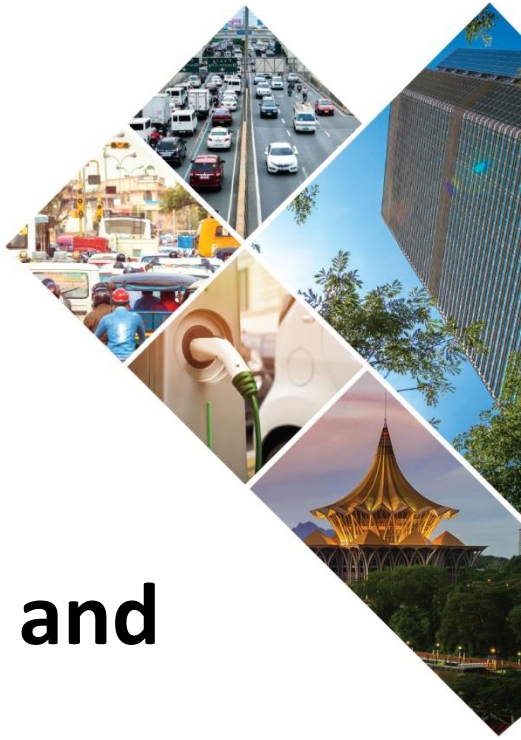
10th BAQ
Better Air Quality Conference
Kuching, Malaysia
14-16 Nov 2018
Borneo Convention Centre Kuching,
Sarawak, Malaysia



VOCs Emissions Control in the P.R.C and Recommendations for Other Cities

City Solutions and Good Practices to Address Urban Air Pollution

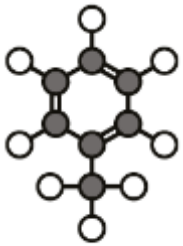
Weihao Zhang
Clean Air Asia
14 Nov 2018

Key points

- Why VOCs
- Emission Status
- Control Strategy
- Recommendations

Why VOCs

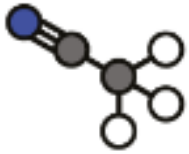
- A class of carbon-based organic compounds
- Evaporate under normal atmospheric conditions
- Relatively high vapor pressure at room temperature
- Diverse sources: anthropogenic and natural
- **Photochemical reactivity**



