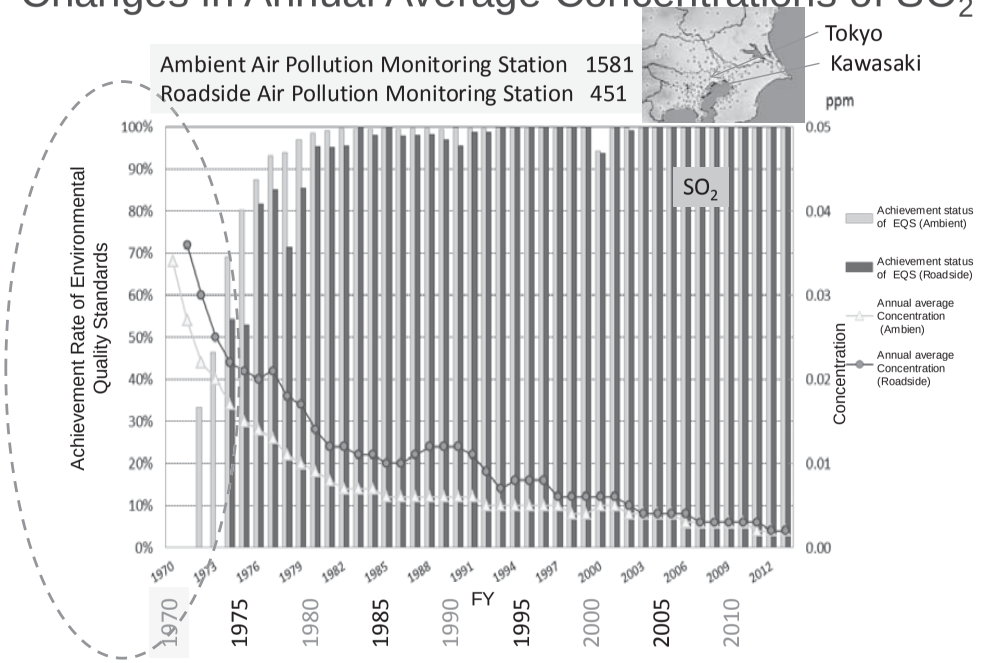
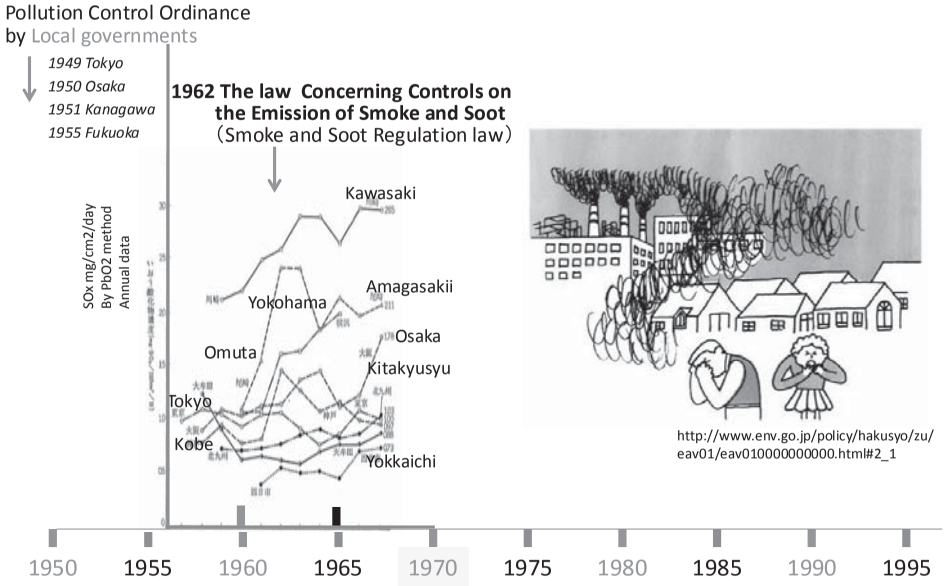
Changes in Annual Average Concentrations of SO_2



1950s – 1960s
Addressing serious pollution problems during the rapid-growth phase of the Japanese economy



http://www.env.go.jp/policy/hakusyo/zu/eav01/eav010000000000.html#2_1

http://www.env.go.jp/policy/hakusyo/hakusyo.php3?kid=144

Actions Against Air Pollution
- Japan's case -

Environmental Control Technology Office
Environmental Management Bureau
Ministry of the Environment

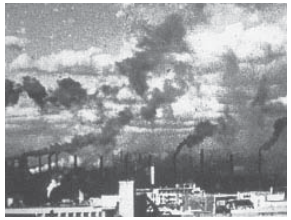
Japan has experienced serious atmospheric pollution in 1960s

1960s 2010s

Kawasaki city

http://www.iges.or.jp/jp/beijing/archive_pdf/activity_20130418/PDF_j/10-J_kawasaki.pdf

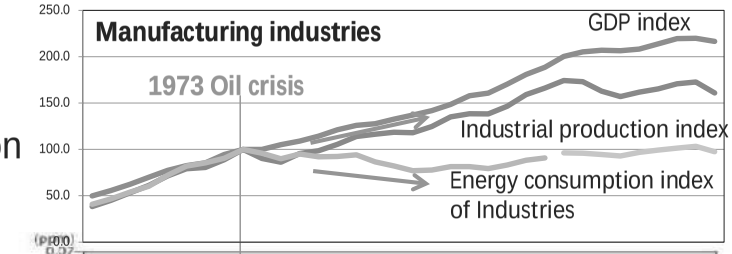
Kitakyusyu city



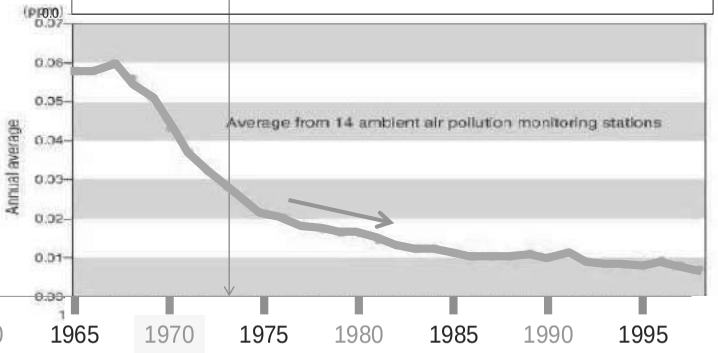
http://www.city.kitakyushu.lg.jp/kankyou/file_0264.html

Less energy consumption = Less pollution

Energy Conservation

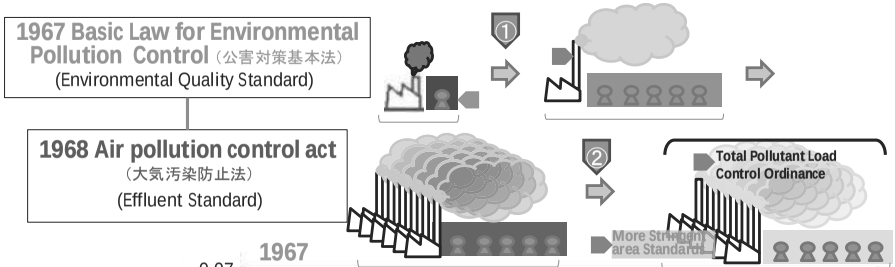


SO_2 Annual ave.

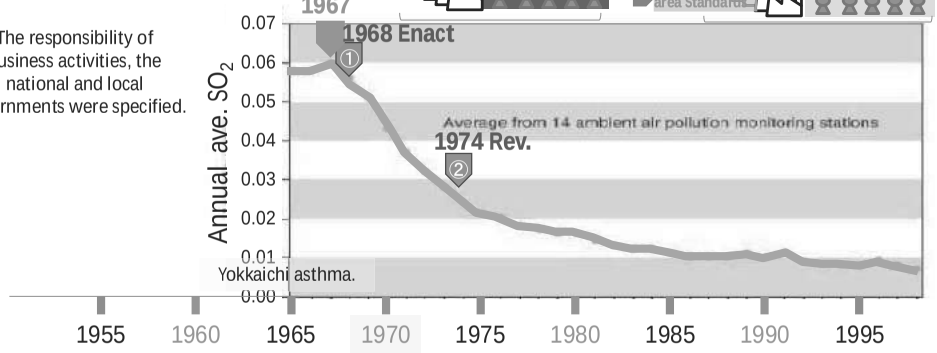


http://www.enecho.meti.go.jp/about/whitepaper/2014html/2-1-2.html

1960s – 1970s
Improving and strengthening pollution control.

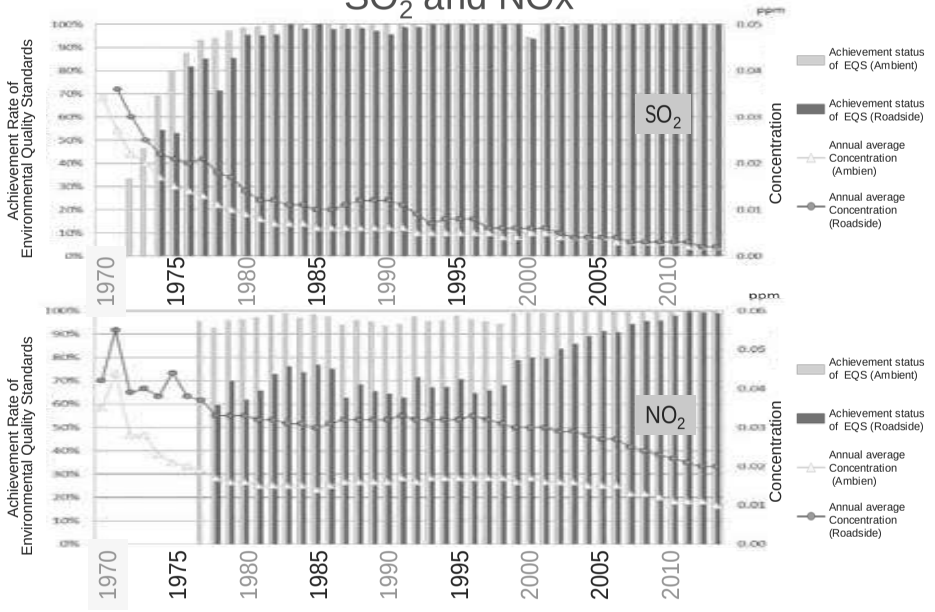


The responsibility of business activities, the national and local governments were specified.



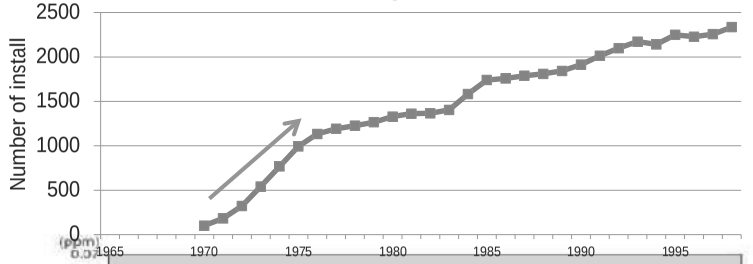
http://www.env.go.jp/en/air/aq/pollution/index.html

Changes in Annual Average Concentrations of SO_2 and NOx

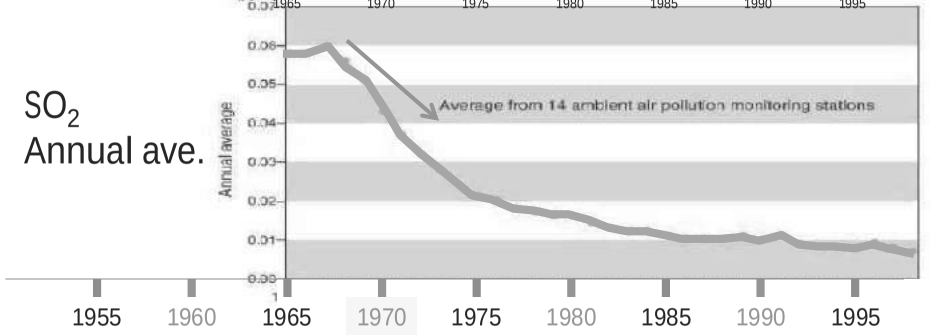


SOx Reduction system development and install to Stationary Source

De-SOx System

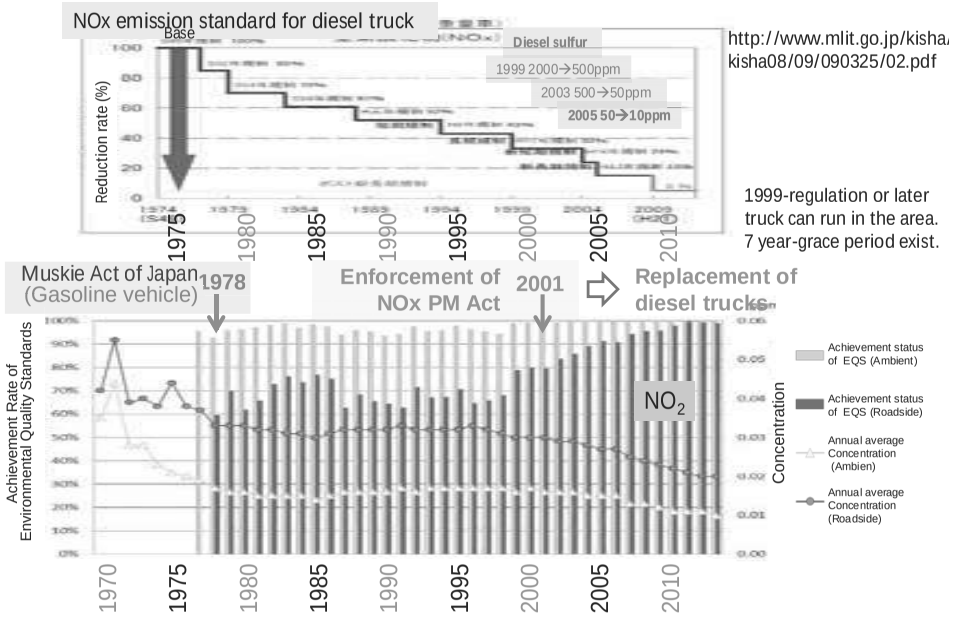


SO_2 Annual ave.



