

Tackle the Air Pollution Caused by Burning Fallen Leaves in Downtown Area of Wuhan by Learning From the Air Pollution Elimination Plan of Chile

REN Qing^{[a],[b],*}

^[a]Ph.D., Student, School of Environmental Studies, China University of Geosciences, Wuhan, China.

^[b]Lecturer, School of Foreign Languages, China University of Geosciences, Wuhan, China.

*Corresponding author.

Received 8 June 2016; accepted 5 August 2016
Published online 16 September 2016

Abstract

In recent years, the air condition is getting worse and worse, and smog days are becoming more frequent than ever. The air quality level of Wuhan city ranges from unhealthy for sensitive groups (air quality index is 101-101) to unhealthy (AQI is 151-200), from very unhealthy (AQI 201-300) to hazardous (300+). Main air pollutant is PM_{2.5}. But just in such a serious air polluted situation, the burning of straws in farmland of Hubei and other adjacent provinces has never been banned completely. And burning the fallen leaves is prevailing even in the downtown area of Wuhan. While, Chile's experience and action provide us with valuable reference on how to effectively tackle farmland straw burning and fallen leaves burning in urban areas, removing this source of atmospheric pollution.

Key words: Air pollution; Downtown area of Wuhan; Elimination plan of Chile

Ren, Q. (2016). Tackle the Air Pollution Caused by Burning Fallen Leaves in Downtown Area of Wuhan by Learning From the Air Pollution Elimination Plan of Chile. *Management Science and Engineering*, 10(3), 41-45. Available from: URL: <http://www.cscanada.net/index.php/mse/article/view/8777> DOI: <http://dx.doi.org/10.3968/8777>

INTRODUCTION

On June 11, 2012, for the first time, Wuhan was shrouded by the smog, which caused by the burning of straw in

Hubei province and adjacent provinces according to environmental experts. On October 5, 2014, the real-time between 19:00 to 20:00 air quality of Wuhan ranked at the bottom of the list of nationwide. Satellite has spotted four burning spots within Hubei territory during the off days of National Holiday, Gong'an, Shishou, Tian'men and Xiantao. There were 12 burning spots around the country in total, while Hubei accounted for the most. Henan, Hubei's neighbor for second.

Synthesizing then weather condition, experts on environmental protection of Wuhan claimed that straw burning was the main factor that caused the serious smog during National Holiday. As the first city to ban straw burning in Hubei, Jinzhou zoned 700 km² "No Burning Area" which covers 4 districts: Jingzhou, Shashi, Jinzhou Development Zone and Central China Farming Area, with 20 small towns and 115 villages. Jingzhou government even rented a helicopter to patrol over the massive field to check if there were any straw burning. But this did not prevent the burning of this year.

1. LEFT COUNTRY AREAS, FALLEN LEAVES BURNING FREQUENTLY APPEARS IN URBAN AREAS OF WUHAN

On June 17, 2014, working staffs of Chestnut Park had burnt fallen leaves for more than half hour, caused serious air pollution in the central part of Hankou. Until journalist left at 02:40 pm, the combustion flame was finally extinguished while the strong smokes kept floating over the park and the air was swarmed with fume smell. On December 8, 2014 (Wuhan Jiangxia District), in the third section of Phoenix Garden Apartment, the strong smokes of burning leaves from day and night choked the apartment, and the burning spot was less than 10 meters away from dwellers' place. Wuhan is not only the city where this happens, burning fallen

leaves is also common in other cities. On November 20, 2014, daily runners of Shenyang Railway Gardener Apartment incinerated the seriously accumulated withered leaves, producing disgusting fumes and badly frustrated the dwellers. Reports of such things are also common phenomenon on local papers of Jiangsu, Guangdong Province.

How much damage can cause of burning withered leaves and straws? The answer is that it will cause much more pollution of burning one piece of leave than one liter of gas. At 02:51 pm of 25th October 2013, Liu Songbo lit three pieces of leaves on the empty spot in Liberation Park under the permission of its management personnel. The concentration of PM_{2.5} rocketed to 1,114 in the air above the burning flame. On 26th October, a resident was using stove cooking by taking wood as fuel in White Jade Hill of Greenmount District, the concentration of PM_{2.5} above this burning stove reached 1,184. Leaves, straws and wood also belong to biomass, by burning which PM_{2.5} produces serious hazard. The amount of PM_{2.5} from burning one piece of leave is much more than that from burning one litre of gas by a combustion engine. There is no doubt we should ban all forms of outdoors biomass burning both in countryside and urban areas.