toluene

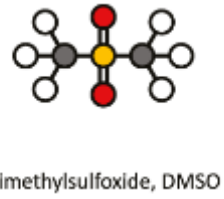
isopropanol

dioxane



acetonitrile

N,*N*-dimethylacetamide, DMA



dimethylsulfoxide, DMSO

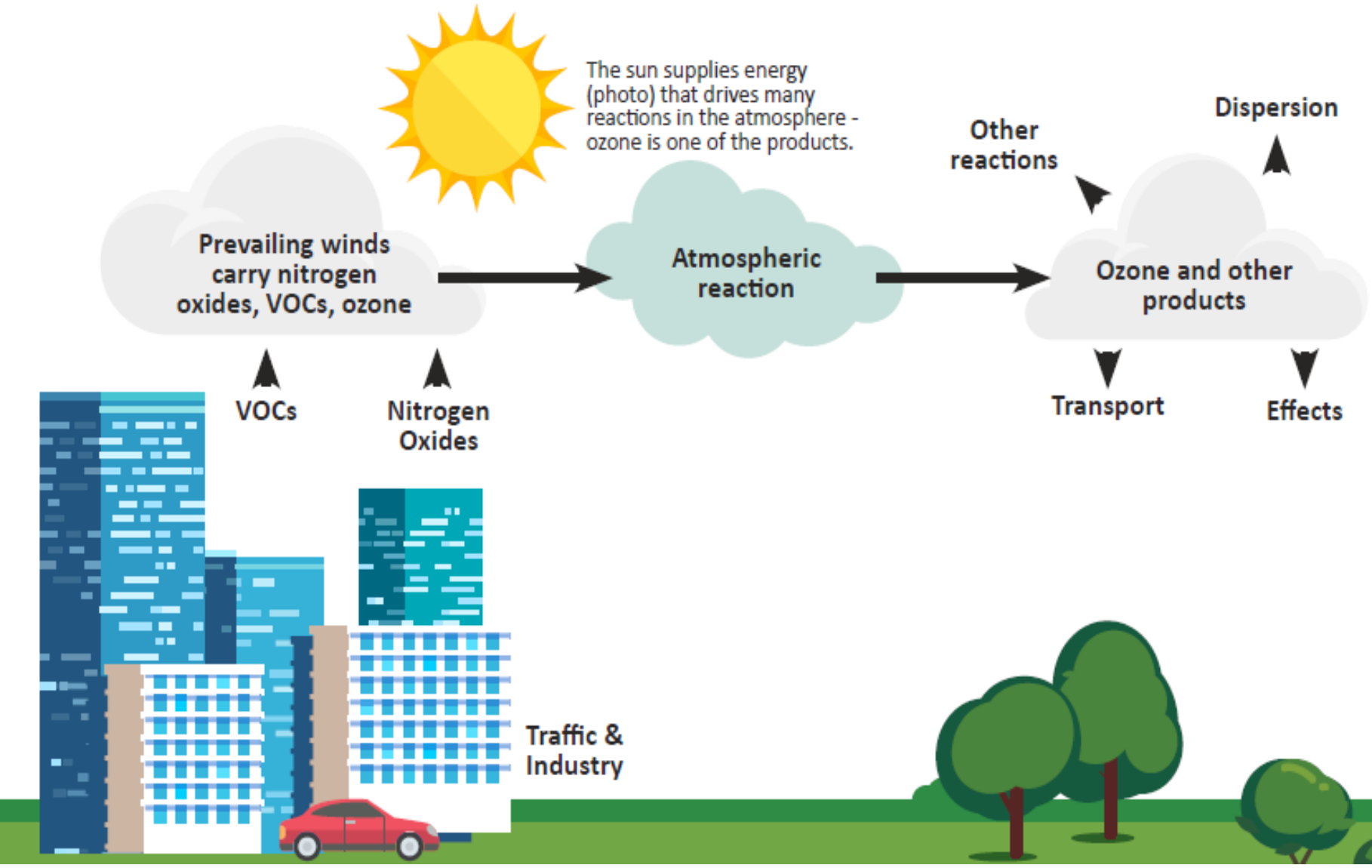
N,*N*-dimethylformamide, DMF

tetrahydrofurane, THF

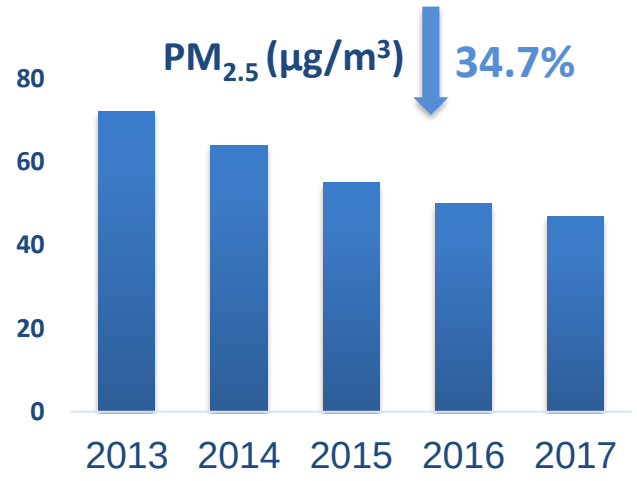
acetone

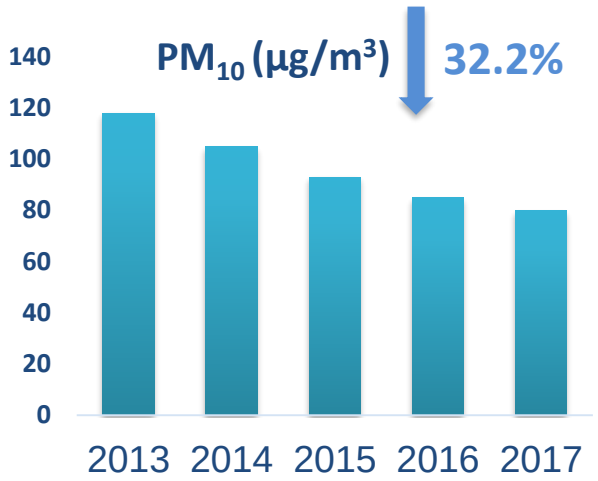
Key precursors of O_3 and PM