http://www.enecho.meti.go.jp/about/whitepaper/2014html/2-1-2.html

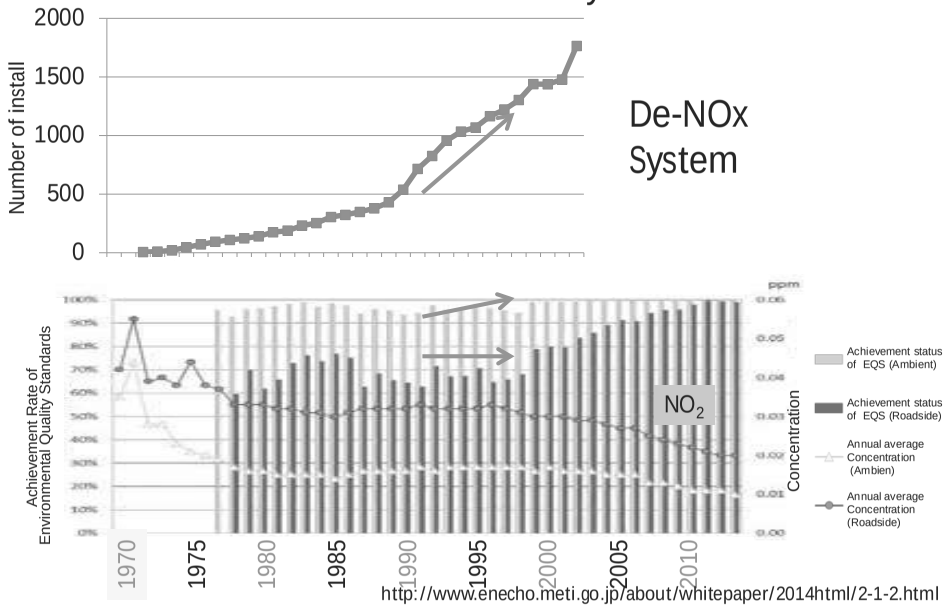
Changes in Annual Average Concentrations of NOx and vehicle regulations



http://www.mlit.go.jp/kisha/kisha08/09/090325/02.pdf

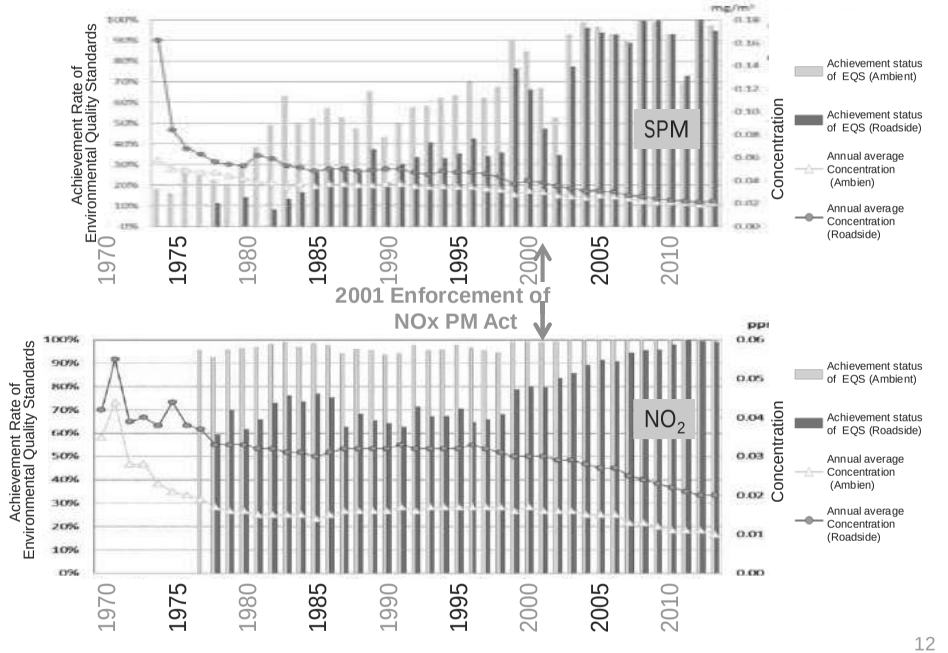
1999-regulation or later truck can run in the area. 7 year-grace period exist.

NOx Reduction system development and install to Stationary Source

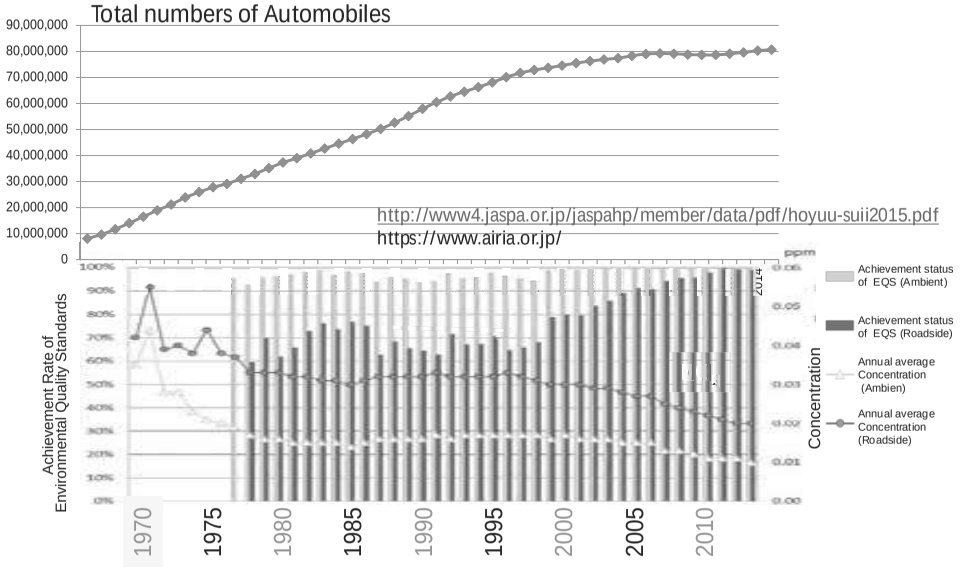


http://www.enecho.meti.go.jp/about/whitepaper/2014html/2-1-2.html

Changes in Annual Average Concentrations of SPM



Changes in Annual Average Concentrations of NOx and vehicle registration number



http://www4.jaspa.or.jp/jaspahp/member/data/pdf/hoyuu-suii2015.pdf
https://www.airia.or.jp/

Air Quality Standards

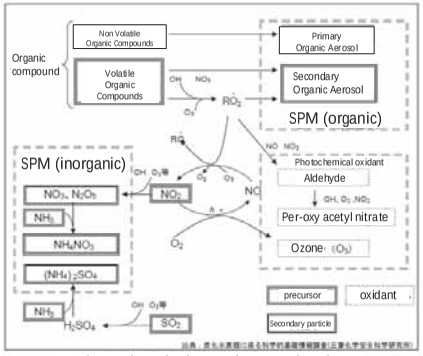
Air Pollutants	Environmental Quality Standards	
SO_2 (Sulfur Dioxide)	Daily average values shall be 0.04 ppm or less	Hourly average values shall be 0.1 ppm or less
CO (Carbon Monoxide)	Daily average values shall be 10 ppm or less	Average of hourly values for any consecutive eight hour period shall be 20ppm or less
SPM (Suspended particulate matter)	Daily average for hourly values shall be 0.10mg/m3 or less	Hourly average values shall be 0.20mg/m3 or less
Ox (Photochemical Oxidants)	-	Hourly average values shall be 0.06ppm or less
NO_2 (Nitrogen Dioxide)	Daily average for hourly values shall be within the 0.04-0.06 ppm zone or below that zone	-
PM2.5 (Particulate Matter 2.5)	Daily average values shall be 35 μg/m3	Annual average values shall be 15 μg/m3

Situation of PM2.5 and O_3

Achievement rates of PM2.5 EQS and O3 Environmental Quality Standards are very low.

Achievement rate of PM2.5 and O_3

	PM2.5	O_3
Number of valid monitoring stations	492	1184
Number of achieved monitoring stations	79	4
Achievement rate	16.1%	0.3%



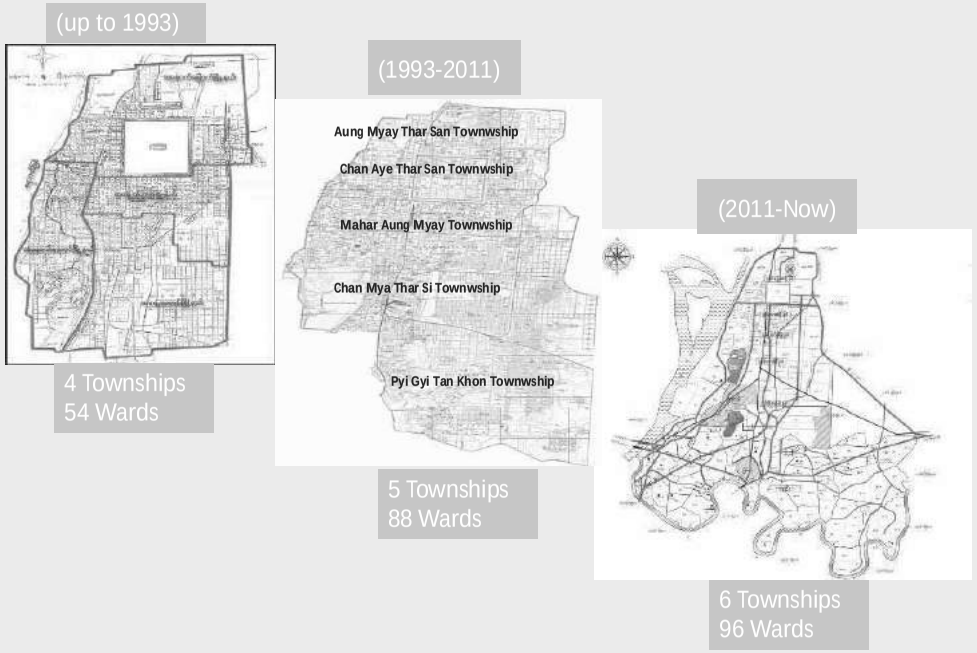
Photochemical reaction mechanisms
https://www.env.go.jp/air/osen/voc/materials/101.pdf

- The causative substances and source of emission vary widely.
- The emission mechanisms are complicated and inadequately elucidated.

