

The background of the slide is a photograph of the Ulaanbaatar skyline, featuring a dense residential area in the foreground and a cluster of modern skyscrapers in the background. The entire image is covered with a semi-transparent blue filter. The title text is centered and written in a clean, white, sans-serif font.

ULAANBAATAR AIR POLLUTION

CHALLENGES AND POLICIES TO REDUCE IT

Oyun Sanjaasuren

Ulaanbaatar

Capital of Mongolia

UB City Population

- 2017 1.4 million
- 2010 1.25 million
- 2000 0.8 million

UB City Households

- 2017 380 800
- 2010 302 200
- 2000 161 300

Households Living in the Ger District

- 2017 220 000
- 2010 180 000
- 2000 100 000

45% of the country's population lives in *Ulaanbaatar*

60% of *UB's* households lives in the *Ger District* *Population of the Ger Districts* **doubled** since 2010

1/3 of the population still lives below poverty line

Nomadic pastoralism



GER



URBAN MIGRATION

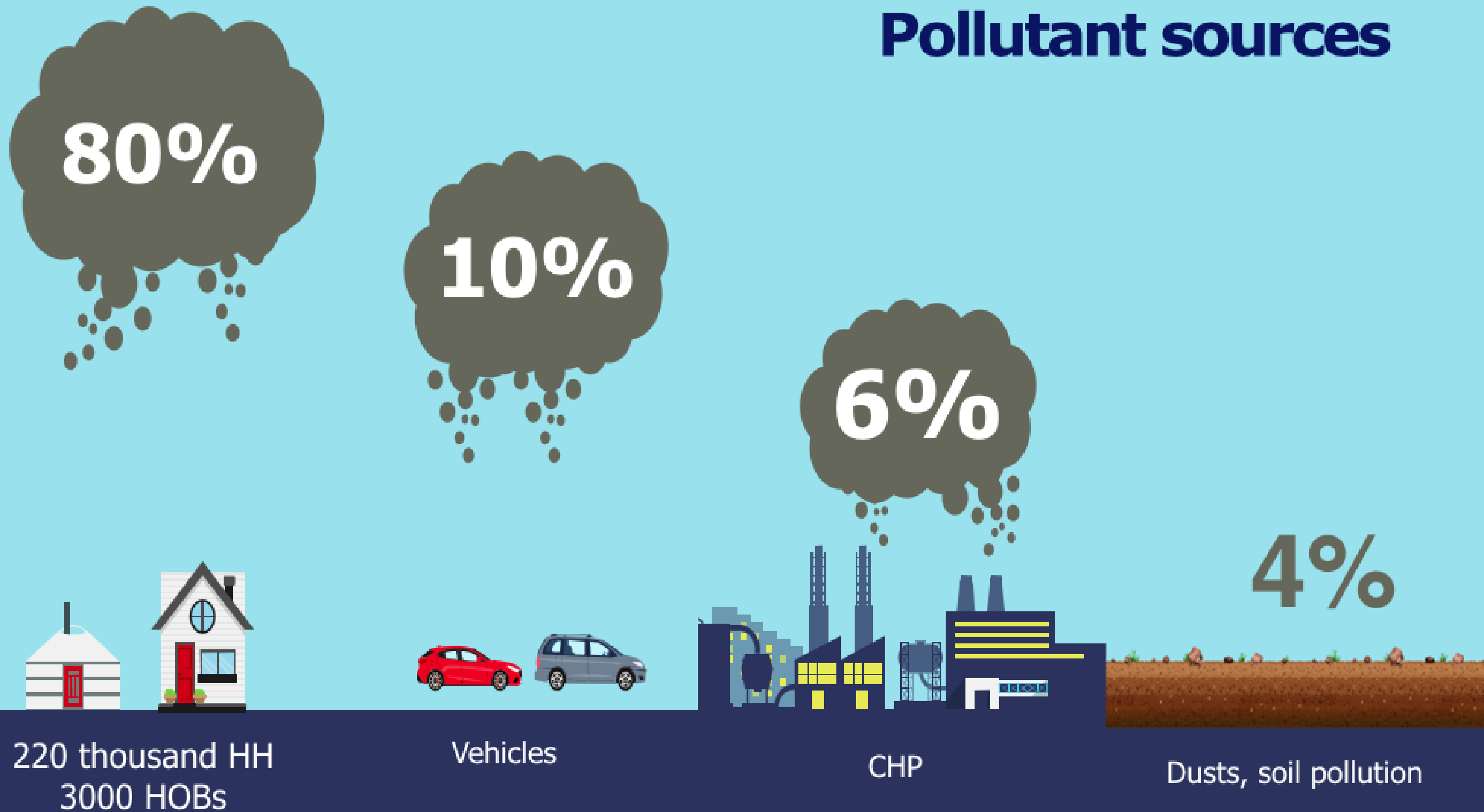
- An estimated 600,000 former herders have moved to the country's capital Ulaanbaatar in the past 30 years