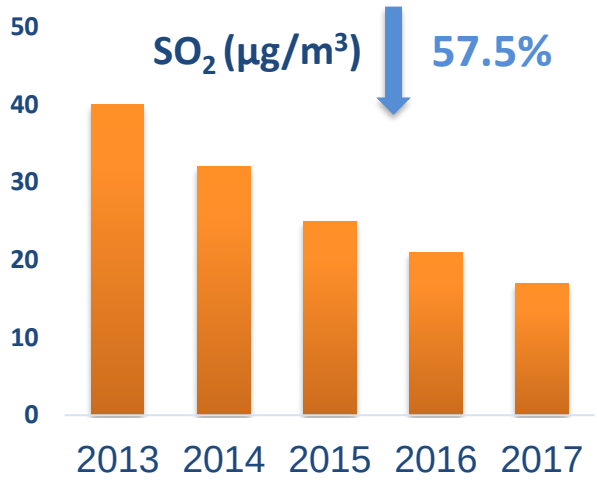
Why VOCs

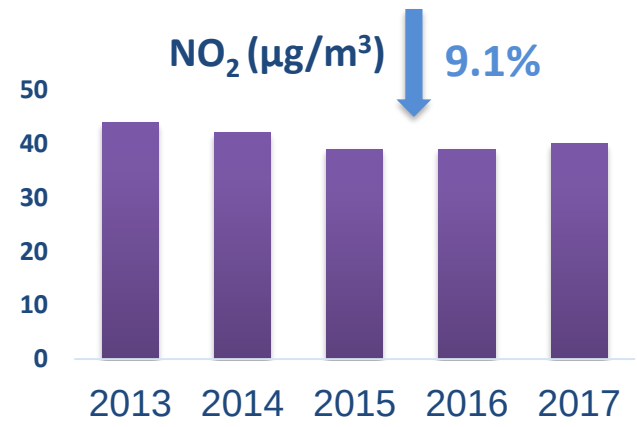

The sun supplies energy (photo) that drives many reactions in the atmosphere - ozone is one of the products.
Other reactions
Dispersion
Prevailing winds carry nitrogen oxides, VOCs, ozone
Atmospheric reaction
Ozone and other products
VOCs
Nitrogen Oxides
Transport
Effects
Traffic & Industry