Brief History of Mandalay City

- ❖Last Ancient Royal Capital City of Myanmar
- ❖Located at Eastern Part of Ayeyarwaddy River,in The Middle Portion of Central Myanmar
- ❖Total area is 44.59 square miles
- ❖Population is 1.46 millions
- ❖The 2nd Last King Mindon (Konbaung Dynasty)
- ❖Established in (1857-1859)
- ❖In 2007, The 150th Anniversary of Mandalay City was held
- ❖Now Our City Age is about 158 years

Mandalay City Area



Air Quality Monitoring Function in Mandalay Environmental Conservation Department

Min Thein (Mr.)
Assistant Director
Environmental Conservation Department
Ministry of Environmental Conservation and Forestry (MOECAF)
Republic of the Union of Myanmar

Presentation Outlines

- Mandalay City Profile
- Mandalay Industrial Zone History
- Background Information of Mandalay ECD and Air Quality Monitoring Activities
- Need and Gap
- Way Forward
- Study Tour to Japan (31.1.2016)-(5.1.2016)

Technology Transfer Project for PM 2.5 monitoring (PMTT)

- Location – Mandalay ECD Office
- Signed MOU with Asia Center for Air Pollution Research (ACAP) on May 19, 2015
- Install and train for PM 2.5 Monitoring Equipment at the end of April 2015 by ACAP & ESI
- We will need to report the out coming data to EANET (Acid Deposition Monitoring Network in East Asia) through Country's National Center (Department of Meteorology and Hydrology, Yangon)

Objectives

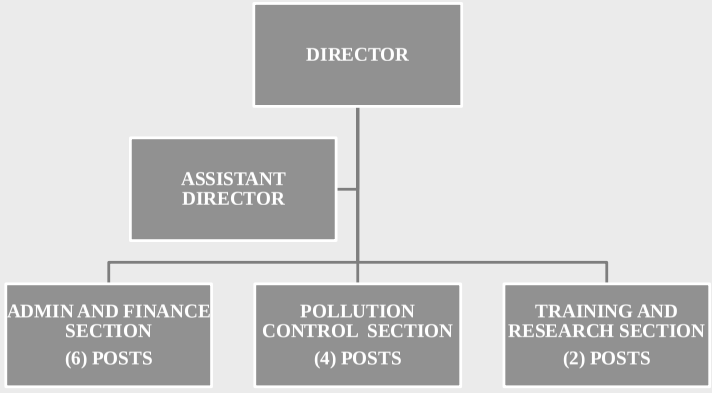
- To monitor daily record of PM 2.5 parameter, atmospheric temperature and humidity
- To support drawing in air quality standard
- To support drawing in air quality management
- To cooperate with international association

Background History of Mandalay Industrial Zone

- Zone 1 established in 1990
- Zone 2 established in 1999
- Zone 3 is established in 2013
- Total area is 736 hectares
- Nowadays combination of all zones,we called Mandalay Industrial Zone
- It is located at South East of Yangon-Mandalay Express Way in Pyigyidagon Township
- Big Factory - 392
- Medium Factory -304
- Small Factory -596
- Total -1292

Background Information (ECD, MDY) and Air Quality Monitoring Activities

- Under **MOECAF**, Environmental Conservation Department (**ECD**) established in 2012.
- ECD office for Mandalay Region has been set up on 1.10.2013

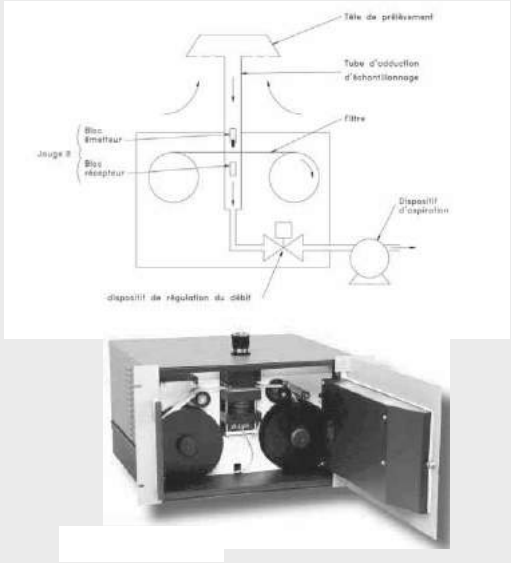


Components of MP101M

- Sampling head
- RST tube
- MP101M
- External pump

Analyzer main functions

- Sampling particle size PM10 or PM2.5 (head)
- Thermal regulation (RST)
- Dust sampling on filter (MP101M)
- Measurement of the mass by beta absoprtion (C14 and GM tube)
- Flow rate 1m3/h (pump)



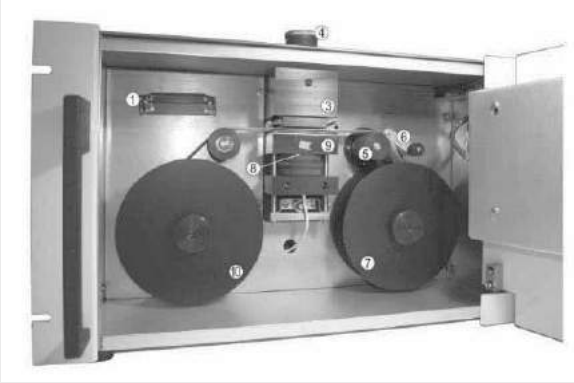
MP101M

Main specifications

Geiger-Müller counting time	:	Programmable from 10 to 200 s
Scan periods	:	10 mn, 1/4 - 1/2 - 1 - 2 - 3 - 4 – 6 - 12 – 24 – 48 hours
Measurement cycles	:	1 - 2 - 3 – 4 - 6 - 12 - 24 - 48 - 72 - 96 hours
Measurement threshold	:	Depends on periods, cycles and flow rates selected for 24-hour cycle and flow rate of 1 m^3/h: 0.5 µg/m^3
Noise (σ with Tc = 200 s)	:	3 µg/cm^2 on one period of 2 h (PM10).
Minimum detectable limit (2 σ with Tc = 200 s)	:	6 µg/cm^2 on one period of 2h (PM10)
Beta source	:	Carbone 14 radioelement, half-life of radioelement ≈ 5730 ans
Gauge adjustment	:	Automatic on each cycle change
Calibration	:	By reference gauge

MP101M

- (1) – reference gauge
- (3) – source holder
- (4) – RST connector
- (5) - capstan
- (6) – pinch roller
- (7) – take up reel
- (8) - Geiger-Muller detector
- (9) – pressuer assembly
- (10) – pay out reel



Front door open

MP101M

- (1) – Power supply block (with fuse)
- (2) - Fan
- (3) – connector for RST
- (4) - RS232/422 DB25 connector
- (5) – external pump connector
- (6) - DB15 met sensor connector
- (7) - TCP/IP plugg
- (8) – pump outlet
- (9) – holding screws (cover)
- (10) – Estel board (option)
- (11) - CPM connection (option)
- (12) – holding screws (rear panel)

rear panel

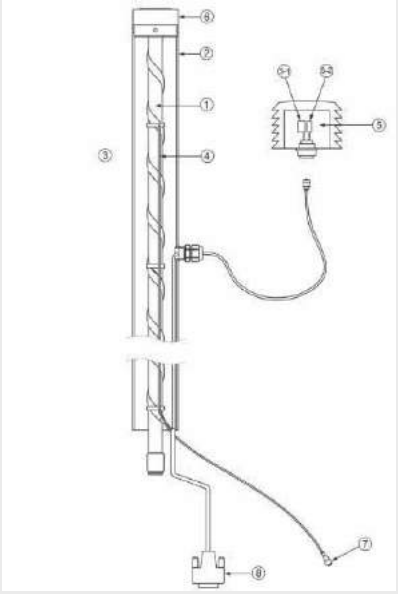
Thermal regulation(RST)

- Sampling is done at ambiant Temperature
- Relative humidity and temperature are continuously measured
- If RH > 60% the heating start and is kept at 5° > Text to avoid condensation

$T_{prélèvement} = T_{atmosphérique} + 5\ °C.$

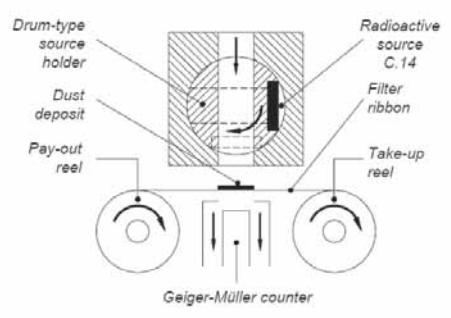
Régulation Thermique (RST)

- (1) – duct tube 20 mm
- (2) – protection sheath 60 mm
- (3) – heating wire
- (4) – internal temperature sensor
- (5) – met sensors (Text, HR)
- (6) – sampling head adaptor
- (7) – heating line connector
- (8) – DB15 connector for signals



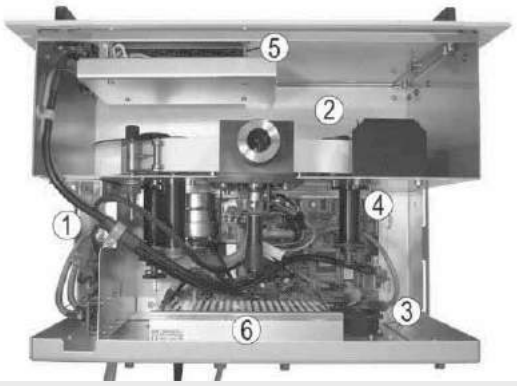
MP101M

- Masse measurement is done by setting the source in front of the GM tube
- Beta rays are absorbed proportionally to the effective mass in between.
- Material in made of the air, filter and collected dust
- Measurement principle is to compare the absorption of a « clean filter » and the one after sampling.



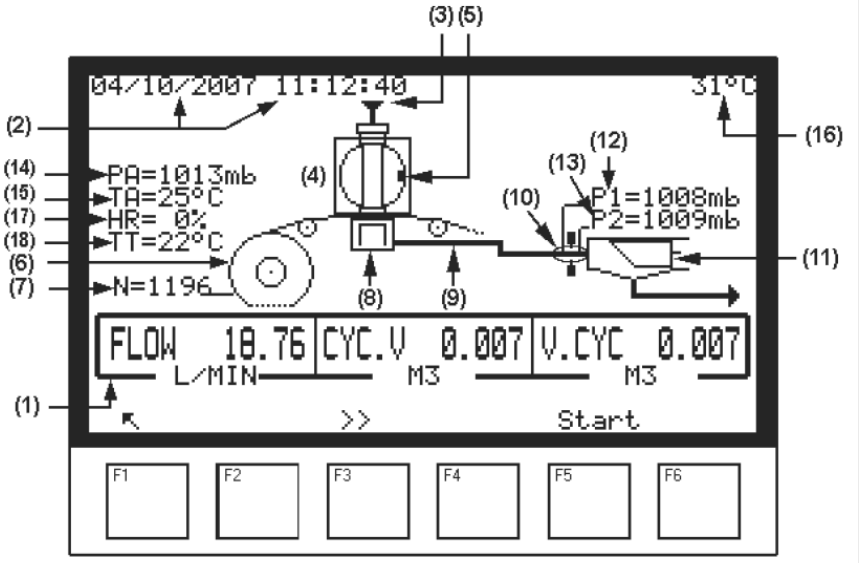
MP101M

- (1) – flow regulation
- (2) – collector and beta gauge assembly
- (3) – electronic part
- (4) – module board
- (5) – Arm7 board
- (6) – power supply board



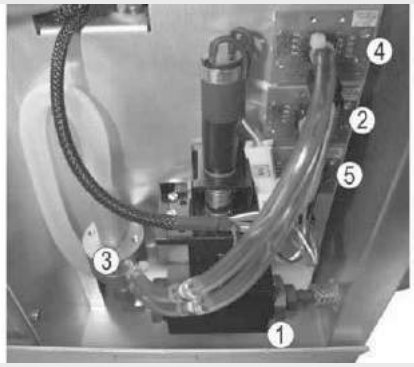
Upside view

MP101M : main menu



MP101M

- (1) – one motor driven valv
- (2) – upstream Pressure sensor P2
- (3) – flat orifice
- (4) - downstream Pressure sensor P1
- (5) – atmospheric P sensor



Flow regulation view

PM 2.5 Monthly Report (April)

Date	Per.Conc ug/m3	WHO Standard guideline 25 ug/m3	Japan Standard guideline 35 ug/m3
28.4.2015	40.7	+	+
29.4.2015	39.1	+	+
30.4.2015	41.1	+	+

Maximum

Minimum

\+ Higher than WHO/Japan standards

PM 2.5 Monthly Report (May)

Date	Per.Conc ug/m3	WHO Standard guideline 25 ug/m3	Japan Standard guideline 35 ug/m3
1.5.2015	34.3	+	-
2.5.2015	45.8	+	+
3.5.2015	46.1	+	+
4.5.2015	66.9	+	+
5.5.2015	66.7	+	+
7.5.2015	33.4	+	-
8.5.2015	40.8	+	+
9.5.2015	60.1	+	+
10.5.2015	144.8	+	+
11.5.2015	47.3	+	+
12.5.2015	49.4	+	+
19.5.2015	118.3	+	+
20.5.2015	178.7	+	+
21.5.2015	98.6	+	+
22.5.2015	121.8	+	+
23.5.2015	164.9	+	+
24.5.2015	225.9	+	+
25.5.2015	185.7	+	+
26.5.2015	196.8	+	+