China has legislated to address this issue. In accordance with The Regulations on Prevention of Air Pollution, as prescribed in paragraph 2 of article 41, no objects or substances which may produce harmful pollutants when they are burned, are allow to be burned outdoors, especially in population densely inhabited areas, places near to airports, city main lines and specialized areas zoned by authorities. Any defiance of this regulation may result in a fine less than 200, and the forced cessation of this kind of burning by local department of environmental protection whose administrative rank is above county. But why the full stoppage of burning straw and fallen leaves is so hard to achieve? Two main causes are presented below: There is a clear rule of cutting polluted air emission on industrial pollutants within the Third Traffic Ring. No burning is allowed in this area.

As for the gas-fueled vehicles, nor yellow-label-cars are allowed to ride within the third ring road, and more strict ban measures will be introduced soon. However, no definite measures are introduced to ban biomass burning. It has to rely on publicity and advertising of environmental protection department and agricultural department to recycle straw in most administrative divisions of Hubei.

Previously, it was required by upper authority to ban straw burning, but no feasible measures were taken despite that many local administrative divisions had organized specialized groups to tackle this problem. Dereliction of duty appeared frequently, and their supervision and capacity were very limited.

2. NO EFFECTIVE WAY OF RECYCLING FALLEN LEAVES AND STRAWS IS EXISTING

Many straw power plants in Jiangsu province are running at loss. It is encouraged by the 17 Article of Renewable Resource Law to generate power by fueling biomass materials, but no specific measures are taken to implement it. And Jiangsu has not made any corresponding regulations and rules to ban leaves burning, which is the direction cause of those bio-power plants having never benefited from those favorable policies. It is impossible to recycle most straw under the circumstance of running at a loss. Taking VAT into consideration, straw-generated power plants have not gained more benefits from composite tax rate than those non-straw-generated power plants. What made it worse was that there is not any preferential policies to reduce their enterprise income tax.

Unfortunately, China is not the only country tortured by this headache. A crossing the Pacific Ocean, Chile is making strategies actively to address this problem. Chile has many similarities with China, both are developing countries, both are facing serious air pollution. As a South-American country, it has its own way to tackle the air pollution.

In accordance with Air Pollution Elimination Plan made by Chilean Environmental Protection Ministry, the main domestic pollutants are PM₁₀, PM₅, SO₂, NO₂, O₃, CO and Pb.

The annual average standard of PM_{2.5} is limited below 20 µg/m³.

The amount goes up high to 40-50 µg/m³ in the most polluted city.

The annual average standard of PM₁₀ is limited below 50 µg/m³.

The amount goes up high to 100-150 µg/m³ in the most polluted city.

Here are the days that pollution exceeding the standard in major cities:

Concepcion Metropolitano: 53 days exceeding the PM₁₀ standard with 150 µg/m³N.

Concepcion Metropolitano: 61 days exceeding the PM_{2.5} standard with 50 µg/m³N.

Chillan and Chillan Viejo: 37 days exceeding the PM_{2.5} standard with 50µg/m³N.

Los Angeles: 43 days exceeding the PM_{2.5} standard with 50 µg/m³N.

The main pollution sources are:

- a) Householding heating from firewood.
- b) Stationary sources from industry and communities.

Specific measures: Corresponding measures should be taken to limit the house holding heating when the pollutants density is tested increasing steadily no matter it is for domestic use or community use. Cut pollutant

source emission and cease the stationary emission. It is a must to stop the stationary emission. Conducting health survey and establishing emission threshold is both necessary. It is also important to inform citizens of the health risk when pollutants spread widely and seriously.

(a) We advise to reduce the group outdoors sports activities, and cooperate with the Ministry of Education to replace PE with indoor courses in educational institutes when high-intense pollutants are inspected.

(b) To supervise with more ministries involved. Enhance the supervision on stationary pollution resources in line with the standards established by local authorities.

(c) The strategic process of eliminating air pollution in Región del Bío-Bío.

Step 1: President Michelle Bachelet announced the completion of 32nd action of Environmental and Sanitary Alarming Plan in Southern Area.