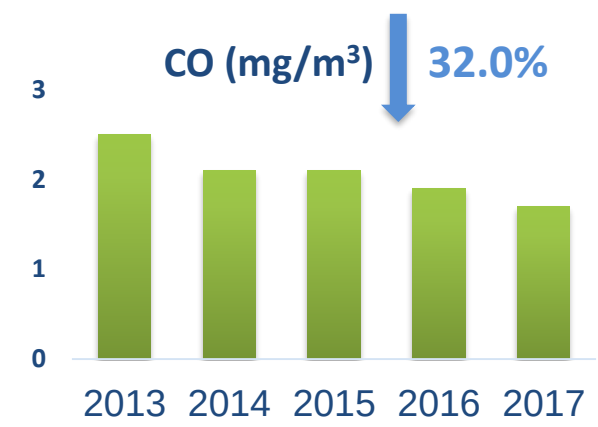
Why VOCs

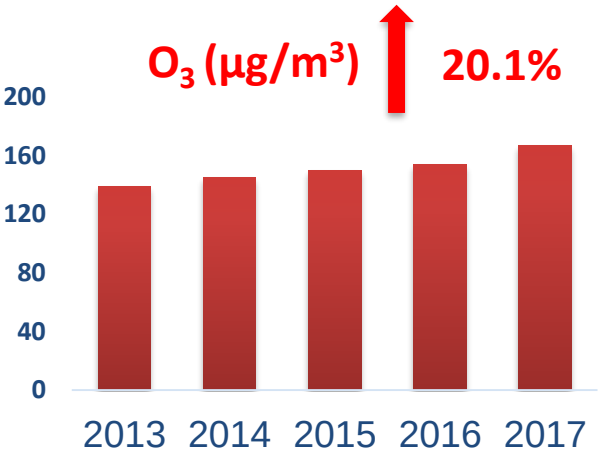

PM2.5 (µg/m3)
34.7%
80
60
40
20
0
2013
2014
2015
2016
2017


PM10 (µg/m3)
32.2%
140
120
100
80
60
40
20
0
2013
2014
2015
2016
2017

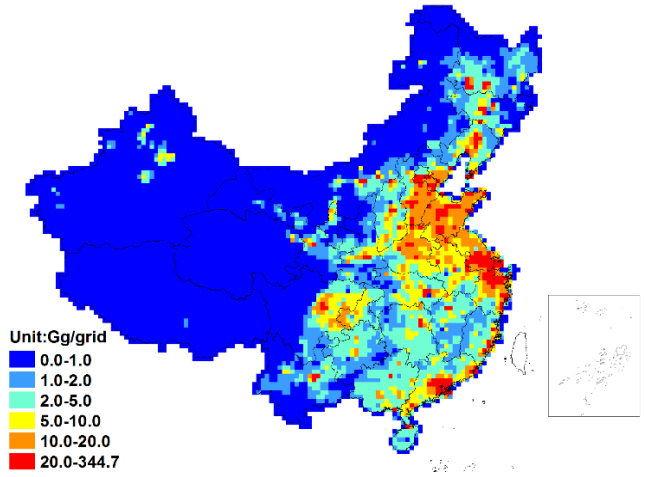

SO2 (µg/m3)
57.5%
50
40
30
20
10
0
2013
2014
2015
2016
2017