Maximum

Minimum

\+ Higher than WHO/Japan standards

MP101M

Preventive maintenance

Preventive maintenance

Nature of operations	Periodicity	Sheet N°
– Check of Picolino pump assembly	1 year	4.3.1
– Check of KNF pump assembly	1 year	4.3.2
– Sampling heads cleaning	1 month	4.3.3
– Multiplexer (MUX) signals verification	3 months	4.3.4
– Replacement of filter ribbon	1 to 3 years	4.3.5
– Verification of pressure exerted on the filter	1 year	4.3.6
– Flow rate and leak rate tests	3 months	4.3.7
– Calibration of sampling flow rate	6 months	4.3.8
– Beta gauge calibration	6 months	4.3.9
– Contamination test	1 month	4.3.10
– Beta gauge check (gauge test, mass test)	6 months	4.3.11
– Verification / Replacement of T°C and RH sensors	6 months	4.3.12

Results of Air Quality(MEI)

Sampling Location	MAQN-1						WHO, 2005			Japan
Parameter	Nov.	Dec.	Jan.	Feb.	March	April	Guideline	Interim target 2	Interim target 1	
SO_2 (µg/m³)	84.65	193.34	143	200.2	28.6	56.6	20	50	125	
NO_2 (µg/m³)	64.86	35.53	56.4	94	112.8	93.4	200 (1 hr)	NA	NA	
CO (ppm)	0.85	2.99	0.4	0.67	0.68	0.56				10
PM 2.5 (µg/m³)	86.60	204.12	140.23	223.19	69.4	78.4	25	50	75	
PM 10 (µg/m³)	98.20	217.72	145.28	227.77	91.96	94.5	50	100	150	

MAQN-1 (Industrial Zone – 2)

Results of Air Quality(MEI)

Sampling Location	**MAQN-2**						**WHO, 2005**			**Japan**
Parameter	Nov.	Dec.	Jan.	Feb.	March	April	Guideline	Interim target 2	Interim target 1	
SO_2 (µg/m³)	70.93	80.08	114.4	57.2	143	28.6	20	50	125	
NO_2 (µg/m³)	64.86	48.5	131.6	150.4	94	150.4	200 (1 hr)			
CO (ppm)	0.80	0.52	0.41	0.71	1.5	0.62				10
PM 2.5 (µg/m³)	87.80	87.3	69.54	106.45	64.74	71.23	25	50	75	
PM 10 (µg/m³)	94.10	99.3	75.3	118.18	96.71	99.74	50	100	150	

MAQN-2 (Nursery Garden)

PM 2.5 Monthly Report (July)

Date	Per.Conc ug/m3	WHO Standard guideline 25 ug/m3	Japan Standard guideline 35 ug/m3
7.7.2015	18.5	-	-
8.7.2015	25.1	+	-
9.7.2015	17.7	-	-
10.7.2015	25.8	+	-
11.7.2015	19.1	-	-
12.7.2015	18.8	-	-
13.7.2015	18.9	-	-
14.7.2015	28.5	+	-
15.7.2015	13.7	-	-
16.7.2015	11.1	-	-
17.7.2015	8.1	-	-
18.7.2015	9.7	-	-
19.7.2015	10.9	-	-
20.7.2015	10.4	-	-
21.7.2015	10.2	-	-
22.7.2015	6.3	-	-
23.7.2015	6.1	-	-
24.7.2015	17.1	-	-
25.7.2015	7.4	-	-
26.7.2015	15.9	-	-
27.7.2015	10.9	-	-
28.7.2015	5.8	-	-
29.7.2015	19.5	-	-
30.7.2015	21.1	-	-
31.7.2015	13.3	-	-

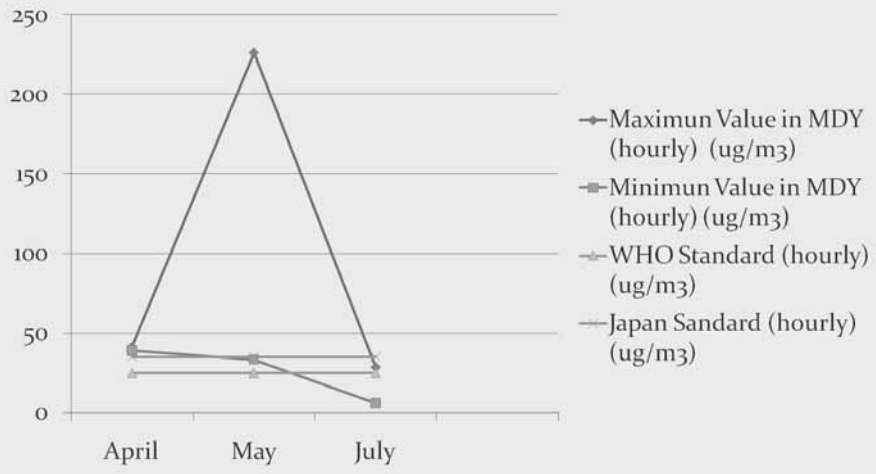
Maximum

Minimum

\+ Higher than WHO/Japan standards

\- Lower than WHO/Japan standards

Comparing between the PM 2.5 data result and WHO & JAPAN Standard



Way Forward

- To announce Environmental Quality Standards
- To announce Air Quality Standards
- To build Air Quality Monitoring Stations
- Have to make Factory's Owner to obey Law, Rules , EQS and AQS

Study Tour in Japan (31.1.2016)-(5.1.2016)

Results of Air Quality(MEI)

Sampling Location	**MAQN-3**						**WHO, 2005**			**Japan**
Parameter	Nov.	Dec.	Jan.	Feb.	March	April	Guideline	Interim target 2	Interim target 1	
SO_2 (µg/m^3)	64.06	114.4	85.8	171.6	143	143	20	50	125	
NO_2 (µg/m^3)	69.37	76.89	75.2	75.2	94	94	200 (1 hr)			
CO (ppm)	1.76	5.16	0.93	0.65	1.92	1.9				10
PM 2.5 (µg/m^3)	47.70	78.3	93.7	106.67	130	46.76	25	50	75	
PM 10 (µg/m^3)	94.10	82.5	97.45	115.82	172	47.1	50	100	150	

MAQN-3 (Inside MOEP Compound ,78th Street between 26th and 27th Road)

Need and Gap

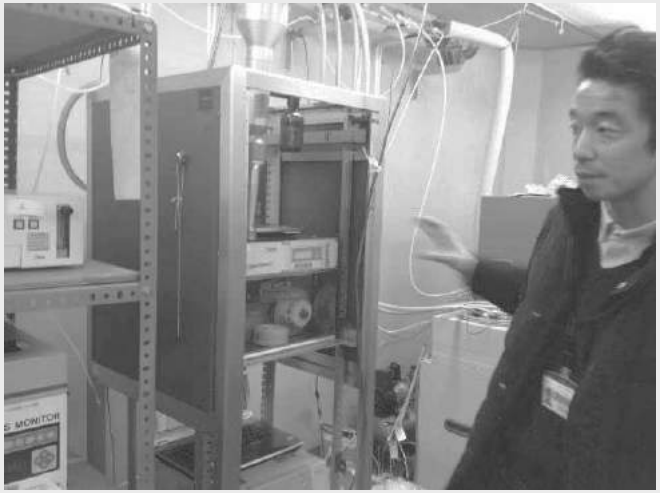
- Environmental Quality Guidelines
- Air Quality Management
- National Air Quality Standards
- Skillful of Human Resources
- Cooperation with Civil Societies and NGOs and have to pay awareness program in Education and Social Sectors
- Law Enforce

Tokyo Metropolitan Research Institute (2.2.2016)

Tokyo Metropolitan Government (2.2.2016)

Ministry of the Environment,Government of Japan (1.2.2016)

National Institute for Environmental Studies (1.2.2016)

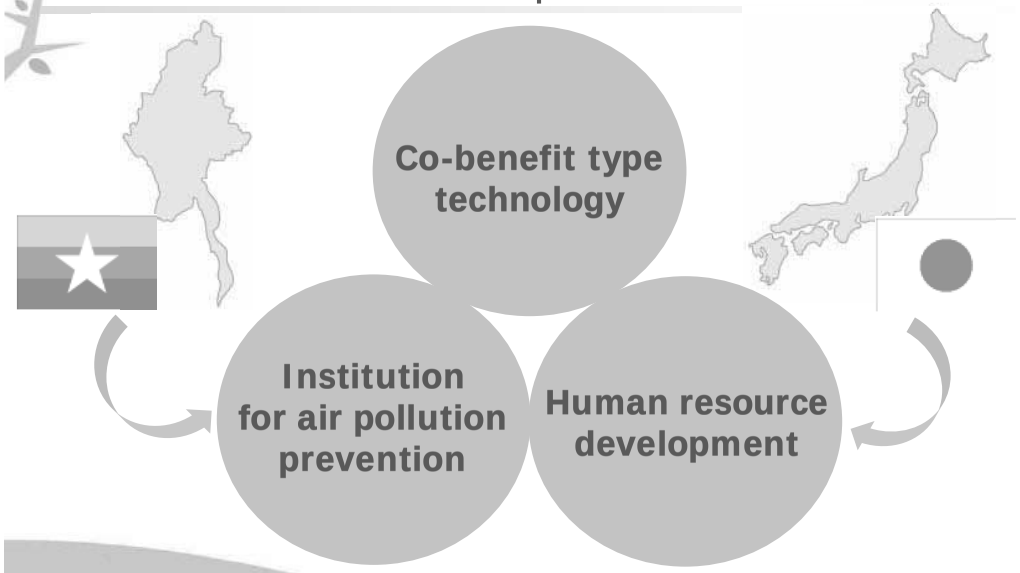


Thank You

Taiheiyo Cement Cooperation,Saitama Plant (3.2.2016)

Adachi Incineration Plant (4.2.2016)

01 About “Bilateral Cooperation Proiect”



Two countries collaborate in Co-benefit activity for air pollution control by packaging technology, institution, and human resource development

Bilateral Cooperation Project
for Air Pollution Prevention and Greenhouse Gas Reduction ~Co-benefits Approach~

Activity report

01 About “Bilateral Cooperation Project”
02 Study result of air pollution in Myanmar
03 Cooperation between Myanmar and Japan
- Air pollution control awareness guide
- Bilateral seminar
- Japanese study tour

Name: Tasuku Takatori
Email : [redacted]

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02 Study result of air pollution in Myanmar

2015	**October**	**1st survey**
	November	**2nd survey**
	December	**3rd survey**
2016年	**February 1st ～**	**Study tour in Japan**
	February 25th	**Bilateral seminar**
	February 26th	**Joint policy research meeting**

Bilateral seminar

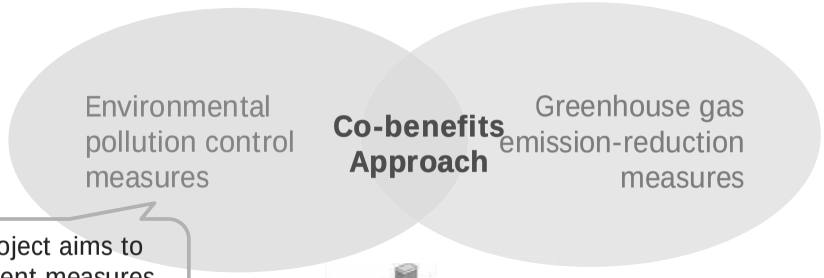
Information sharing between two countries: Japanese experts introduce Japanese experiences, technologies, institutions and their knowledge, while Myanmar’s experts explain of current status concerning air pollution control in Myanmar.

Joint policy research meeting

Discussion meeting about Myanmar’s policies and institutions for air pollution control among policymakers and experts from two countries (Myanmar-Japan).

01 About “Bilateral Cooperation Project”

Co-benefits Approach means integrated efforts to address environmental pollution control issues and climate change mitigation concerns



This project aims to implement measures against air pollution

Source: MOEJ

Ex1） High-efficient thermal power plant
- **Exhaust gas reduction from power plant**
- **CO2 reduction by higher efficiency**

Ex2） Energy saving of factory
- **Exhaust gas reduction from factory**
- **CO2 reduction by energy saving**

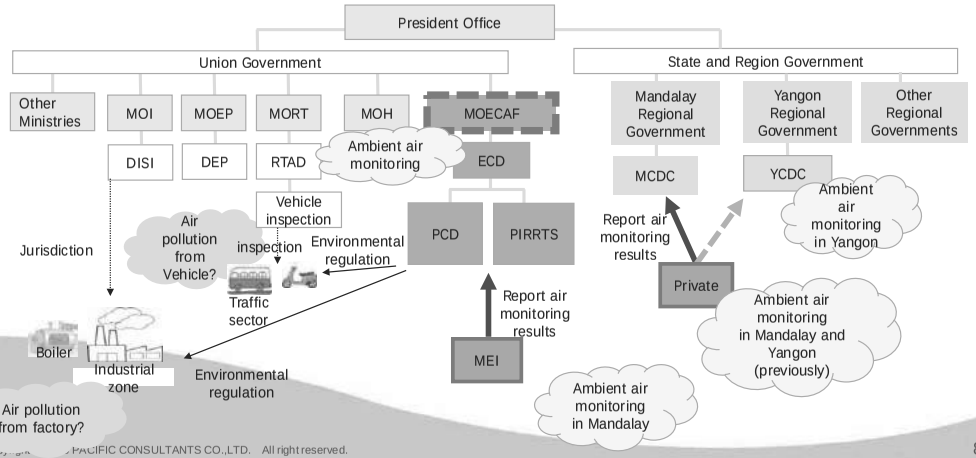
Ex3） Improving fuel economy of vehicle
- **Exhaust gas reduction from vehicle**
- **CO2 reduction by fuel saving**

02 Study result of air pollution in Myanmar

02 Study result of air pollution in Myanmar

02 Study result of air pollution in Myanmar

Several ministries and organizations are monitoring ambient air in major cities. Air pollutants seem to be emitted mainly from traffic and industrial sector.