Step 2: Once the seriously polluted areas enter the polluted period, healthy warning system will be announced. ICAP assessment will be started, indicating dynamic average values of 24 hours. It is Sanitary Minister who is in charge of this warning system.

Step 3: Multi-ministry cooperation has to play its role as required by local Action Committee which is coordinated by the provincial executive office, performing its duty properly with cooperation of Sanitary, Education and Environment Ministries. The executive official has the right to summon other executive divisions or community apartments to get involved.

The main duties of Local Action Committee:

- classify the areas where action is necessary to take.
- make sure the stoppage of stationary pollution resources.
- determine measure-taking date and implementation.
- make the supervision plan.
- sustain the assessment to achievements.
- keep citizens and related apartment informed.

Step 4: Sanitary Authorities dispose the decision-making right under the requirement of agreement reached for local divisions.

Step 5: Establish standard of PM_{2.5} in accordance with which to rank the emergency of pollution as described by Code 5.

Step 6: To complete the environmental alarming plan by 31th, August. Make the final report in due date and summarize the information gathered during the period of application. Let us take another look at Wuhan.

There is no feasible way to ban straw burning which causes more serious air pollution, let alone to tackle the fallen leaves burning in downtown.

It is irresponsible to ignore the fallen leaves burning due to the fact that it produces less pollutants than burning straw. History of burning straw and fallen leaves has lasted more ages than people can count. Historical

documents offer the undisputable evidence that severe air pollution has been harmed our ancestors when they burned massive straw. The first measure that strikes people's mind to handle the excessive fallen leaves or field straws is to burn no matter for the purpose of municipal sanitation or farmers wanting to get rid of the trouble of handling surplus straw or citizens' need for plant ash to fertilize their vegetable gardens. If we cannot figure out how to control the prevailing biomass burning in cities whose people received a better education, how is it possible to stop the straw burning in rural areas? It is not impossible to realize the zero-biomass-burning by taking pragmatic actions after average people accepting the conception that zero-biomass-burning do reduce the air pollution. If that happens, it would be easier to control and prevent the straw burning in rural area by drawing lessons from cities experiences on this issue. Therefore, to control the biomass burning in the urban area is the current priority. First, we need to enhance the control and prevention of biomass burning in the urban area, then promote it to a rural area. Every city should make its own specific plan: Rewards and penalties system, supervision system, education and propaganda, we take whatever ways to convey an idea that reducing biomass burning does lessen air pollution. Below are the detailed measures we need to take.

3. THE DETAILED MEASURES

Find out the causes and resources comes first:

(a) Residents' apartment managing companies are unwilling to add the fallen leaves fee to their cost. In that way, those municipal cleaning companies merely clean up those household garbage, excluding fallen twigs and leaves. Burning the piles of fallen leaves directly is most cost-saving way to get rid of the trick trouble.

(b) When it comes to autumn or winter, some citizens would burn twigs or leaves to procure plant ash to fertilize their vegetable gardens.

4. RECOMMENDATIONS FROM CHILEAN AIR POLLUTION ELIMINATION PLAN

(a) To perfect the regulations and codes regarding to ban outdoor biomass burning in Wuhan urban areas.

(b) To perfect the rewards and penalties system regarding to apartment managing companies and municipal sanitary companies. Once leaves burning is spotted, penalties will be fallen on both apartment managing company and sanitary company that is in charge of this division. And fine will be raised. Each autumn and winter, rewarding bonus will be allotted to those companies in whose division no leaves burning has ever happened.

(c) To appoint special personnel to take charge of the corresponding division. And clarify the duties of the supervisory staff. Any leaves burning might lead to fine on those who take the responsibility for apartment managing and sanity in this area. Under the circumstance of this happening, government law enforcement personnel would fine apartment managing companies and sanitary companies in whose division leaves burning was spotted, then these companies would transfer their penalty cost to those people who are in charge of this matter. Any working staff in apartment managing companies or sanitary companies who burn fallen leaves would be deducted on their wages or bonus. If it is citizens who burn leaves, those working personnel in apartment managing companies and sanitary companies would fine those violated citizens. If no one responsible was found for this, then fine would fall on apartment managing companies and sanitary companies. Thus apartment managing companies and sanitation companies will organize patrols to strengthen supervision.