NO2 (µg/m3)
9.1%
50
40
30
20
10
0
2013
2014
2015
2016
2017

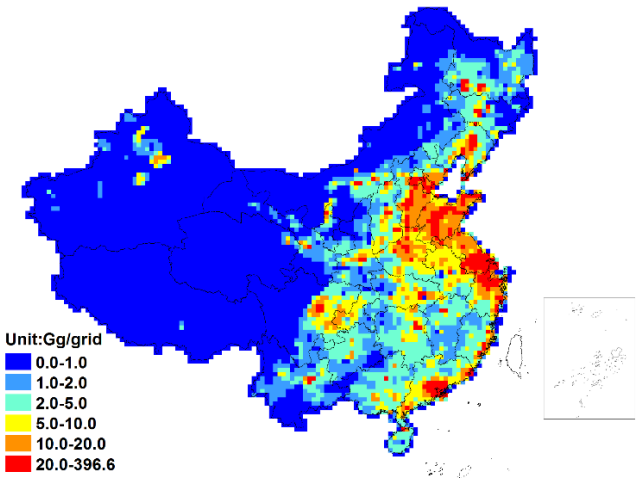

CO (mg/m3)
32.0%
3
2
1
0
2013
2014
2015
2016
2017


O3 (µg/m3)
20.1%
200
160
120
80
40
0
2013
2014
2015
2016
2017

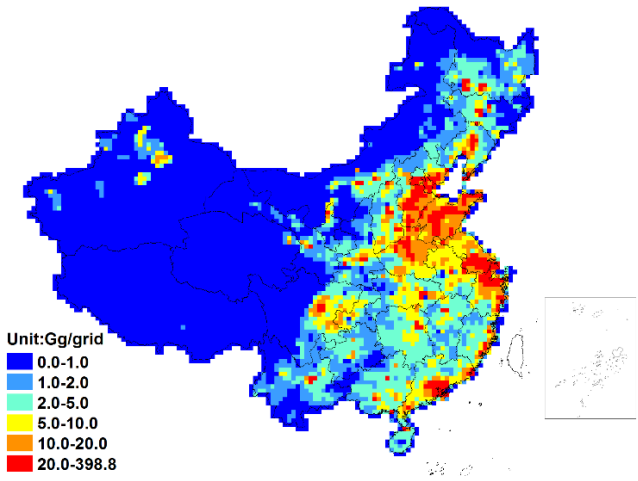
Emission Status



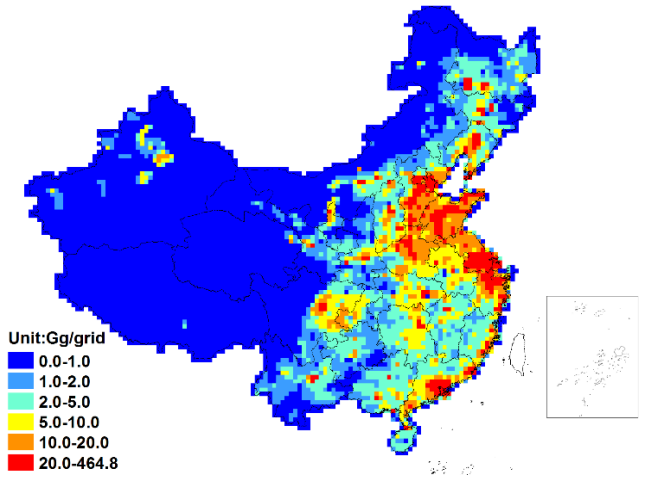
2008