02 Study result of air pollution in Myanmar

02 Study result of air pollution in Myanmar

Transportation

Current:
- Older model cars are still on the roads
- Fuel quality is improving recently

Future:
- There are(or will be) “high emitter vehicles”?

Factory

Current:
- Light industries have been developed
- In heavy industry, cement factory has been developed in advance

Future:
- working conditions will become worsen due to exhaust gasses?
- Pollution source from heavy industry will expand and become serious?

Air pollution seems not to be serious at present, but will need to be controlled in the future!

03 Cooperation between Myanmar and Japan

■ Suggestion from Japan

1. Get accurate knowledge about air pollution control
2. Monitor and understand daily environmental air condition
3. Implement proper countermeasures for air pollution at appropriate timing

- ☐ Air pollution control awareness guide
- ☐ Information sharing (this seminar)
- ☐ Study tour in Japan

03 Awareness guide

Air pollution control awareness guideline

Contents

1. About air pollution
- 1.1 What is “air pollution”?
- 1.2 Key air pollutant

2. Air pollution sources
- 2.1 Source types
- 2.2 Mobile emission sources
- 2.3 Stationary emission sources
- 2.4 Natural emission sources

3. Air pollution monitoring
- 3.1 How to monitor pollutants
- 3.2 Ambient air monitoring
- 3.3 Vehicle emission monitoring
- 3.4 Stack gas monitoring

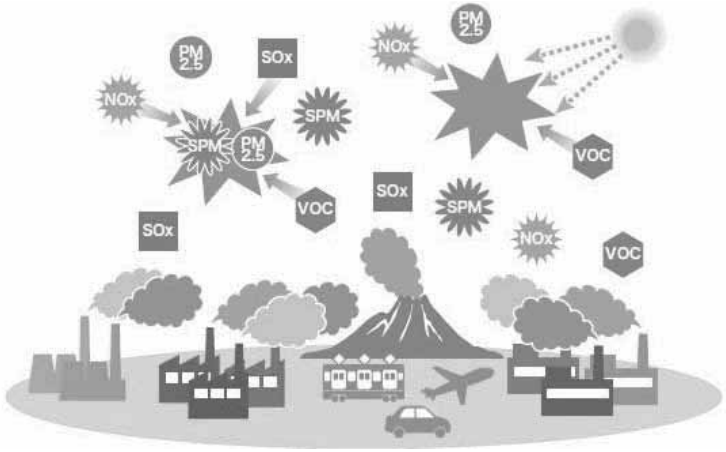
4. Measures for air pollution prevention
- 4.1 Measures for mobile emission sources
- 4.2 Measures for stationary emission sources
- 4.3 Measures for stationary emission sources

5. Japan history in combating air pollution
- 5.1 Industrial pollution
- 5.2 Urban-life pollution
- 5.3 Recent air pollution

6. Air pollution situation in Myanmar
- 6.1 Mobile emission sources
- 6.2 Stationary emission sources
- 6.3 Air pollution monitoring

Appendix
Prevention measure checklist

03 Awareness guide



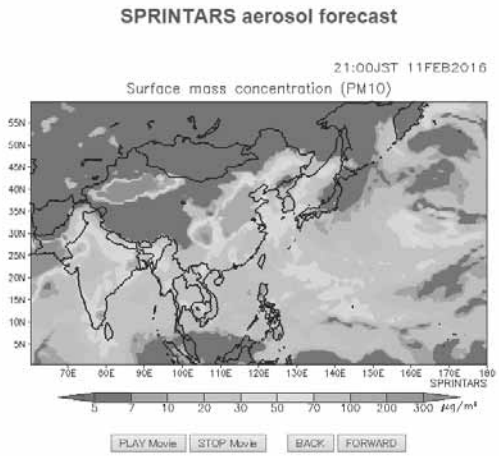
- ✓ **Key air pollutants?**
- ✓ **Where air pollutants come from?**
- ✓ **How to monitor pollutants?**
- ✓ **How to prevent pollution at source?**

SPRINTARS

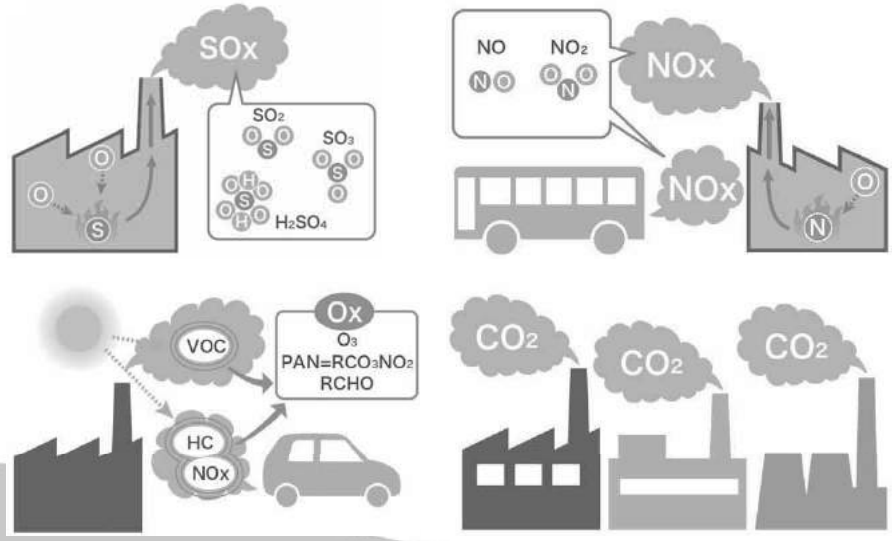
http://sprintars.riam.kyushu-u.ac.jp/indexe.html

- Numerical model that forecasts densities of particle matter in Asia

- Developed by Japanese university with the aid of research institution



Air pollutant

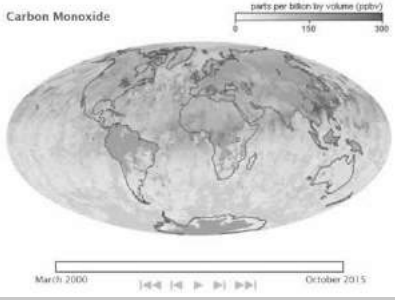


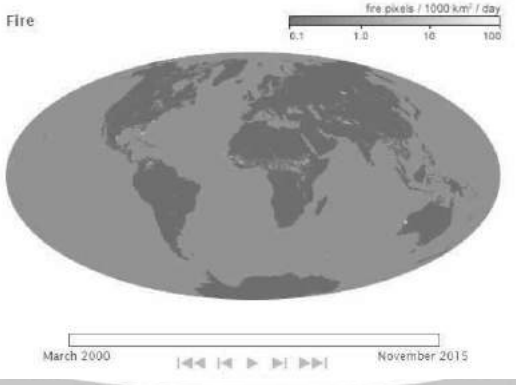
NASA Earth Observatory

http://earthobservatory.nasa.gov/?eocn=topnav&eoci=logo

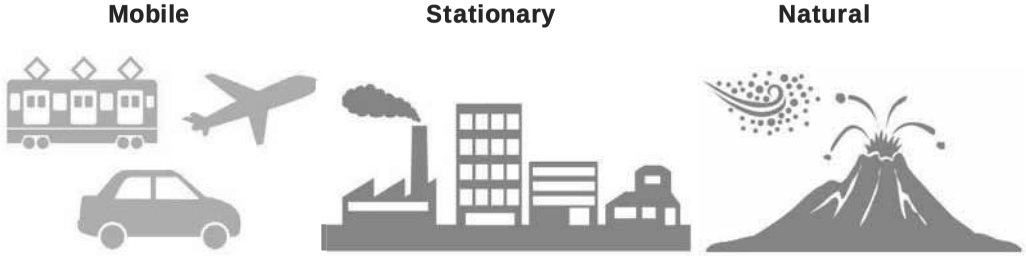
- NASA publishes global maps that show monthly averages of global concentrations of particle matters, CO etc.

- Meteorological information such as sea surface temperature, rainfall and snow depth





Pollutant source



Mobile	passenger car, bus, railway, vessel, airplane
Stationary	factory, calcinatory, power plant, burn agriculture
Natural	volcano, dust, plant, sea salt particle

"Mobile" and "Stationary" are man-caused sources

→ *need to be managed!!*

Thank you

Tasuku Takatori (Reseacher)
Email: [redacted]
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03 Information sharing (this seminar)

Information sharing from Japanese experts

Time	Theme	Presenter
10:30~	“Opening remark”	MOECAF
10:35~	“Policy of bilateral cooperation project”	MOEJ
10:40~	<Policy and regulation session>	Mr. Akihiro Misumi (MOEJ) Mr. Min Thein (MOECAF) Tasuku Takatori (PCKK)
12:15~	Lunch	-
13:00~	<Air monitoring Session>	YCDC MCDC MEI HORIBA
15:00~	Coffee break	-
15:20~	<Vehicle exhaust gas Session>	MORT Automobile inspection JARI
16:20~	<Industrial exhaust gas Session>	MOH Taiheiyo engineering
17:20~	“Closing remarks”	MOEJ

03 Study tour in Japan

National institute for Environmental Studies

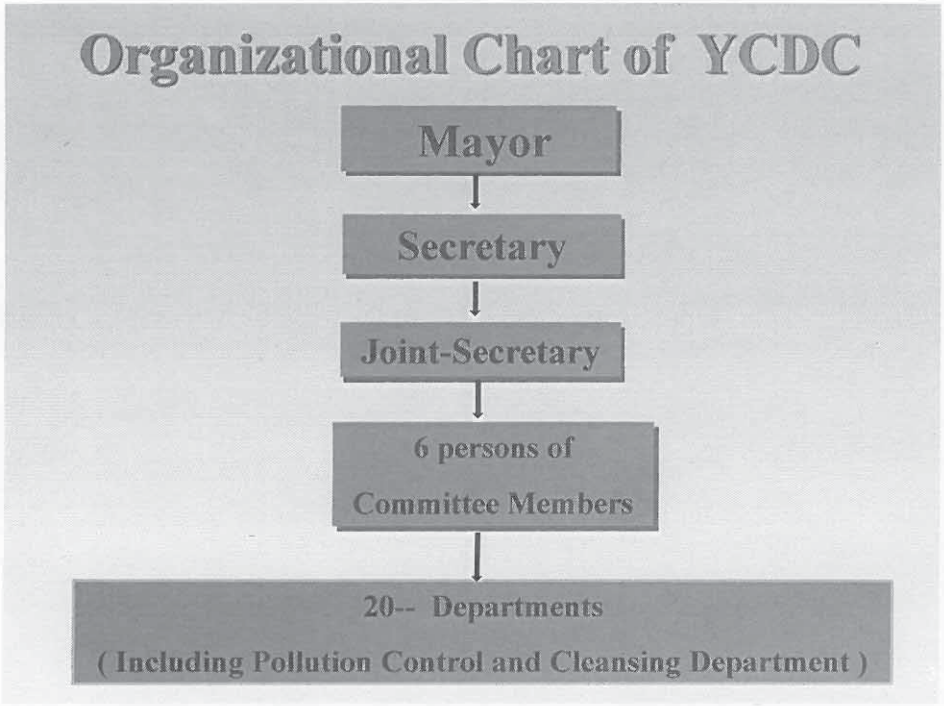
Tokyo Metropolitan Research Institute for Environmental Protection

