

Summary for:

## ***PM 2.5 Discussion with Japanese***

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### [Prof. Antung A. Liu](#)

- The concentrations of PM10, SO2, and NO2 show clear downward trends at cities throughout China, including Beijing, Shanghai, Guangzhou and Shenzhen. The one pollutant that has eluded this trend is PM2.5. Data on PM2.5 have only begun to be collected by the Chinese government since the beginning of 2012.
- U.S. Department of State monitors have collected this data since 2008 and they have shown no improvement over the past six years. China's PM2.5 standard is 35 micrograms per cubic meter, though sometimes levels reach over 200 by monthly average or more than 300 per hour. The U.S. standard is 12 micrograms per cubic meter, and the most of the U.S. already meets this standard.
- Satellite monitoring conducted by NASA from 2001 to 2006 shows that concentrations are worst in China's northern and southeastern regions, meaning the air pollution coincides with a heavily populated area.
- PM2.5 comes primarily from combustion activities and industrial processes. The major sources of PM2.5 in China are motor vehicles, power plants and heavy industry.
- A 100 microgram per cubic meter increase in long-term exposure has been found to decrease life expectancy.
- In both the state and private sectors, healthy intention increase significantly.
- New business opportunities related to this field should be plentiful.

### [Mr. Onogi](#)

- I was really surprised by the concentration data announced in 2012. There was no data before 2012, but I guess China grasped the data and estimated this trend before this point.
- Nowadays, the Air Quality Index (AQI) in Beijing can reach 300. AQI is subject to both emissions and air pressure. High air pressure can sometime lower the AQI from 300 to 20. But this phenomenon results from natural conditions and lies out of the control of humans. The most important - and the controllable - issue in the fight against air pollution is to decrease emissions.
- The Chinese government has worked to integrate environmental policies to regulate air pollution. Beijing issued "The prevention of air pollution regulations", effective from May 2014. One thousand companies, shops and factories now receive a monthly inspection visit

and one hundred corporations are warned each month.

[Prof. Antung A. Liu](#)

- Each of these issues has proven tough, and to solve the problems will take a long time:
  - Motor vehicles are decentralized. Older vehicles don't have the proper pollution control equipment.
  - Power plants have been operating at full capacity. Electricity production has already been growing at a frantic pace, and if you decommission or retrofit older plants, you have to build two new ones.
  - Coal plants are still being built at a very high rate, but renewables such as wind and solar power last year accounted for more than fossil fuels and nuclear energy combined last year for the first time.
  - Heavy industry co-exists with high populations. Right in the heart of downtown Beijing, for example, next to some of the most expensive real estate in the country, you can still see smokestacks from operating factories.

[Mr. Onogi](#)

- The most important and urgent projects are "source analysis" ones. The accumulation of data is still insufficient. If we can get more detailed breakdowns about the origin of PM2.5 particles, it could help provide sufficient measures in a more timely way.
- PM2.5 studies never show the origin of the particles. For example, in Beijing 30% of the particles less than 2.5 micrometers in diameter come from cars, 30% come from coal emissions, 20% come from outside the city and others derive from natural materials like sand.
- To solve the problem, more national sectors need to be involved, including Science, Industry, Power, Traffic, Health and even Agriculture or the State Council.

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- A group of economists from Tsinghua and Harvard Universities have found that the impact of total suspended particulates on human health with a long-term exposure can decrease life expectancy by 3.0 years.

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- The Chinese government has worked to integrate environmental policies to regulate air pollution, but this is a long and winding road to go. Now they are accelerating the introduction of renewable energies such as wind and solar power. Frankly speaking, these energies still have efficiency problems. For example, solar power production consumes a lot of silicon (another source of pollution) and wind turbines are difficult to maintain.

[Prof. Antung A. Liu](#)

● CKGSB has an ongoing commitment to research on sustainability issues. I teach a class on Sustainability Management at our school and it is popular with our MBAs and our alumni. We are continually developing innovative classes and programs which teach about China's sustainability issues and we are actively engaged in this area of research. For example, the impact of China's license restriction policies and its vehicle license plate restriction policies are one area that we have been looking at.

● One of the most interesting companies I have ever had the pleasure of meeting is "Smart Air Filters". The founder of the company is a graduate student and the other managers in the company are very young and so not look like directors, but they discovered that you can take out 90% of air particulates by simply strapping a HEPA filter to a fan. They have had success selling this to the market at an extremely affordable price.

● Because the problems are obvious and everybody places great value on health, there is a significant willingness to pay for solutions.

● I think that there are many niche spaces which could still see innovation, and I know that Japanese technology is very strong in these niche fields.

● In my class, for example, one of my favorite things is to have students come up with ideas for sustainability products they would like to see in the marketplace. One MBA from the 2013 class thought up a particle filtration mask for runners. Clearly there are some high-performance athletes in Beijing, and current masks are not designed to stay on during intense athletic usage. There are some clear marketing opportunities.

● There are two types of measures here, short-term and long-term:

● Short-term plays

- Air filters for the home, workplace, school.
- Air filters for the car.
- Energy efficiency: insulation, Energy-efficient lights.
- Organic food.

● Long-term plays (for example, the US needed around 40 years to improve the situation)

- Cleaner energy: China will certainly look to shift its energy mix away from coal.
- Natural gas and nuclear energy are the candidates that look most likely to grow.
- Real estate: China values green areas, and demand for environmentally-friendly and safe housing will certainly rise.

[Mr. Onogi](#)

● I agreed with Prof. Liu's opinion. We need at least 20 to 30 years to solve this. Prof. Liu

mainly talked about B-to-C, but I suppose B-to-B and B-to-G opportunities will also rise.

- Firstly, B-to-C would be in the field of photocatalysis, masks and eco-friendly cars etc.

- Secondly, B-to-B opportunities could be dust extractors, bug filter, VOC recovering machines, smoke exhaust machine, NOX eliminators etc.

- Thirdly, B-to-G could include measuring instruments to get more data on which to base future action.