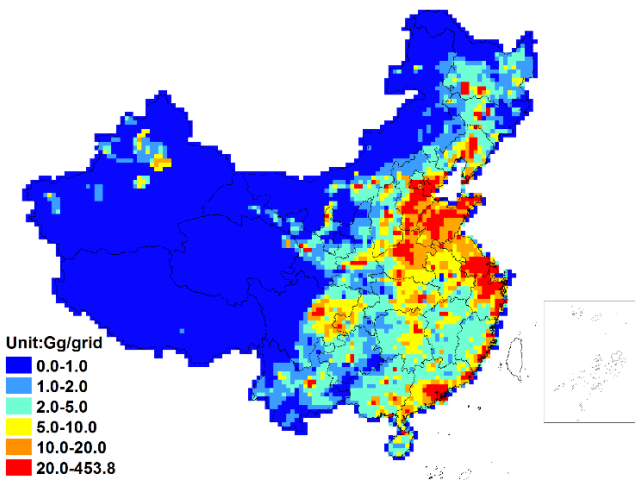
2009



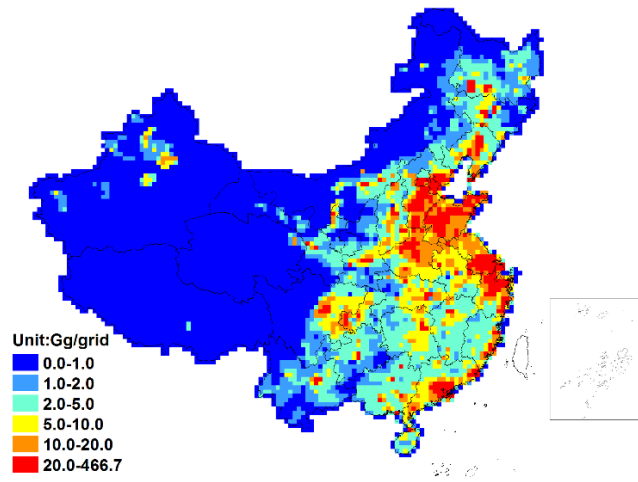
2010



2011



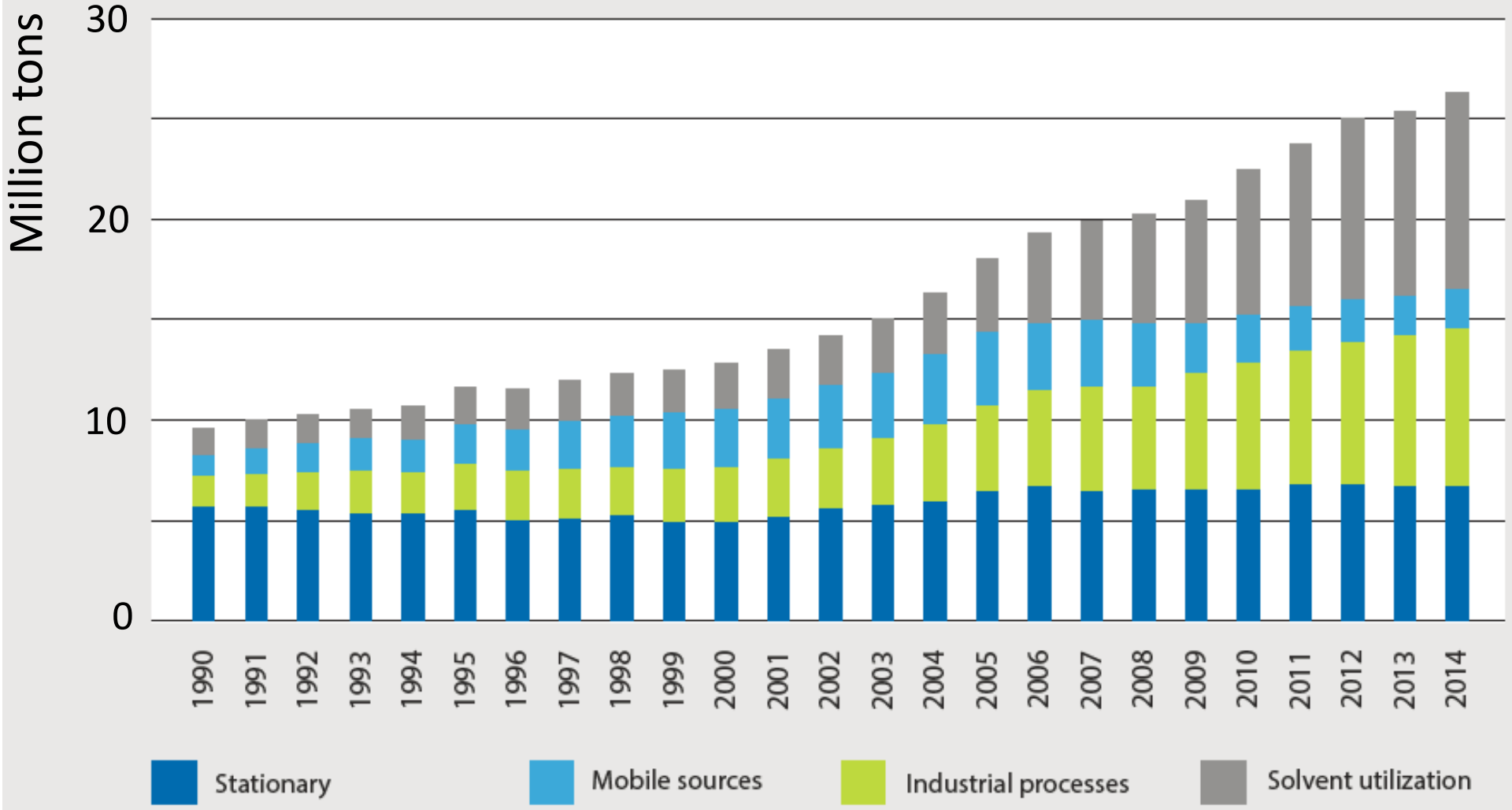
2012



2013

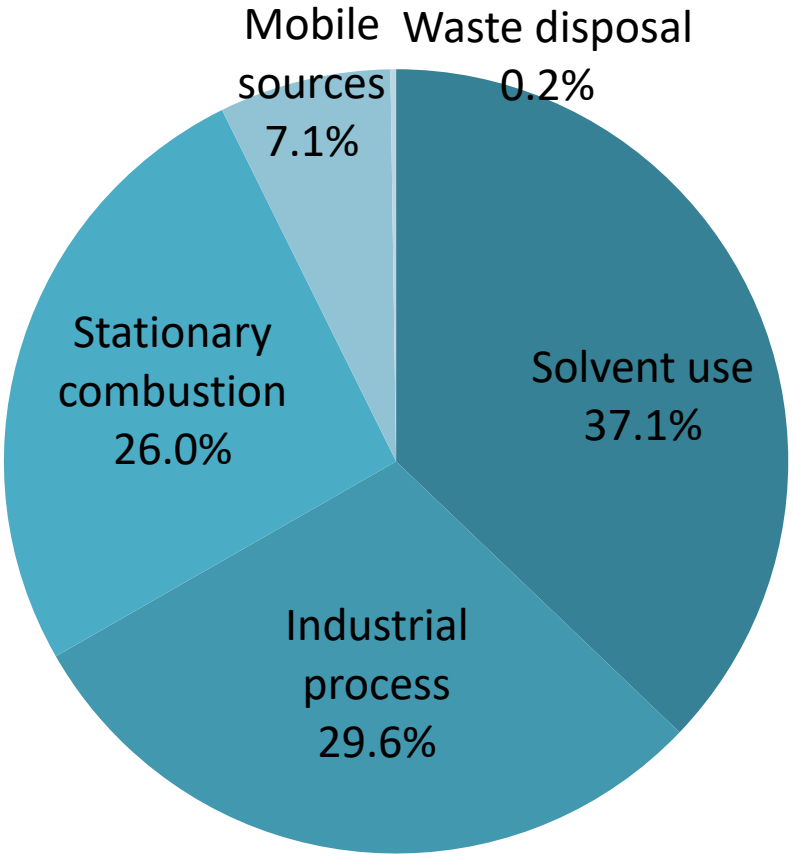
Source: Xie Shaodong, 2016

Emission Status



Source: Tsinghua University, 2016

Emission Status



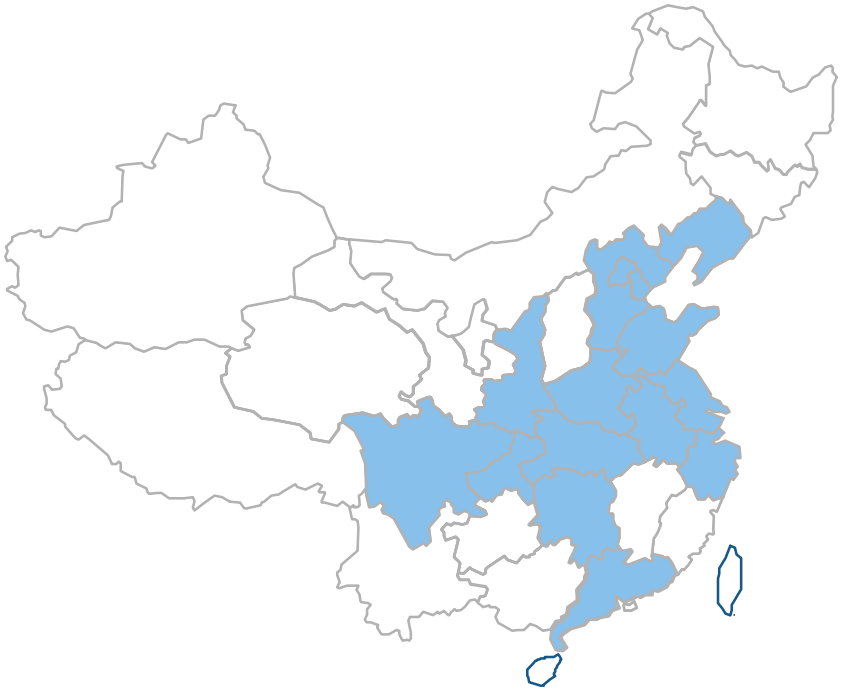
Contribution of Souces to anthropogenic VOCs Emissions in PRC, 2014

2014 total VOCs emissions (million tons)	
Solvent use	9.76
Industrial process	7.78
Stationary combustion	6.82
Mobile source	1.86
Waste disposal	0.05
Total	26.27

Source: Tsinghua University, 2016

Control Strategy

Target set in the 13th Five Year Plan (2015-2020)



