



AIR POLLUTION CAUSED BY VOLATILE ORGANIC COMPOUND (BENZENE, TOLUENE AND XYLENE) IN HO CHI MINH CITY AND MITIGATION SOLUTIONS

Nguyen Dinh Tuan and Do Thi Hong Hoa

Hoa Sen University, Vietnam

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INTRODUCTION

❖ **Ho Chi Minh City (HCMC) is one of the biggest socio-economic centers of Vietnam**

❖ **City profiles:**

- ✓ Area: 2.000 km²
- ✓ Populations: > 10.000.000, accounted for 10% of whole country
- ✓ The contribution for whole country
 - ✓ 10% of inhabitants
 - ✓ 40% and 25% for industrial production and industrial capacity, respectively.
 - ✓ 40% of vehicle's quantity (7 million Motorcycle and 1 million Automobile)



Fig 1: Map of Ho Chi Minh City



SEVERE AIR POLLUTION



INTRODUCTION

- Since July, 2001, Vietnam officially ending the use of leaded gasoline on the nationwide → the amount of lead (Pb) in the air decreased significantly.
- However, the high amount of many other air pollutants emitting from transportation, such as Benzene, Toluene, Xylene (BTX) harmed to environment and people's health.

INTRODUCTION

- ❖ **From 1995 – 2000:** begin to monitor air quality in HCMC. There were six semi-automatic air quality monitoring stations in hotspots of transport and residential areas.
- ❖ **From 2000 – 2009: HCMC authorities focused on air quality monitoring, including:**
 - Six roadside semi-automatic air quality monitoring stations
 - Nine automatic air quality monitoring stations
 - One radiation air quality monitoring station
 - **Six Benzene – Toluene – Xylene monitoring stations**
- ❖ **From 2009 – present:** 15 semi-automatic monitoring stations (other stations were damaged and stopped operation)



METHODOLOGY AND STUDY SITES

Table 1. The BTX study sites in HCMC

No.	Name of station	Description
1	Center of Occupational and Environmental Health	the East gate of the city
2	Department of Science and Technology (DOSTE)	Dien Bien Phu Street, District 3
3	Preventive Medicine Center (YTDP)	Tran Hung Dao Street, District 5
4	Thong Nhat Hospital (TN)	Bay Hien crossroad, Tan Binh District
5	Hong Bang High School (HB)	Hong Bang Street, District 5
6	Continuing Education Center (BC)	the West gate of the city
7	Tan Binh Industrial Park	Industrial Area
8	Tan Son Hoa	Resident Area