Tokyo Metropolitan Government Bureau of Environment

Taiheiyo Cement factory

Clean Authority of TOKYO

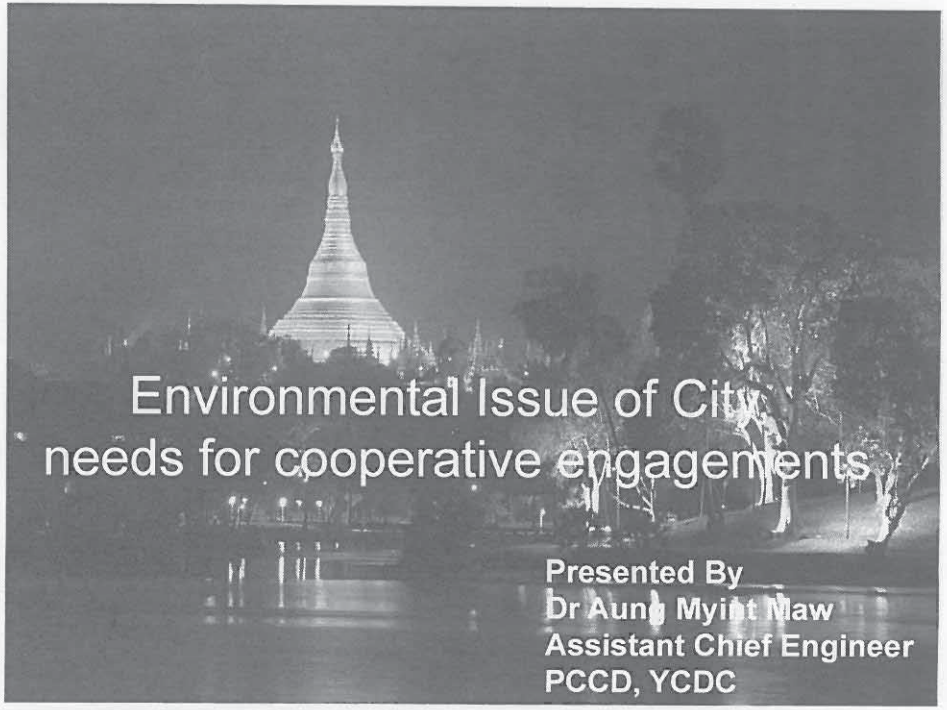
Organizational Chart of YCDC



ASEAN – German Technical Cooperation
"Clean Air for Smaller Cities in the ASEAN Region"

Objective

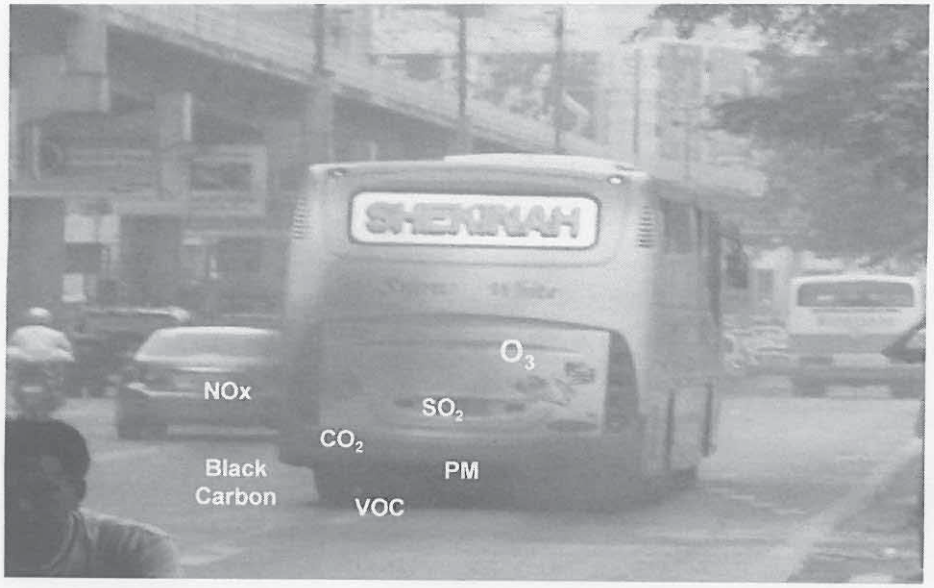
To equip participants with basic knowledge and information on air quality management and technical knowledge on air quality monitoring



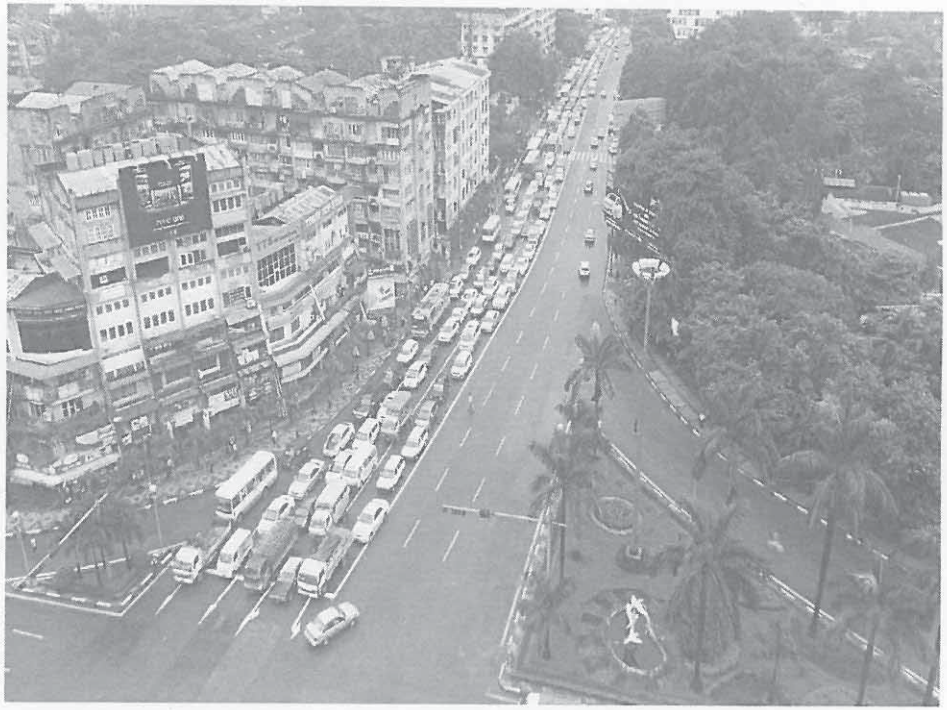
Population	: 6 million (2014)
Area	: The administrative boundary of YCDC, in 1985 (133.643 Sq-Miles) and now a day (292.426) Square Miles.

Automobile Growth in Yangon City

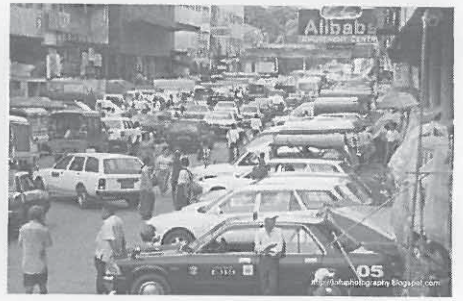
Sr	Year	Number of Vehicles(Ygn.)
1	2008	186,931
2	2009	194,087
3	2010	204,763
4	2011	215,893
5	2012(June)	279,096
6	2013 - August	311,211
7	2016	742,712



Automobile import rate is more and more in Myanmar, mostly in Yangon



Lack of Discipline in Yangon



Air Quality Monitoring in 2012

- At 2012, ambient air quality was measured at Nay Pyi Taw and Yangon at our Occupational Health Division from January to December once a week.

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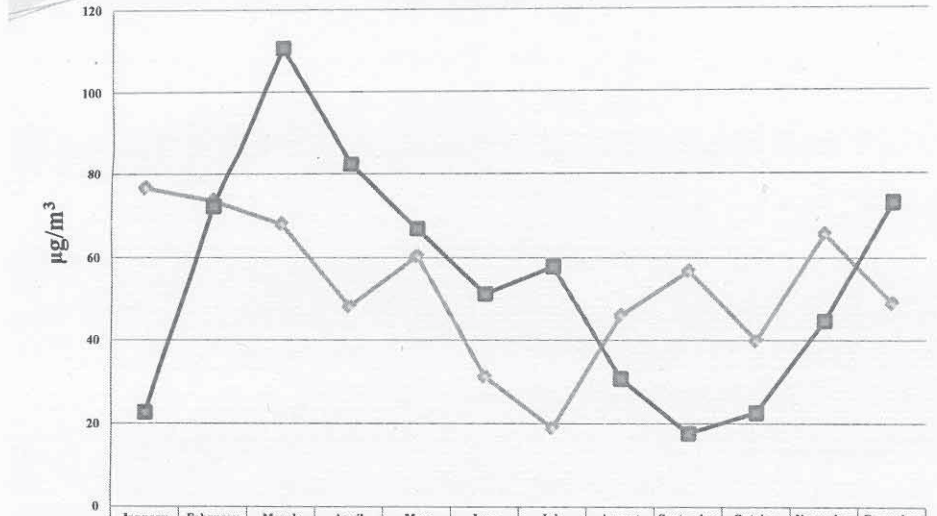
TSPM (2012)

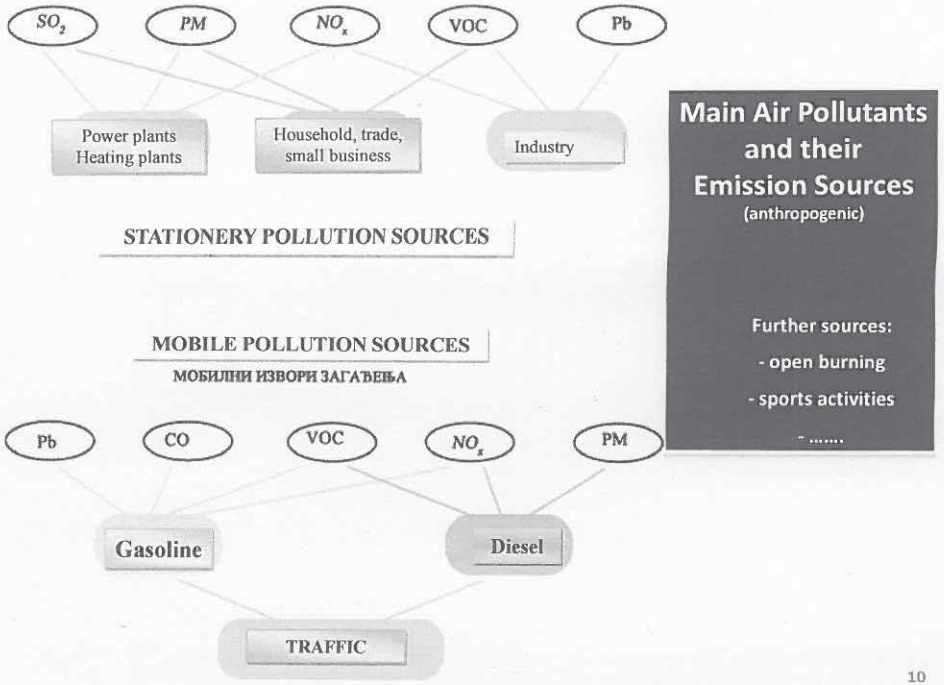


	January	February	March	April	May	June	July	August	September	October	November	December
Yangon	76.58	73.66	68.12	48.17	60.46	31.21	18.98	45.92	56.82	39.86	65.84	48.85
Nay Pyi Taw	22.7	72.31	110.64	82.38	67.03	51.2	57.9	30.7	17.65	22.61	44.58	73.4

12

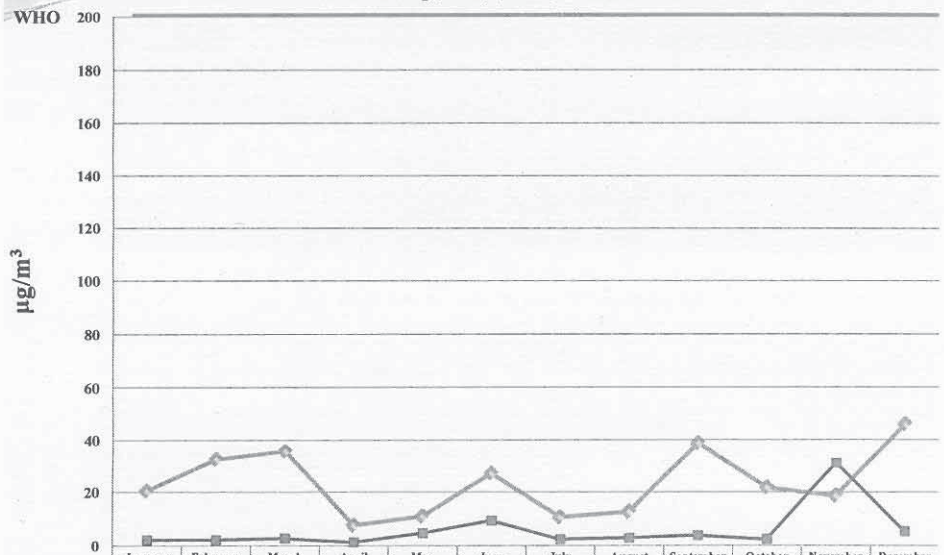
Main Air Pollutant Emissions From Vehicles