Air quality data for winter months (Oct –
Dec)
Ulaanbaatar 2012-2017

Pollutant	Mongolian National Air Quality Standard		Oct-Dec Average Concentration in (µg/m³)		Number of Days which Exceeded the Standard in October and December in (Percentage)	
	Threshold in (µg/m³)		2016	2017	2016	2017
	24h	Annual				
PM ₁₀	100	50	178	159	68%	70%
PM _{2.5}	50	25	137	117	76%	81%
SO ₂	50	20	44	28	31%	12%
NO ₂	50	40	49	51	42%	46%

Pollutant Sources



- In winter, burning of raw coal for warmth
- Emission from 350 thousand registered vehicles

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Ger District in the Summer



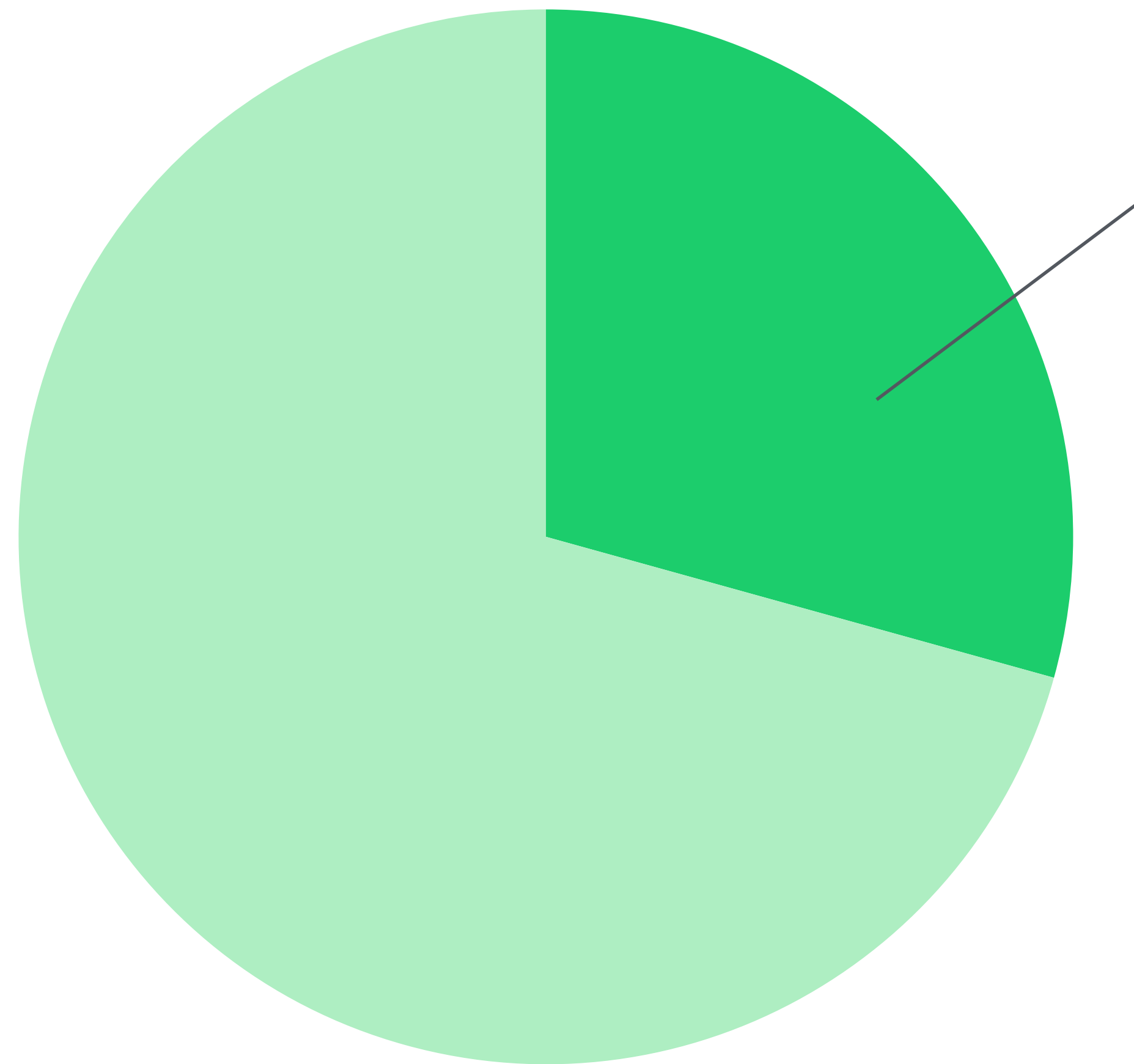
Ger District originally not meant for permanent settlements