Frequency: once a month

METHODOLOGY AND STUDY SITES

❖ Sampling method

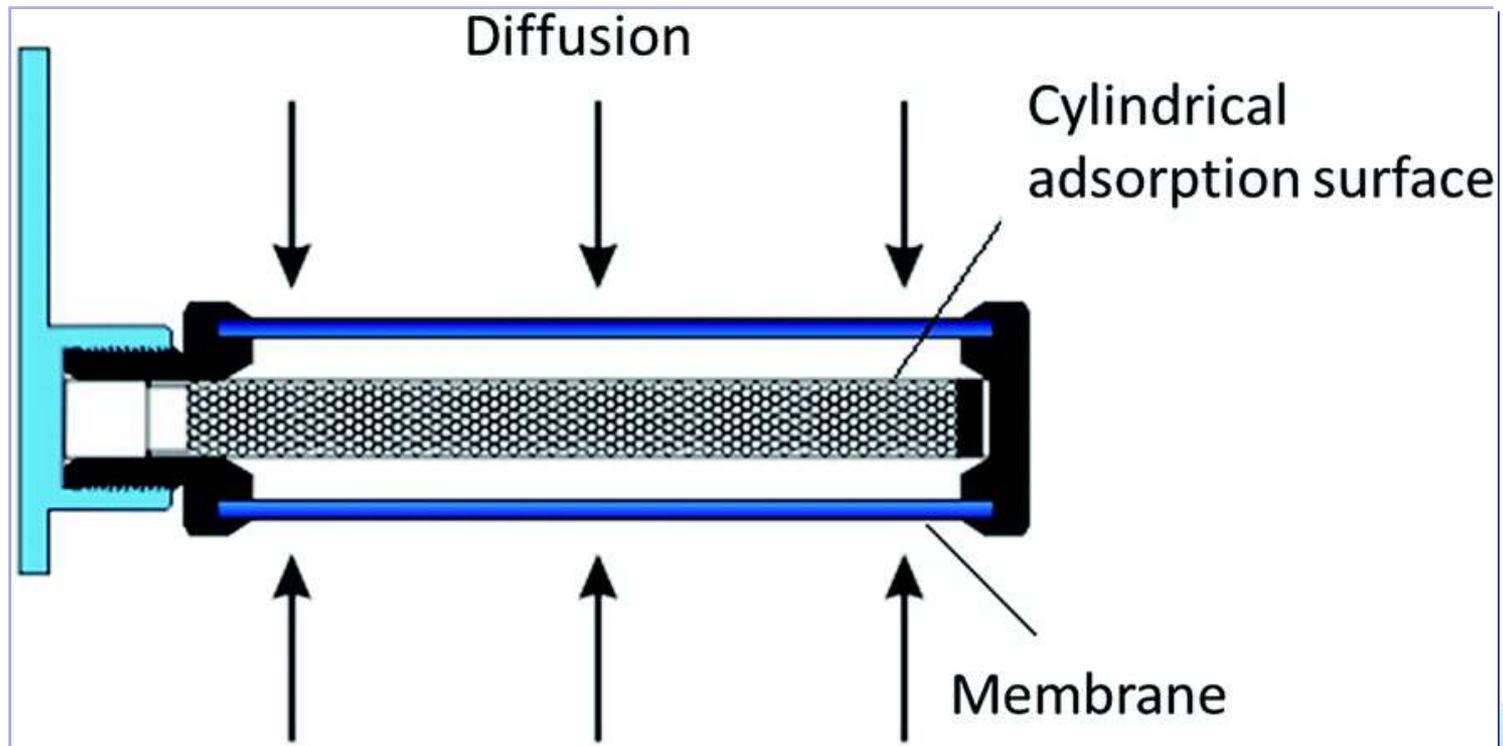


Fig 1: Radiello passive sampler

METHODOLOGY AND STUDY SITES

❖ **Sampling time**

- The BTX samples were put in the monitoring stations during 24/7

❖ **Sampling site**

- Samples were put 2 – 5m from the edge of the road in the 2-3m high (Fig. 1)

❖ **Analysis method**

- Samples was analyzed by Gas Chromatography (GC) of Neri Environmental Institute, Denmark.