- To strengthen the public supervision, complaint line should be established so any burning would be recorded specifically as the evidence to fine those people who are responsible.
- It is also necessary to lesson those working staffs in apartment managing companies and sanitary companies who prefer to burning leaves.
- To strengthen the publicity in communities. To distribute leaflets to residents' apartment to help residents realize that burning leaves lead directly to smog. To nourish residents' responsibility to protect air.
- To proceed publicity in schools, making school students aware of the policies of banning biomass burning.

5. REWARDS AND PUNISHMENTS MEASURES AND URBAN BIOMASS WASTE TREATMENT COUNTERMEASURES

5.1 The Rewarding Bonus Sources to Companies That Realize Zero-Biomass-Burning: Mainly From Fines for Burning in Other Divisions

When more zero-biomass-burning divisions emerge, penalties to those divisions where burning happens would be enlarged, so does the subsidies from government. So that zero-biomass-burning divisions would increase, when this sustains longer enough, zero-biomass-burning in urban area is able to achieve.

5.2 The Countermeasures to Urban Biomass Waste

(a) To transfer them to the specialized waste treatment plants. Although this way cannot recycle the biomass,

it can shorten the burning time comparing with random outdoor burning. To cut the pollutants emission by taking filtering measures.

A waste treatment pattern was formed, the 5-2-1.

- There exists 5 waste incineration power plants: Hanyang Pot Top Hill, Huangpi Hankow North, East-west Lake New Ditch, Jiangxia LongMountPass, and Chemical Engineering Division Spark;
- 2 landfills: Jiangxia LongMountPass and New Islet Chen Chong.
- 1 comprehensive waste processing plant Caidian Qian Mountain Solid Aaste Recycling Economical Industrial Park.

(b) To generate power by burning straw, to follow Jiangsu's step.

(c) Make the straw as the main source of heating. In winters, there would be gas shortage nationwide, causing a big heating problem in Beijing, Tianjin and other major cities in Northern China. Wuhan does not supply the systematics heating to residents, so many citizens have to install their own gas heating system to shut out the humid cold winter air. But Wuhan only supplies 300 m gases per month due to the limited gas deposit. We may introduce biomass-burning heating system from developed countries, such as Spain, to tackle the gas shortage and recycle the biomass waste.

ACKNOWLEDGMENTS

Cristian Quiroz Reyes, Región del Bío-Bío committee member, Chile, provided the plan of eliminating the air pollution from 2014 to 2018 made by Chile's ministry of environment in May 2014.

REFERENCES

- Anonymous. (2014, December 8). A big fire of three periods of phoenix garden property burned the block with heavy and billowed smoke. *People's Daily Online*. Retrieved from <http://liuyan.people.com.cn/thread.php?tid=2786030>
- Ju, D. (2014, December 7). The operation of Hanyang Guodingshan garbage incineration power plant Dioxin amount less than burning leaves. *Wuhan Life Net*. Retrieved from <http://www.tomwh.com/wuhan/20141107/20187.html>
- Ke, M. J. (2014, October 10). How will Wuhan decode the hard problem of straw combustion. *The Yangtze River Business Newspaper*. Retrieved from <http://www.changjiangtimes.com/2014/10/489674.html>
- Ming, T. S. (2014, December 2). Sanitation workers in Wuhan burning fallen leaves downtown discharge clouds of smoke. *Wuhan Evening News*. Retrieved from http://microreading.chinadaily.com.cn/hqsj/shbt/2014-12-02/content_12822778.html

- Qi, X., & Hu, W. M. (2013, November 7). Depth concerning - smoking and burning leaves will mount $PM_{2.5}$. *Changjiang Daily*, p.A05.
- Shenzhen Radio. (2012, June 12). *The soaring average $PM_{2.5}$ of Wuhan and Nanjing , straw combustion polluted the air*. Retrieved from <http://www.s1979.com/news/china/201206/1239548912.shtml>
- Wang, P. (2014, June 17). Lingjiao lake park burning leaves in half an hour. *Changjiang Daily*.
- Wang, P. (2014, November 21). The Sanitation Department claimed forbade burning leaves in outdoors. *Liaoshen Evening News*. Retrieved from http://liaoning.lnd.com.cn/htm/2014-11/21/content_4148494.htm