Key regions

Key industries

10% emissions reduction

Control Strategy

Petrochemical

Storage

Organic chemical

Coating

Rubber

Printing

Automobile spraying

Vessel spraying

Container spraying

Furniture

Electronic

Leather

Shoes

Spinning

Sewage treatment

Control Strategy

CLEAN AIR ASIA

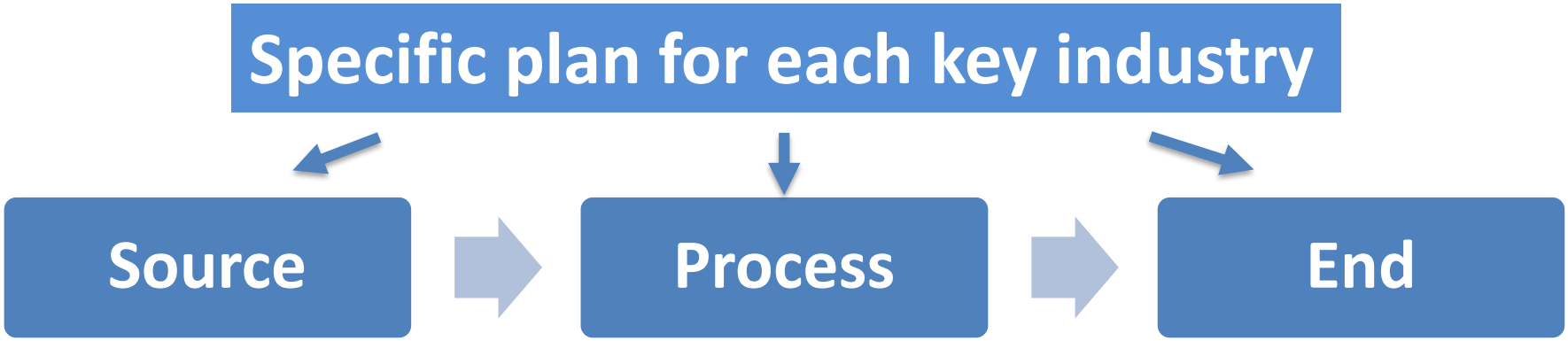
Government

VOCs emissions inventory	30+ cities
Industrial emissions standards	20+ industries
Industrial guidelines/control plans	20+ guidelines
Discharge fee to environmental tax	Since 2015

Enterprise

Entire process control	Source-process-end
Continuous monitoring system	Connected to local gov

Control Strategy



- Industrial park
- Low VOCs content raw materials
- Low volatility raw materials

- Improve production process
- Vapor/exhaust collection
- Recovery
- Fugitive emission control: LDAR

- Combination technology: recovery and destruction

Challenges and Recommendations

Challenges	Recommendations
Insufficient knowledge and data on local emission sources	Develop VOCs emission inventory at city level and identify key sources as local control priorities
Lack of an effective integrated VOCs management system	Include the Control of VOCs Emissions in Permit System
Unclear technical guidelines and roadmaps	Specify Technology Roadmaps for VOCs Control in Key Industries and Strengthen Technological Application

Annex-Training materials on VOCs

Clean Air Asia knowledge hub: www.allaboutair.cn

Training materials

- **VOCs Control in Pharmacy and Petrochemical Industry**

http://www.allaboutair.cn/plus/view.php?aid=486

- **VOC Emissions Assessment and Control Measures in Coating Materials and Ink Producing Industry**

http://www.allaboutair.cn/a/training_gov/2016/0509/453.html

Good Practice on VOCs Pollution Control in China

- **Shanghai**: http://www.allaboutair.cn/a/experience_domestic//2015/1210/264.html
- **Jiangsu**: http://www.allaboutair.cn/a/experience_domestic//2015/1210/265.html
- **Zhejiang**: http://www.allaboutair.cn/a/experience_domestic//2015/1210/266.html
- **Beijing**: http://www.allaboutair.cn/a/experience_domestic//2015/1210/263.html

For more information, visit: www.cleanairasia.org

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www.baq2018.org

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acfa ASIAN CLEAN FUELS ASSOCIATION

TOYOTA

261 Clean Air Asia Partnership Members

- Cities
- Environment ministries and government agencies
- Development agencies and foundations
- Non-government organizations
- Academic and research institutions
- Private sector companies and associations

Clean Air Asia Country Networks

Indonesia · Malaysia · Nepal · Pakistan
Philippines · Sri Lanka · Vietnam