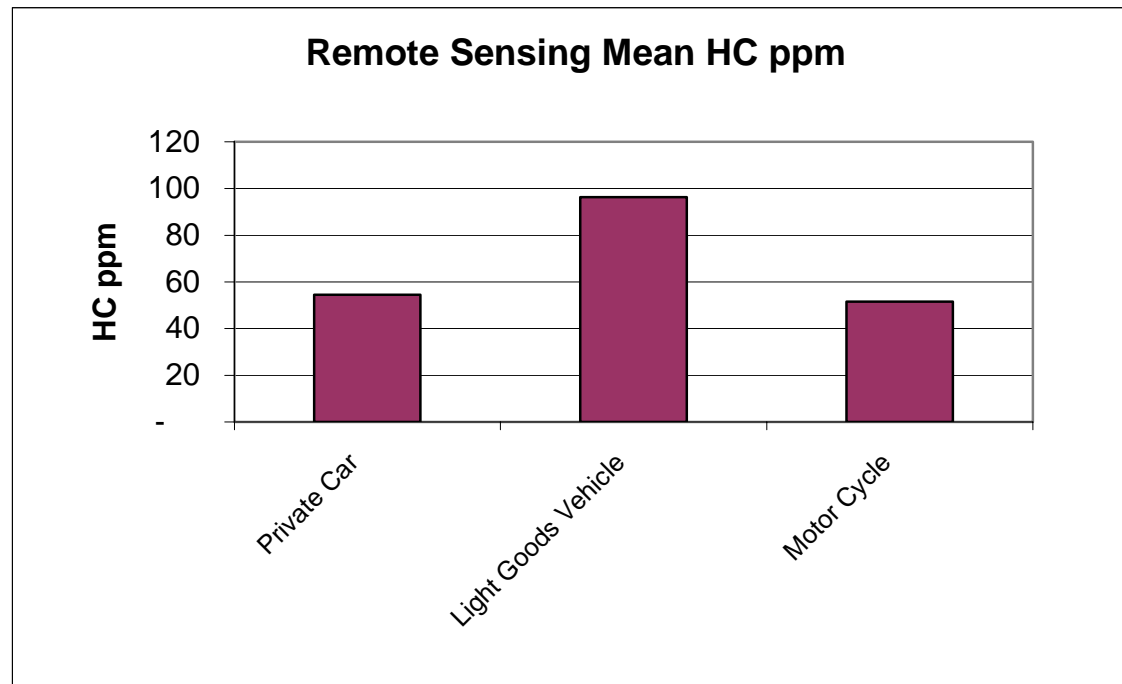
# RSD NOx Deciles

NOx			
	Decile	Private Car	Light Goods Vehicle
	1	(57)	(23)
	2	1	56
	3	26	130
	4	57	272
	5	105	439
	6	187	603
	7	346	934
	8	660	1,470
	9	1,335	2,775
	10	2,886	4,298

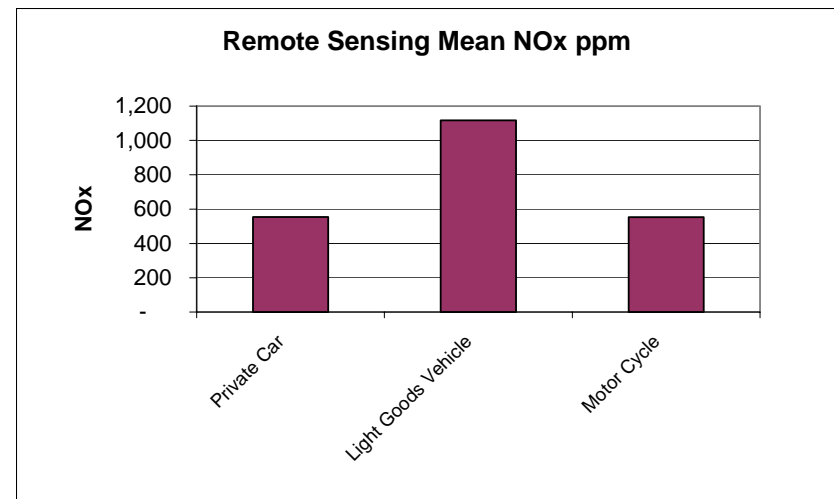
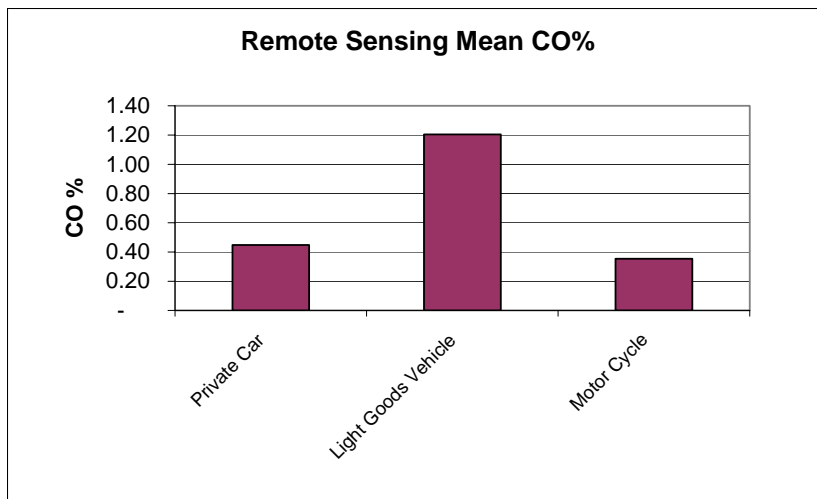