METHODOLOGY AND STUDY SITES

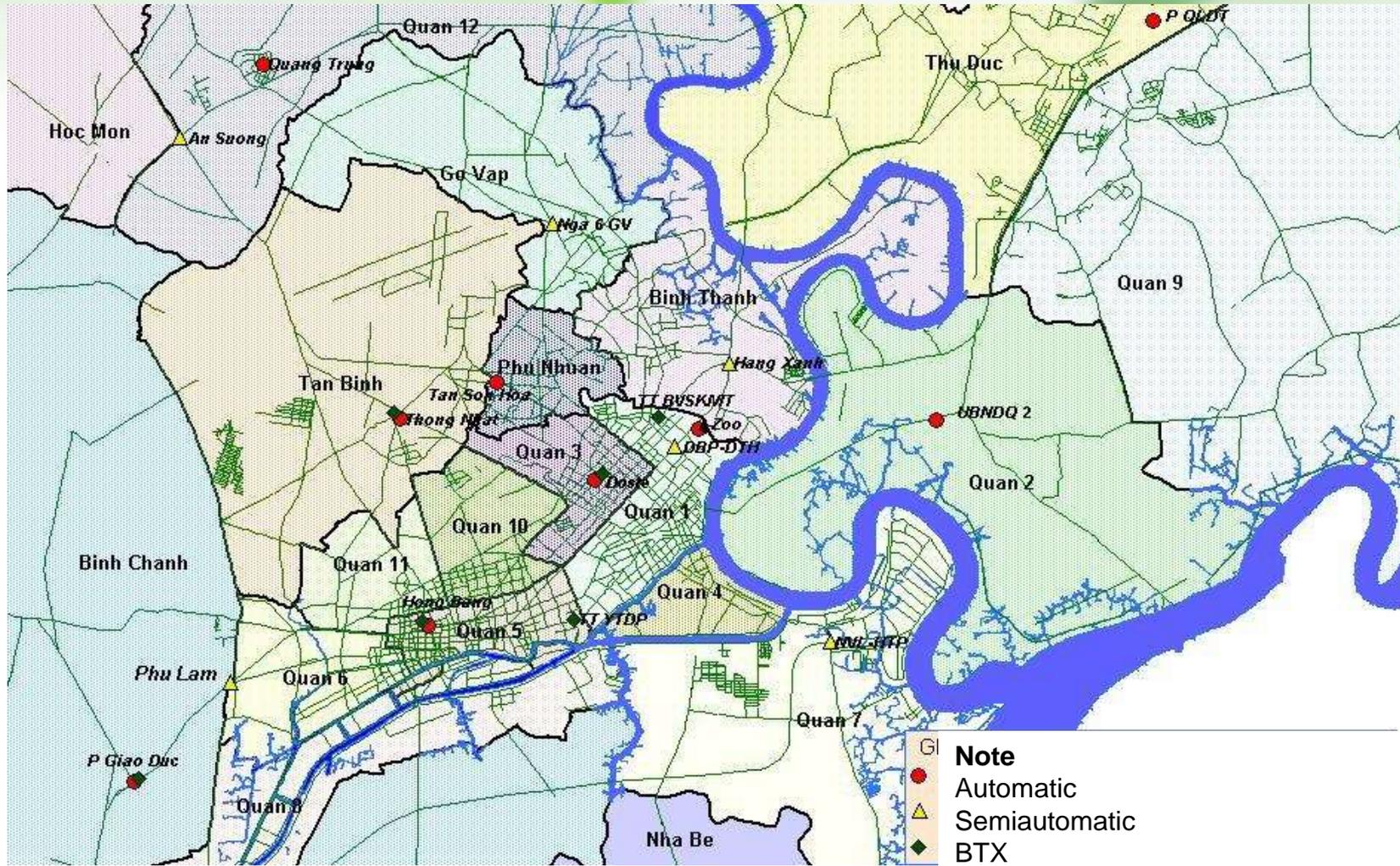


Fig 1. The site map of the air monitoring stations

RESULTS AND DISCUSSION

❖ Benzen

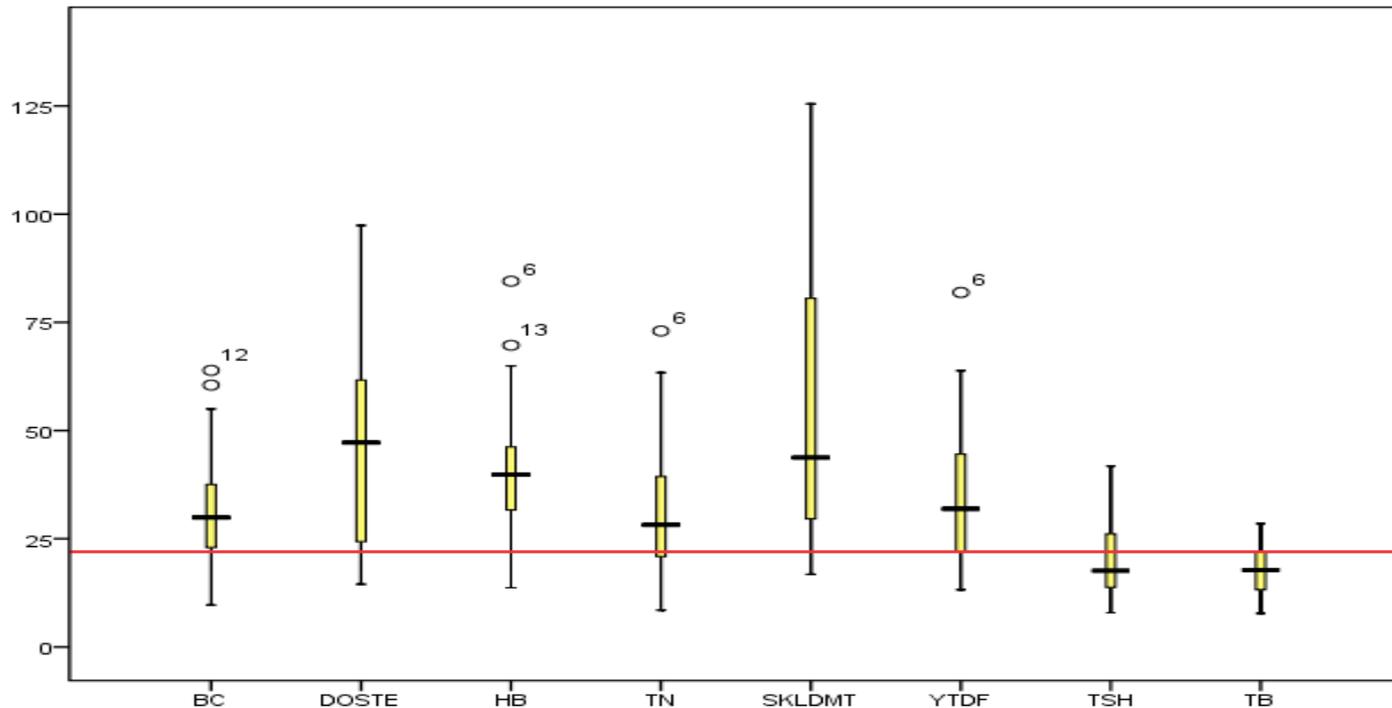


Fig 2. The distribution of concentration of Benzene in the areas of HCMC in 05 years (2005-2009) (Source: HEPA, 2009)

RESULTS AND DISCUSSION

❖ Benzen

- In 08 monitoring stations, the concentration of Benzene in Station 1 was higher than the other stations: 91% of the data exceeded NTR, annual average 57.91 g/m^3 exceeded 5.8 times NTR. Next, station 5: 83% of the data exceeded NTR, annual average $39.15 \text{ } \mu\text{g/m}^3$, exceeding 3.9 times NTR. The lowest data is at two stations 7 and 8: with station 7, 23% data exceeded NTR, annual average 18.02 g/m^3 exceeded 1.8 times NTR; station 8 has 39% data over NTR, annual average 19.86 g/m^3 exceeded 2 times NTR.