- The ger districts that radiate from the centre of Ulaanbaatar are the result of the impromptu planning, the rapid and uncontrolled urbanization of people migrating to the capital in search of economic opportunities

UB City in January



Statistics of 2016



29.6% or 907.5 thousand people are poor

Most of the low-income households live in the ger district of Ulaanbaatar

As of 2016, Mongolia had a population of 3.1 million

Traditional nomadic herders

Climate

Change: **+2.24**

Leading to more

Desertification,

Pasture

degradation,

melting glaciers

and permafrost

thawing



More frequent natural disasters — dzud (drought+ cold winter = livestock perishing)

220 000 Chimneys



Practical actions



- ✓ **Clean Stoves /distribution of ~170,000 clean stoves to ger district households/**

Projects	Distribution of Clean stoves	Explanation
Millennium Challenge Corporation, Clean air fund	97787	TOTAL USD 30 mln MCC; 15 mln WB 30 mln Govt CAF During 2011-2013 average of 91% subsidy and during 2014-2015 66% subsidy of price was given to every household purchase of clean stoves
Clean air fund	29518	
Ulaanbaatar Clean Air project, (WB) Clean air fund	40813	
Total	168118	

Results of Clean stove project

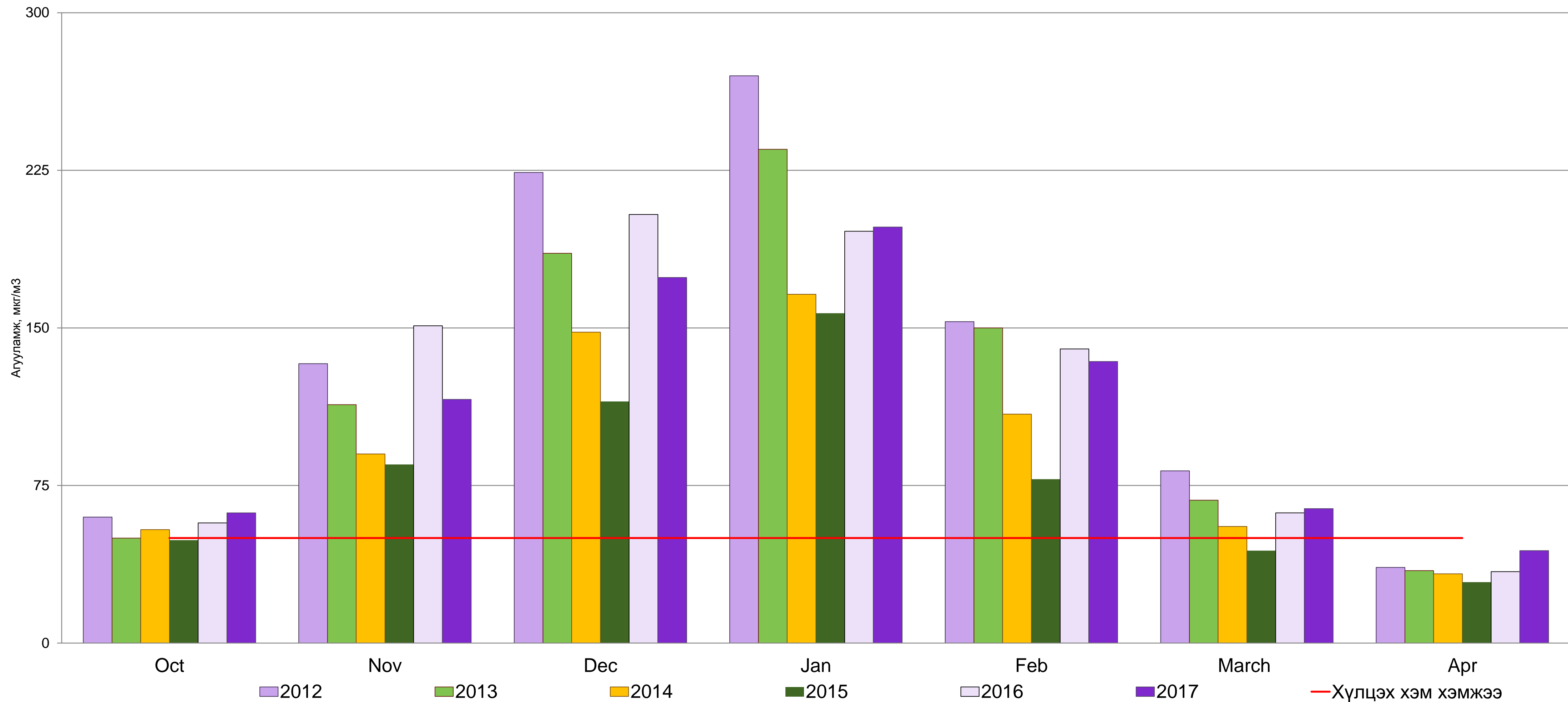
- The EEP stove subsidy program had 65% lower emissions of $PM_{2.5}$ compared to traditional stoves under typical usage conditions.
- Ulzii stoves significantly reduced $PM_{2.5}$ emissions by 74% in houses and 83% in gers. Smaller reductions were also observed for Khas stoves in houses (46% reduction) and Dul stoves in both houses and gers (reduction of 31% and 38%, respectively) compared to traditional stoves.
- (MCC project monitoring report, 2014)