# Remote Sensing Mean HC, CO, Nox By Car Type

Site	Valid Tests	HC (ppm)	CO %	NOx (ppm)	Avg Speed (kph)	Accel (kph/s)
Private Car	7961	55	0.45	555	33	0.35
Light Goods Vehicle	106	96	1.20	1,116	38	0.60
Motor Cycle	11	52	0.35	553	37	0.30
All	8078	55	0.46	562	33	0.35

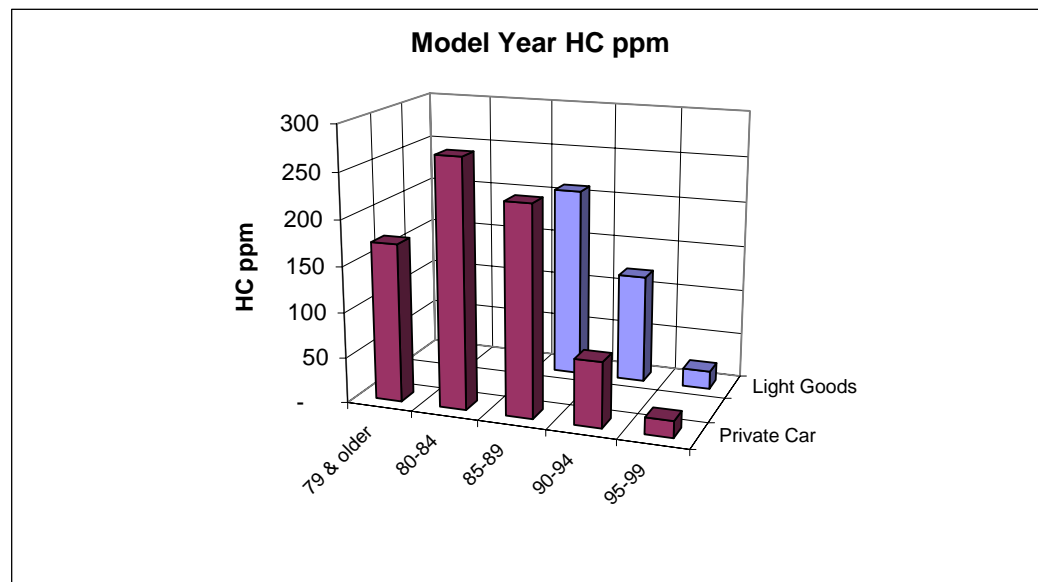


# Remote Sensing Mean HC, CO, NOx By Car Type



# Average HC,CO,NOx by Car Type and Model Year

Class	Year	Measurements			HC ppm			CO %			NOx (ppm)			Avg Speed (kph)			Accel (kph/s)		
		Private Car	Light Goods	M/C	Private Car	Light Goods	M/C	Private Car	Light Goods	M/C	Private Car	Light Goods	M/C	Private Car	Light Goods	M/C	Private Car	Light Goods	M/C
PC	79 & older	10			173			2.02			985			30			0.05		
PC	80-84	45		1	271		(1)	1.69		0.01	1,790		49	32		35	(0.37)		(2.90)
PC	85-89	522	17	2	229	209	61	1.42	1.98	0.73	1,834	1,599	1,163	34	40	43	0.33	0.56	0.80
PC	90-94	3144	49	4	71	119	64	0.61	1.26	0.04	725	1,711	568	33	37	42	0.33	0.67	0.85
PC	95-99	4240	40	4	18	20	48	0.19	0.81	0.57	258	182	358	33	37	29	0.37	0.54	0.30



# Average HC,CO,NOx by Car Type and Model Year