RESULTS AND DISCUSSION

❖ Benzen

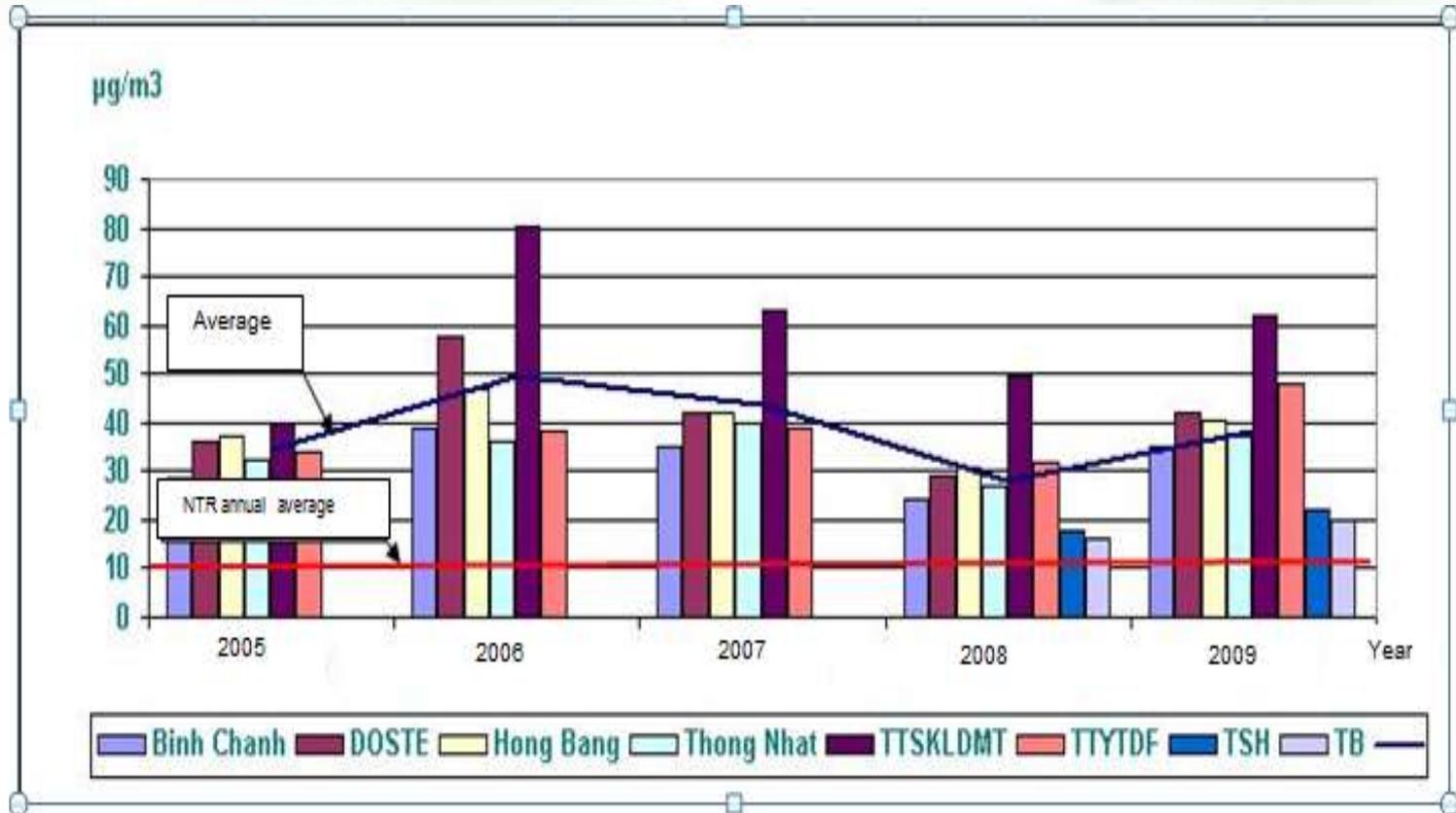


Fig 3. The average concentration of Benzene in the areas of HCMC in 05 years (2005-2009) (Source: HEPA, 2009)

RESULTS AND DISCUSSION

❖ Benzen

- The average concentration of Benzene in the 05 years (2005-2009) ranged from $18.02 \mu\text{g}/\text{m}^3$ - $57.91 \mu\text{g}/\text{m}^3$, 67% of the monitoring data exceeded Vietnam National Technical Regulation (VNTR). Sometimes, the concentration of benzene was up to $236.9 \mu\text{g}/\text{m}^3$, exceeded 10.8 times of NTR (NTR 06: 2009/MONRE: benzene $22 \mu\text{g}/\text{m}^3$ hour average; $10 \mu\text{g} / \text{m}^3$ annual average)