- Diesel Engines
  - Fine Particulate Matter (PM) – nearly all $PM_{2.5}$
  - Oxides of Nitrogen (NOx)
- Four-Stroke Gasoline / LPG / Natural Gas Engines
  - Carbon Monoxide (CO)
  - Oxides of Nitrogen (NOx)
  - Unburned Hydrocarbons (HC)
  - Smoky vehicles emit $PM_{2.5}$
- Two-Stroke Gasoline / LPG / Natural Gas Engines
  - Oil Particulate Matter ($PM_{2.5}$)
  - Unburned Hydrocarbons (HC) – very high!
  - Carbon Monoxide (CO)



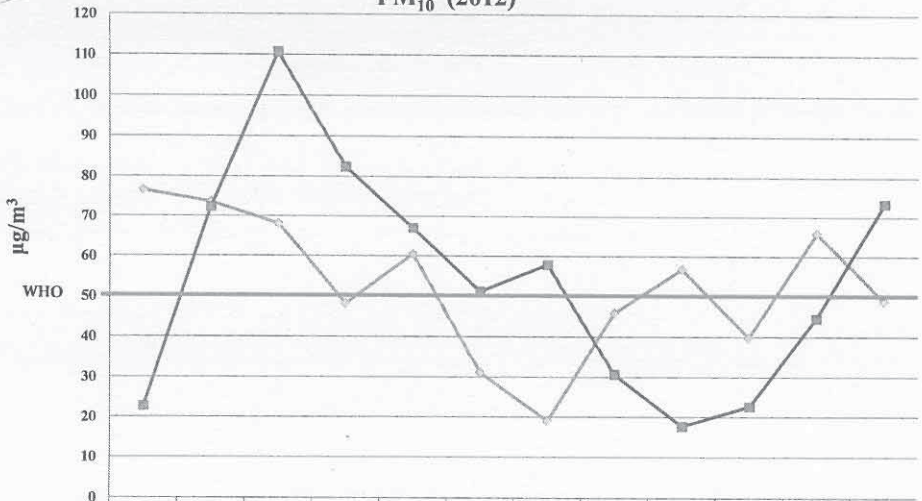
10

NO_2 (1 hr) (2012)



	January	February	March	April	May	June	July	August	September	October	November	December
Yangon	20.36	32.54	35.61	7.59	10.91	27	10.55	12.58	38.58	21.66	18.64	45.89
Nay Pyi Taw	2.12	2.12	2.76	1.33	4.66	9.38	2.45	2.92	3.87	2.48	31.05	15 5.34

PM_{10} (2012)



	January	February	March	April	May	June	July	August	September	October	November	December
Yangon	76.58	73.66	68.12	48.17	60.46	31.21	18.98	45.92	56.82	39.86	65.84	48.85
Nay Pyi Taw	22.7	72.31	110.64	82.38	67.03	51.2	57.9	30.7	17.65	22.61	44.58	73.4

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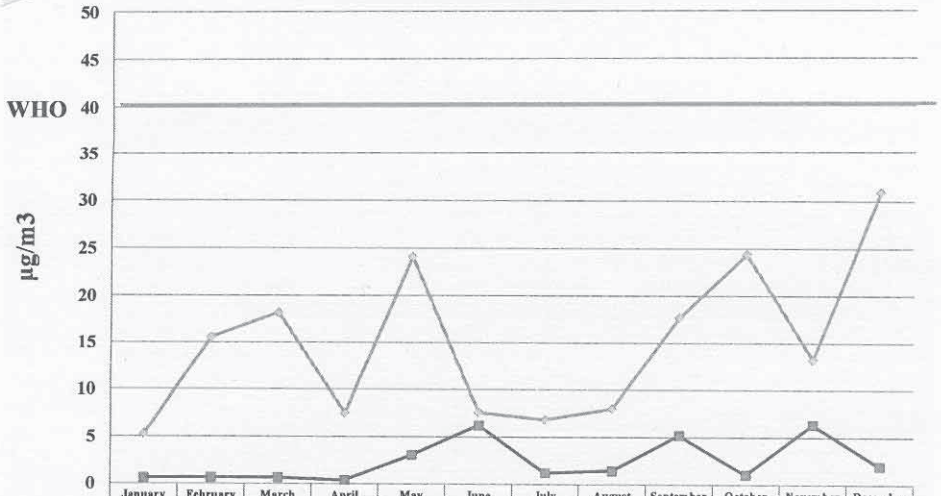
NO2 (24 hr) (2012)



	January	February	March	April	May	June	July	August	September	October	November	December
Yangon	5.27	15.54	18.16	7.49	24.09	7.62	6.84	8.03	17.68	24.4	13.23	30.93
Nay Pyi Taw	0.61	0.64	0.64	0.4	3.08	6.23	1.2	1.45	5.21	1.05	6.35	1.98

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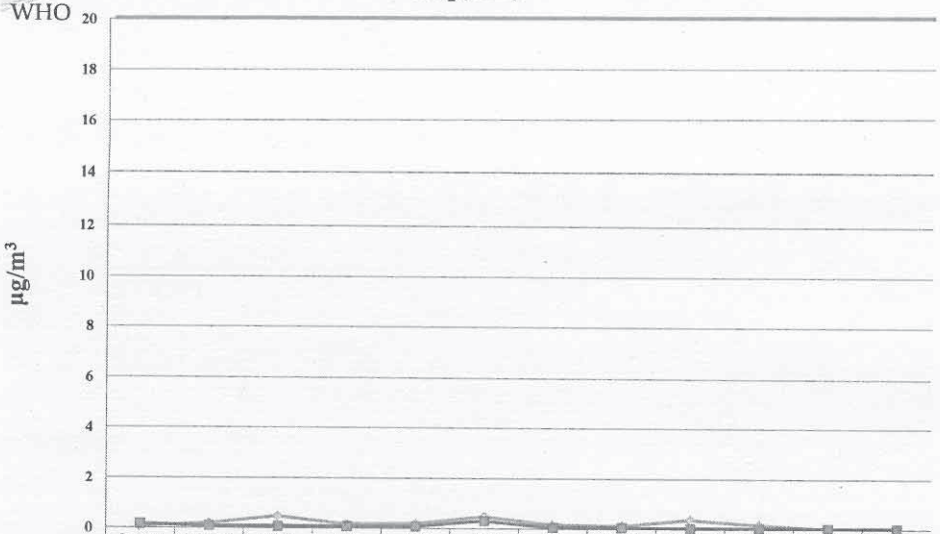
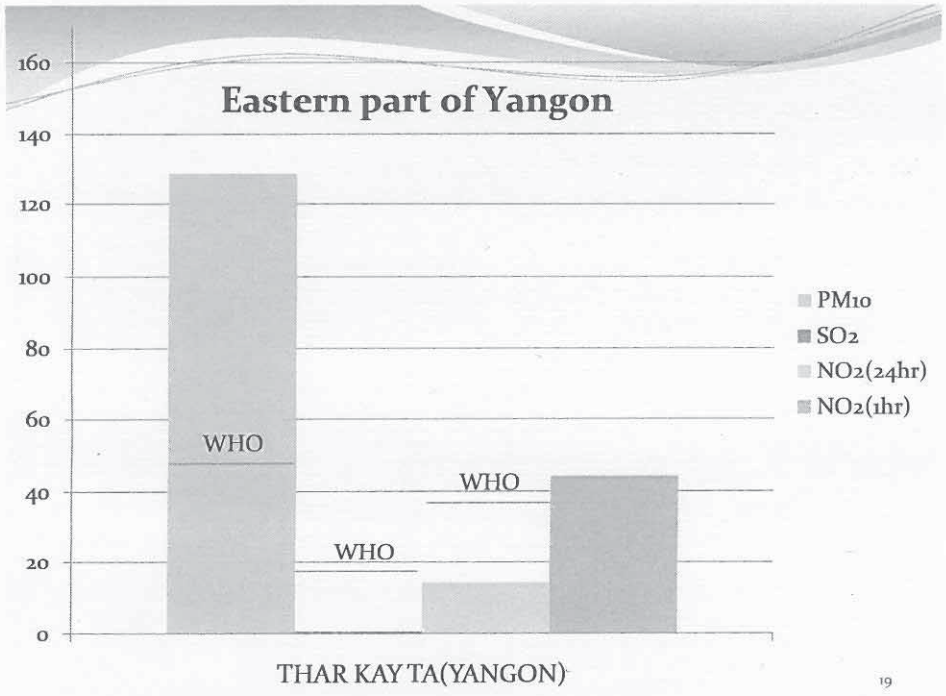
SO_2 (2012)



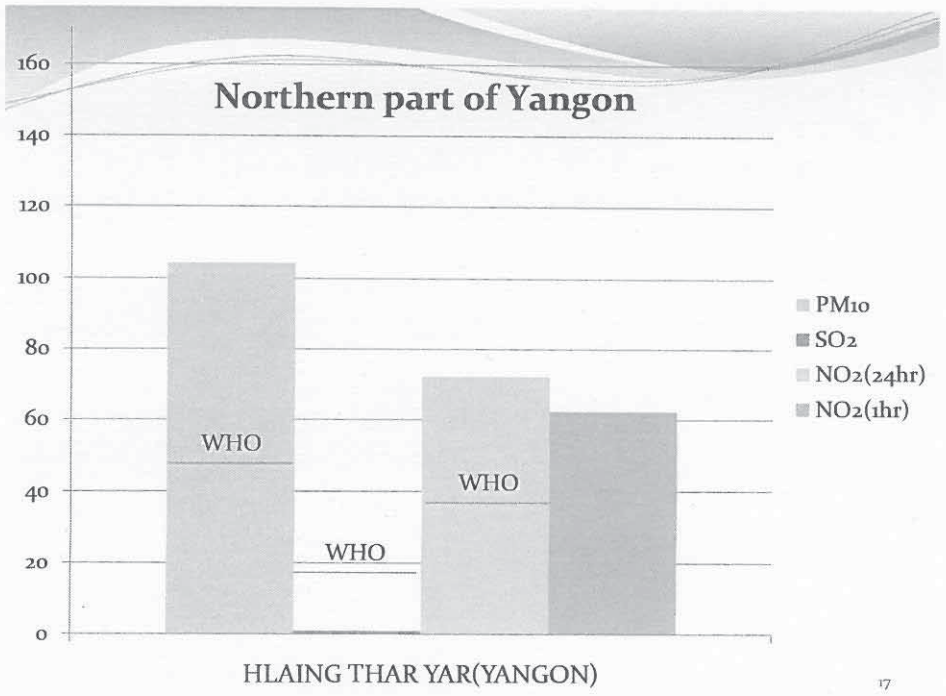
	January	February	March	April	May	June	July	August	September	October	November	December
Yangon	0.06	0.18	0.47	0.16	0.18	0.47	0.16	0.11	0.37	0.18	0.03	0.04
Nay Pyi Taw	0.16	0.09	0.07	0.07	0.07	0.31	0.05	0.06	0.04	0.04	0.04	0.03

14



THAR KAY TA(YANGON)

19



HLAING THAR YAR(YANGON)

17

Key finding of Clean Air

- Weakness of Law, Rules and regulation
- Research and development in AQM
- Capability Building of AQM
- Advanced Technologies and Technology transfer
- Data Inventory
- Lack of the AQM Devices