MCC EVALUATION REPORT

- The EEP stove subsidy program reduced ambient PM_{2.5} concentrations over UB attributable to heating stoves by an estimated 30%, with largest reductions in highly polluted areas that were more heavily targeted by the program
- There was no sustainability of the stove policies which resulted in the retraction of the emissions reduction after 2014

2012-2017 Winter **PM_{2.5}** Monthly Average in (mkg/m³)



PM₁₀ - Monthly Average in (μg/m³)

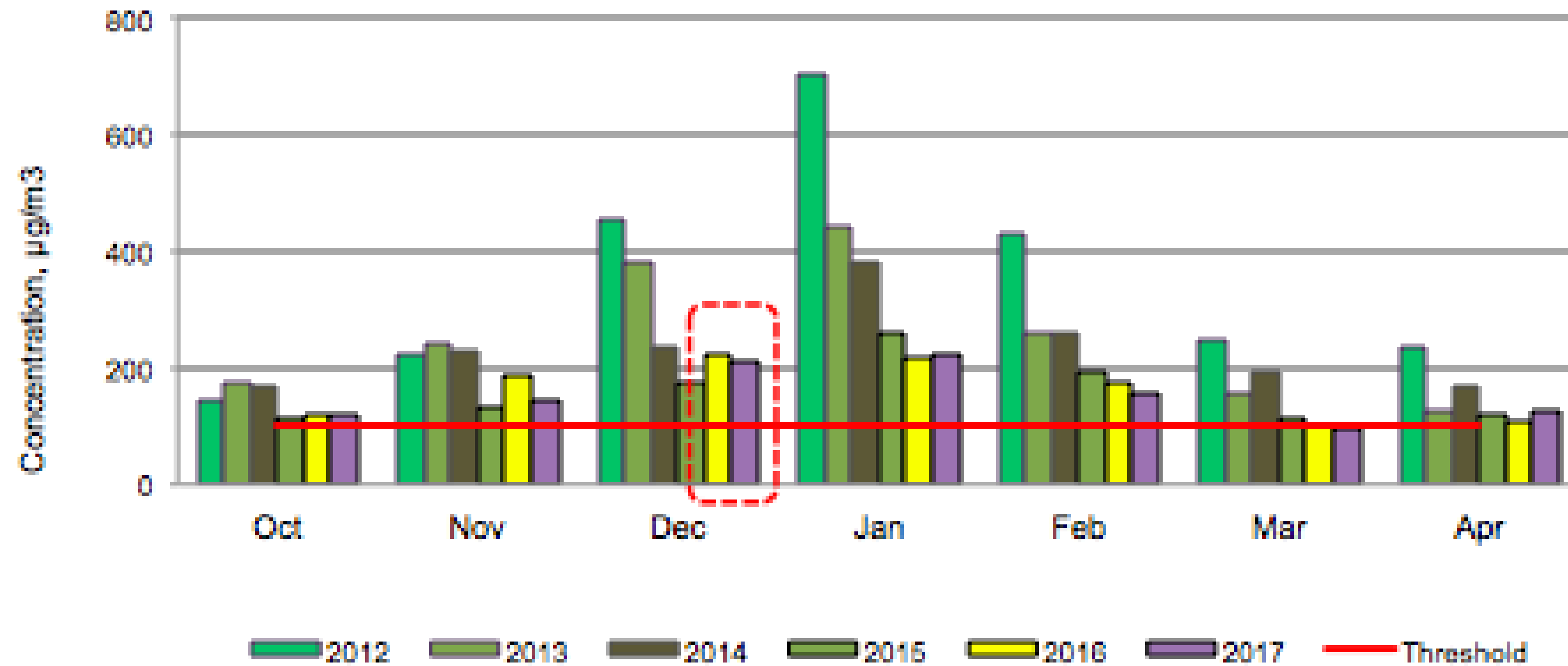
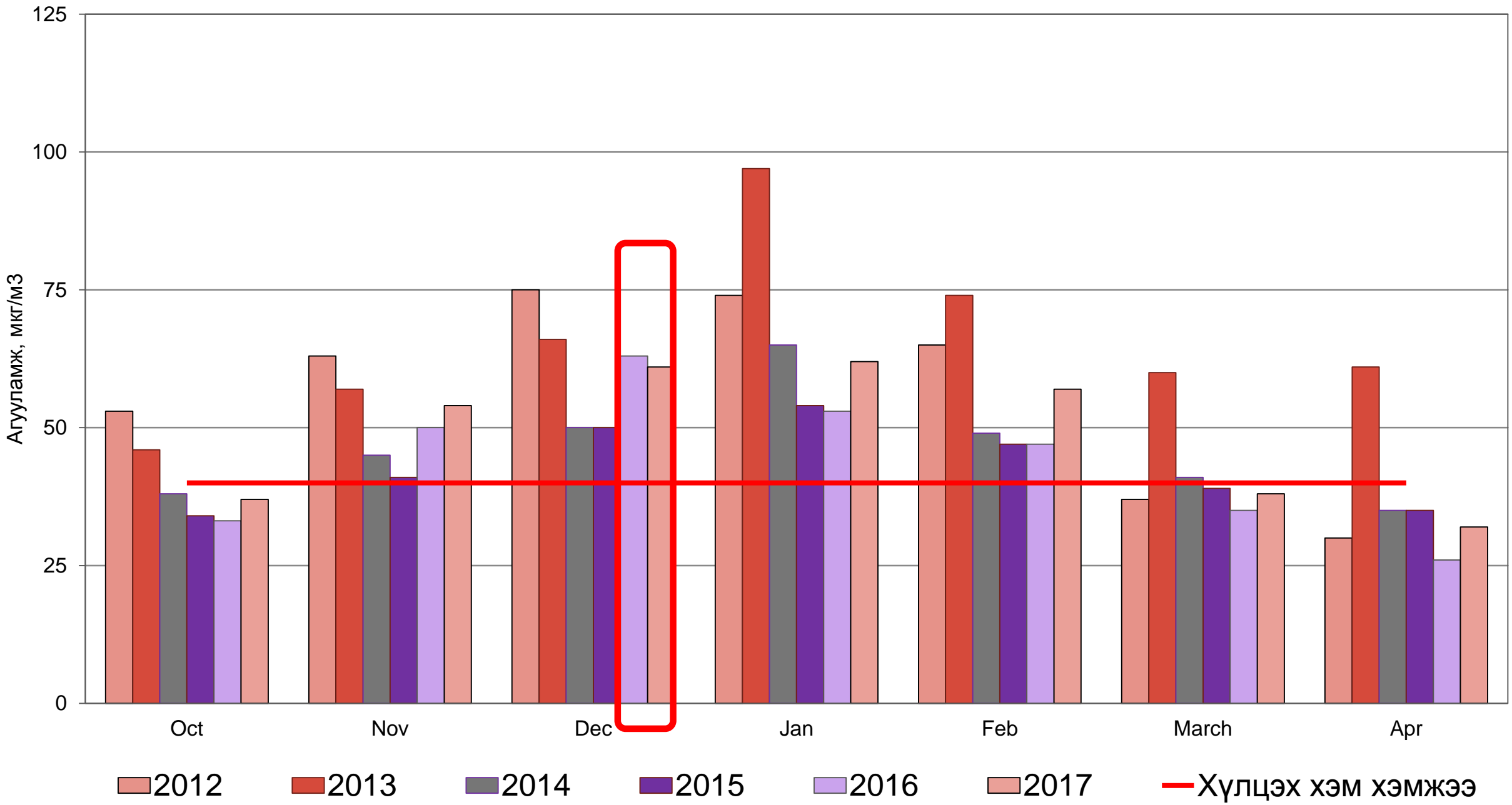