RESULTS AND DISCUSSION

❖ Toluene

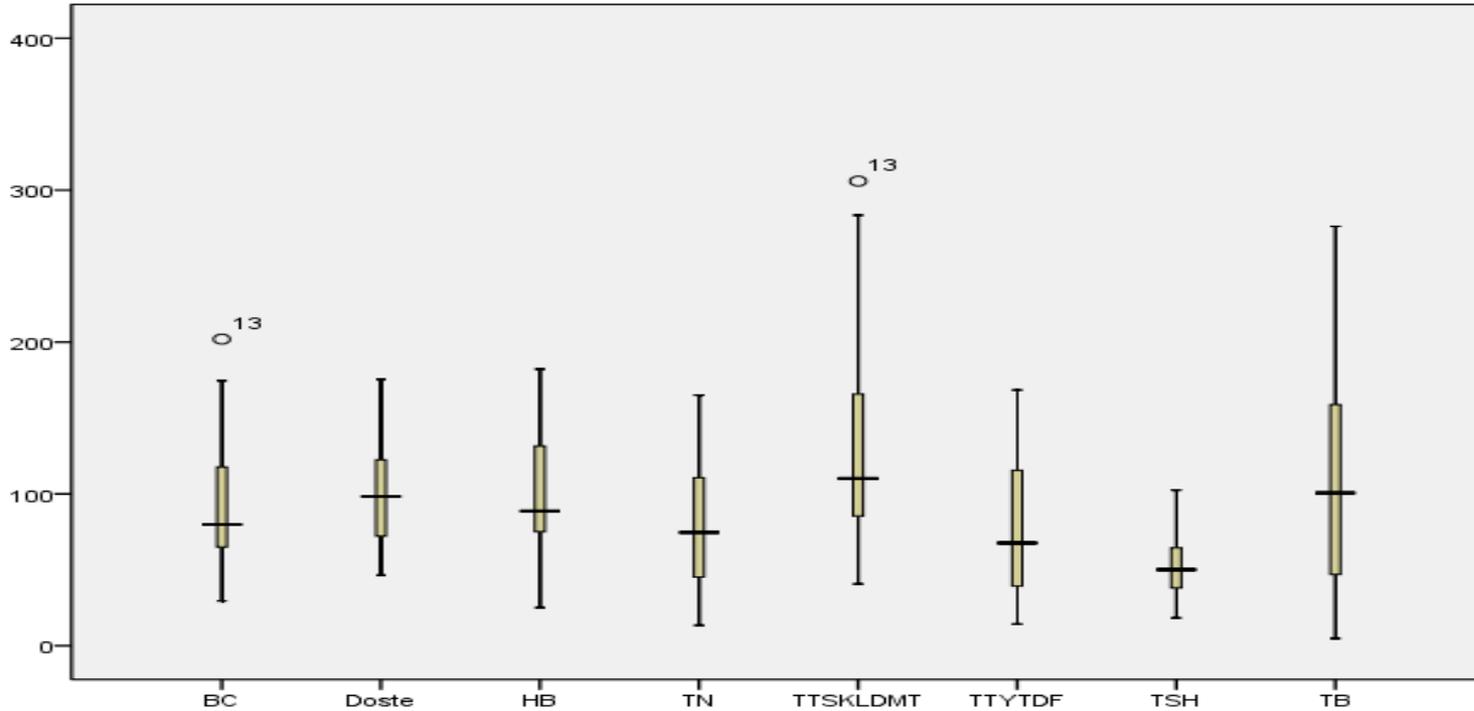


Fig 4. The distribution of concentration of Toluene in the areas of HCMC in 05 years (2005-2009) (Source: HEPA, 2009)

RESULTS AND DISCUSSION

❖ Toluene

- In monitoring stations, the Toluene concentration 1 was the highest: annual average (aa) $150 \mu\text{g}/\text{m}^3$; followed by station 6 : $111 \mu\text{g}/\text{m}^3$ and the lowest was station 8: annual average $54 \mu\text{g}/\text{m}^3$.
- Over 2 years (2008-2009) at the station 7, showed the concentration of Toluene in this station is quite high: $95 \mu\text{g}/\text{m}^3$ in 2008 and $115 \mu\text{g}/\text{m}^3$ in 2009. This showed the industrial park is also one of significant Toluene emission sources in the air of HCMC.