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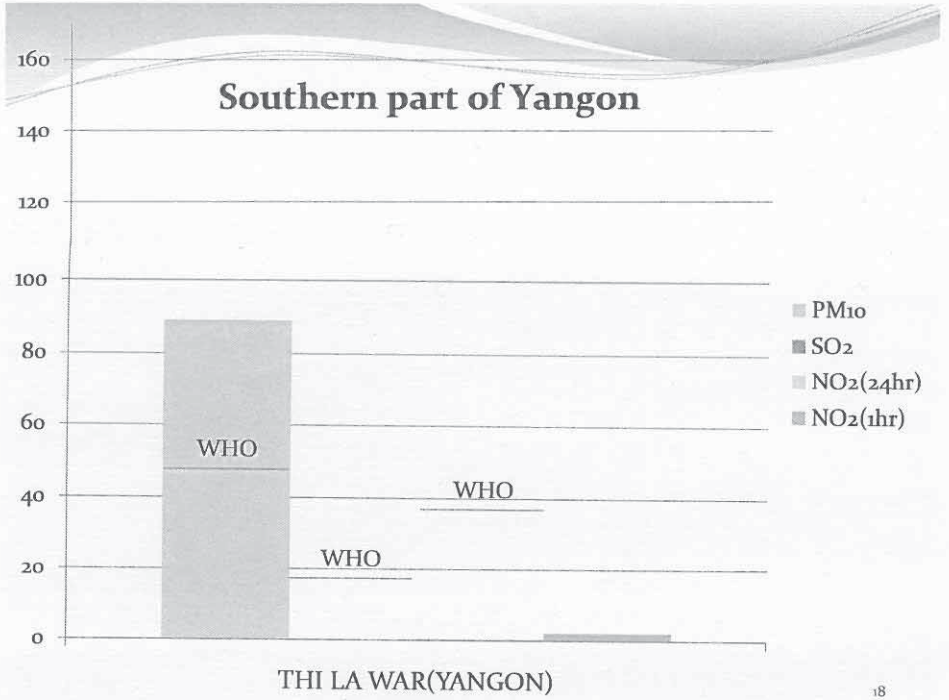
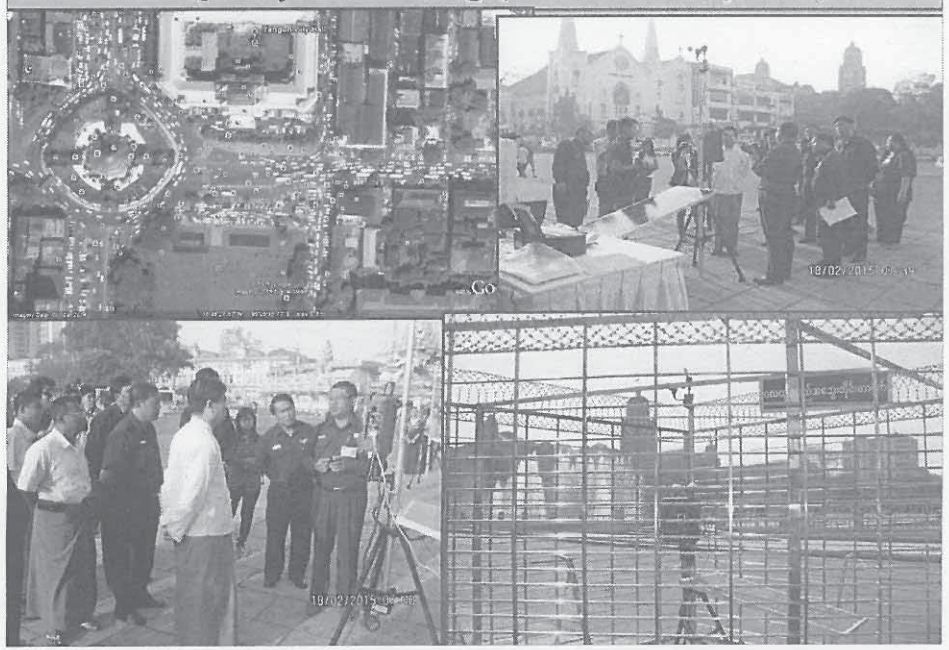


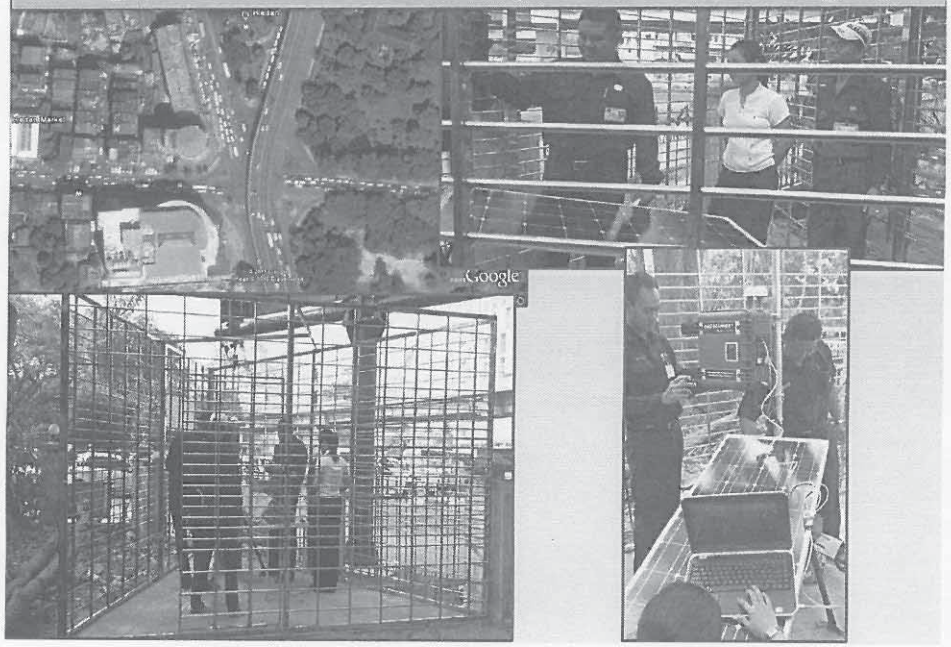
THI LA WAR(YANGON)

18

Air Quality Monitoring (in front of City Hall)



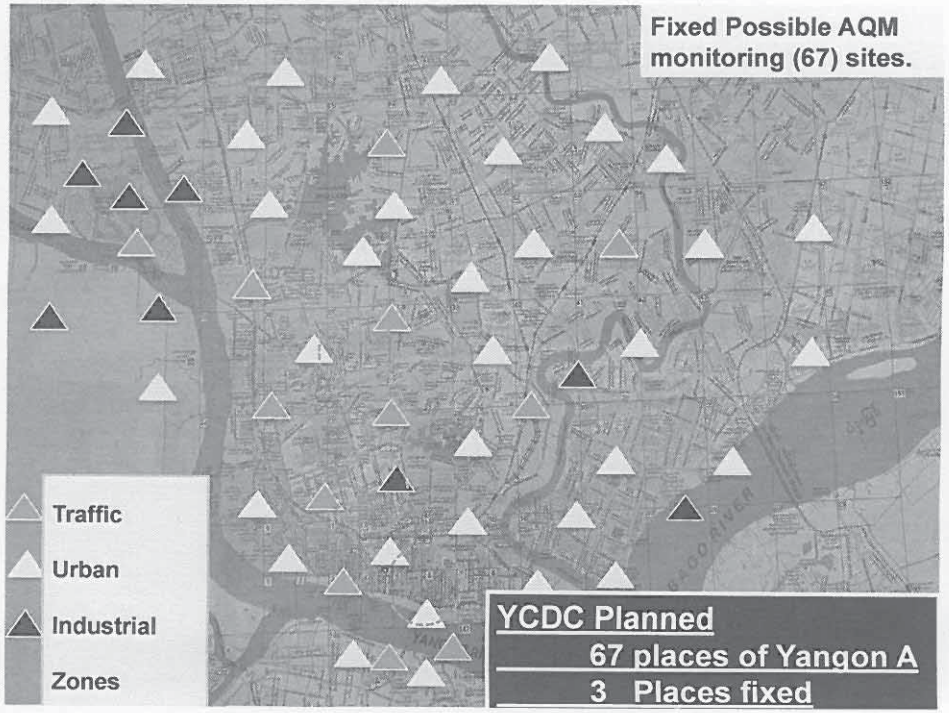
AQM - Junction of Hledam (Central Part of Yangon)



Low Carbon Society Sector

- Yangon City Development Committee – Pollution Control and Cleansing Department (YCDC – PCCD) is trying to implement (CDM) including clean air, clean land and clean water.
- At present, there are 1690 tons/day of waste generated

- Carbon credit can be got and so 169 CERs from waste.
- PCCD would like to know how to connect and implement, and how Kawasaki City can support to YCDC.
- To obtain carbon credit, PCCD would like to ask to share knowledge to YCDC how to start the activities.

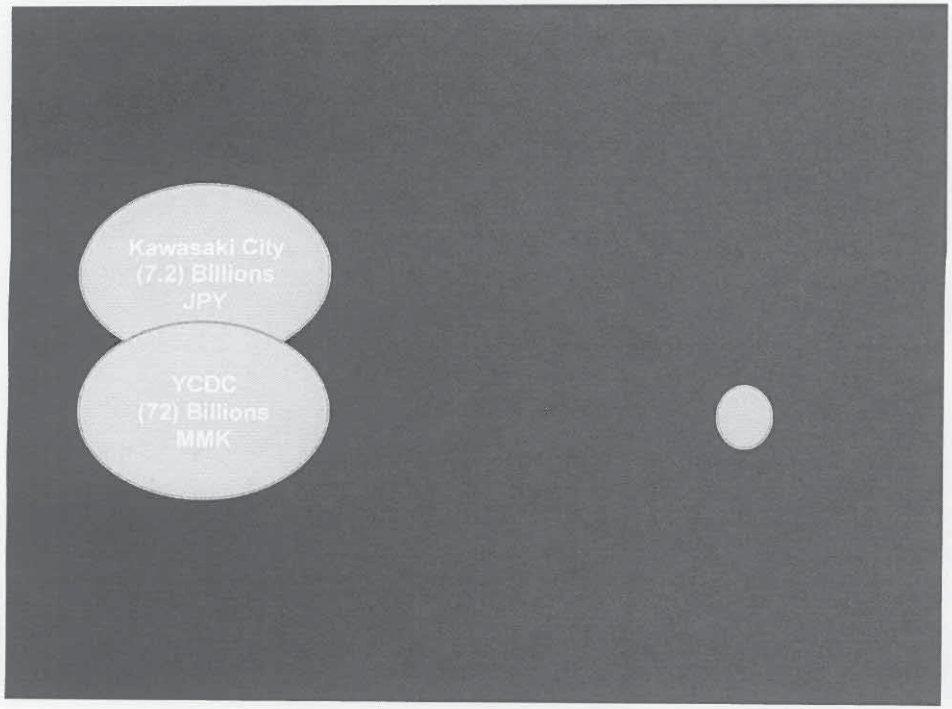


Joint Crediting Mechanism

The "**Yangon Waste to Energy Plant Project**" will be subsidized under the Joint Crediting Mechanism (JCM) Program. Approximately Up to 50% of total construction cost of the plant will be subsidized by the Japanese Government under the JCM Program. In order to reduce the generation of greenhouse gases such as methane from Open dumping Site, Yangon City Development Committee and JFE Engineering Corporation will

[redacted]

which will aim to achieve a establish an "International Consortium



AQM - Junction of Htaukyant (Northern part of Yangon)

YCDC Planned

67 places of Yangon Area
3 Places fixed
64 places mobile

Overall Discussion

- We are so interested in low carbon society sector.

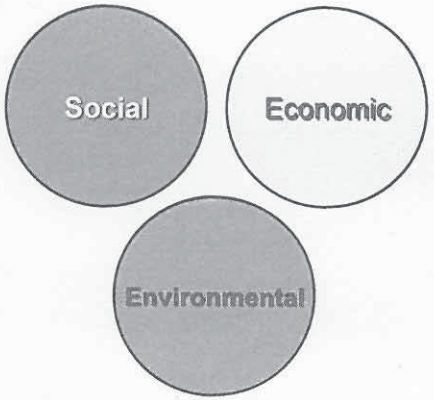
- Our PCCD collects and disposes 1600 tons per day of , So I want to ask you to help us to get carbon credit from the waste.

- I also would like to collaborate with you if there are other activities of low carbon.

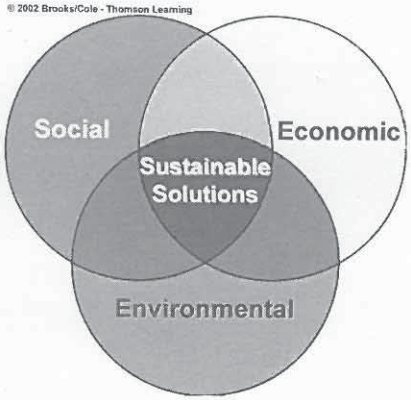
- HAZ-SCANNER Modern EPAs and chosen 67 places to monitor.
  -We have installed 3 sets of device as station
  - other device is used as mobile station
  -The 11 kinds of parameters we used for air quality monitoring are CO2, CO, CH4, NO2, SO2, PM2.5, PM10, Relative Humidity, Wind Speed, Wind Direction and Temperature.

Environmentally-Sustainable Economic Development

Globalization: An Integrated World



Traditional Decision Making



Decision Making in a Sustainable Society

29

Carbon Reduction Reporting Program

- A prior program to Cap-and-Trade (2016 to up)

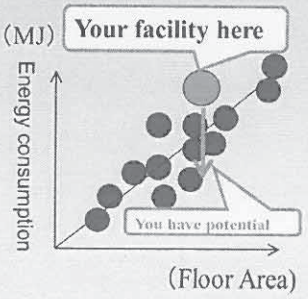
◆**Mandatory Reporting Program**

Require a report of 5 year plan for energy reduction with voluntary reduction target

◆**Advise, Evaluate & Disclose**

Level up the reduction efforts by

- Advising,
- Evaluating and
- Public disclosure



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