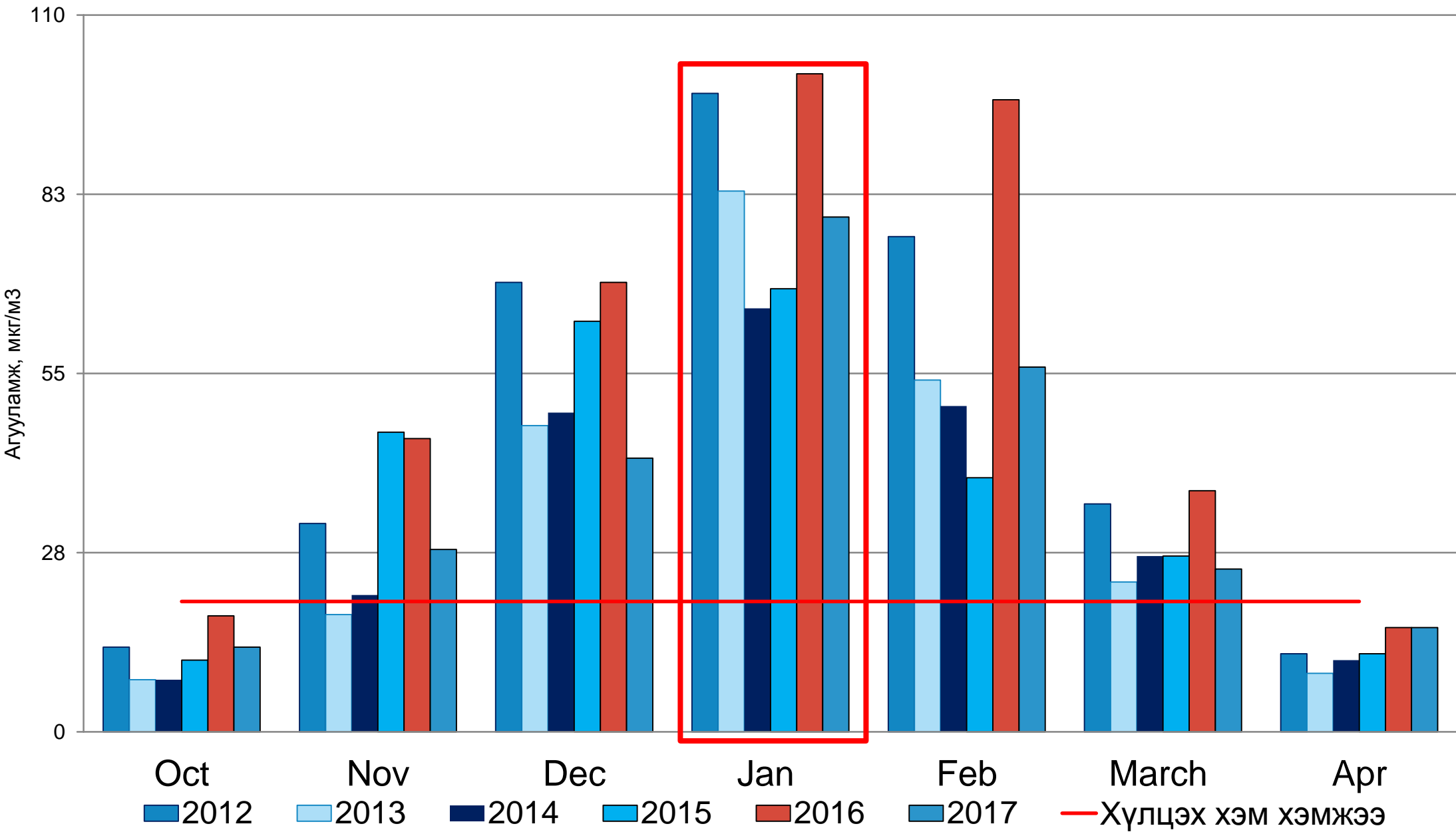
Figure1. Monthly average concentration of PM10 in winter, 2012-2017