RESULTS AND DISCUSSION

❖ Xylene

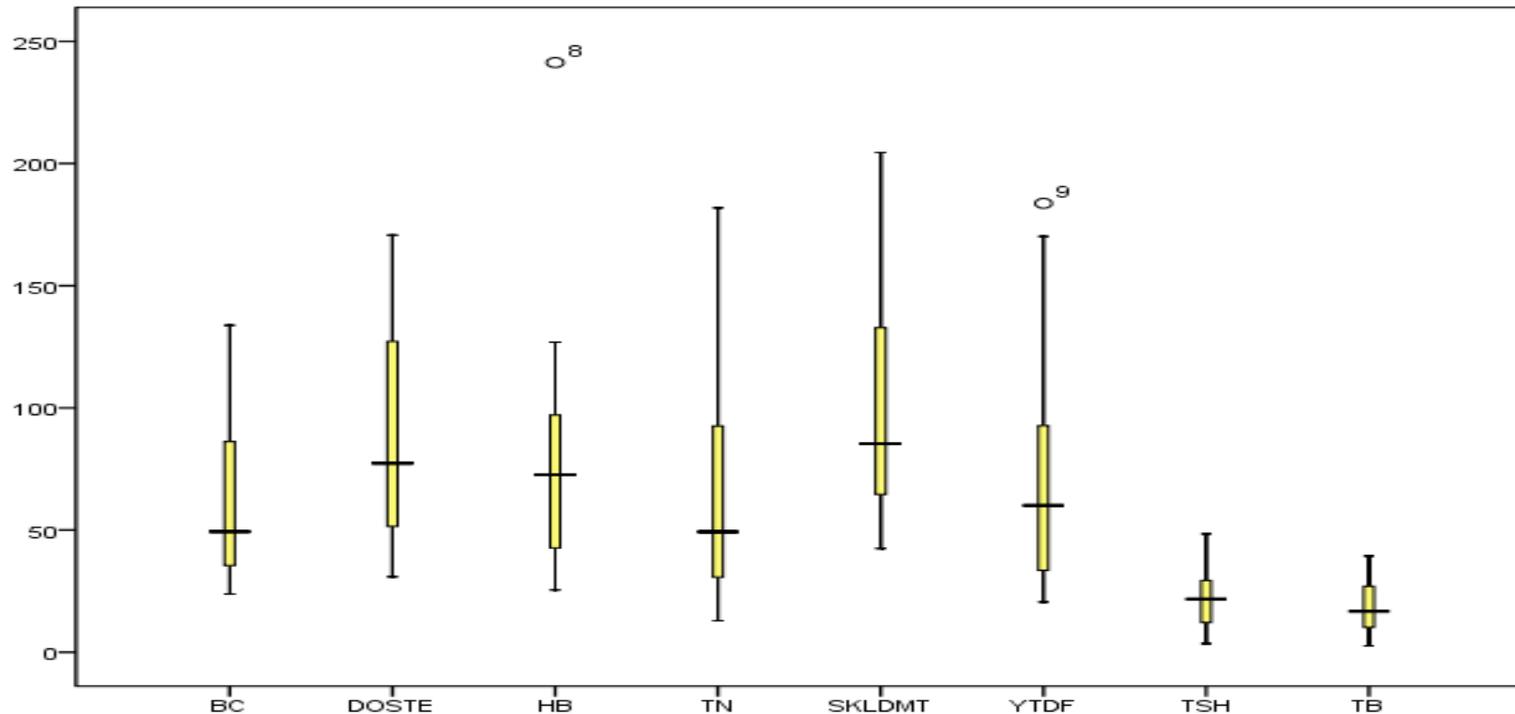


Fig 5. The distribution of concentration of Xylene in the areas of HCMC in 05 years (2005-2009) (Source: HEPA, 2009)

RESULTS AND DISCUSSION

❖ Xylene

- In 08 monitoring stations, the concentration of Xylene in station 1 was higher than the other stations (annual average $108.66 \mu\text{g}/\text{m}^3$); Next was stations 2 (annual average $72.05 \mu\text{g}/\text{m}^3$). The lowest were station 8 (annual average $21.78 \mu\text{g}/\text{m}^3$) and station 7 (annual average $18.07 \mu\text{g}/\text{m}^3$).

MEASURES TO ELIMINATE BTX POLLUTION

❖ **Focused to propose measures for limiting the excessive increase in the number of vehicles and traffic congestion in urban transport such as:**

- To accelerate the construction of urban railway to be able to transport a large number of passengers;
- To develop a bus system with safety, comfort and efficiency criteria;
- To push the implementation of the key transportation projects in the city;
- To prevent flood in urban;



MEASURES TO ELIMINATE BTX POLLUTION

- To reduce the population density in central urban areas;
- To build parking lots for cars;
- To raise awareness of residents on traffic rules;
- To conduct economic solutions to decrease private cars/motorbikes, etc.



MEASURES TO ELIMINATE BTX POLLUTION

- ❖ **Besides, some technical solutions also need to be taken:**
 - To improve fuel quality, for example, reducing the content of benzene in petrol from 2.5% to 1% To use alternative fuels such as biofuels or green power;
 - To apply the deadline (01/01/2017) of car emission standards as Euro 4 for new cars and Euro 3 for new motorcycles;
 - To perform testing motorcycle.



CONCLUSIONS

- ❖ The air pollution of BTX in Ho Chi Minh City is a significant matter for concerning, especially Benzene, a contaminant which WHO classified as carcinogen, exceeded many times NTR.
- ❖ To limit the emissions of BTX, management and technology measures should be conducted to reduce the number of cars and traffic congestion, such as improve the quality of gasolines or use alternative fuels and improve quality motorbike...
- ❖ Ho Chi Minh City should be to re-establish BTX monitoring stations and may increase the number of monitoring stations to get reliable data about these dangerous pollutants.



THANK YOU FOR YOUR LISTENING