2012-2017: Last 6 Winters Dynamics for SOx and NOx

NO₂
Monthly Average
in (mkg/m³)



SO₂
Monthly Average
in (mkg/m³)



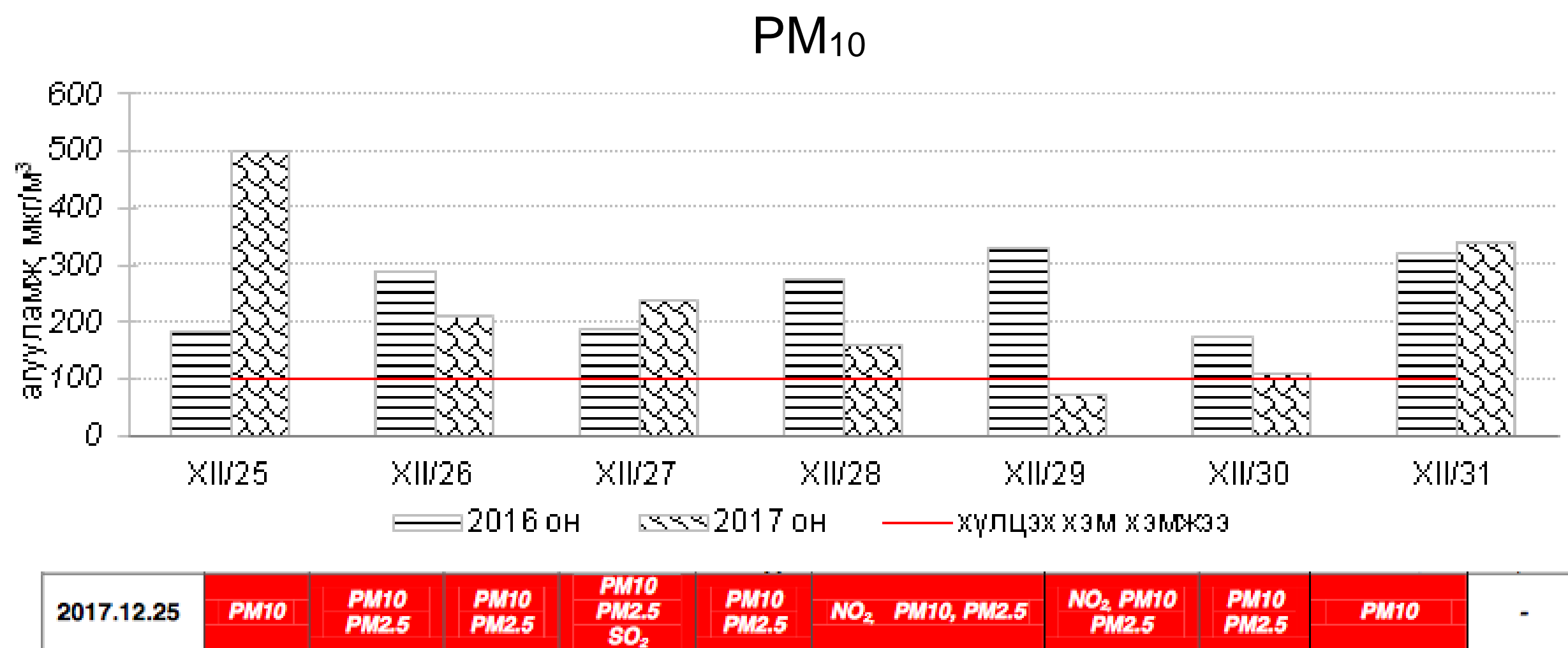
JICA Study on Low-Emission Stoves & Fuel

Type of stove and fuel	Av. Dust concentration in (mg/Nm ³)	Difference in (%)
Baganuur's coal + Traditional stove	293	
Baganuur's coal + Improved stove	122	-58
Semi coke + Traditional stove	55	-81
Semi coke + Improved stove	27	-91

Air quality monitoring stations in UB City



2017. 12. 25

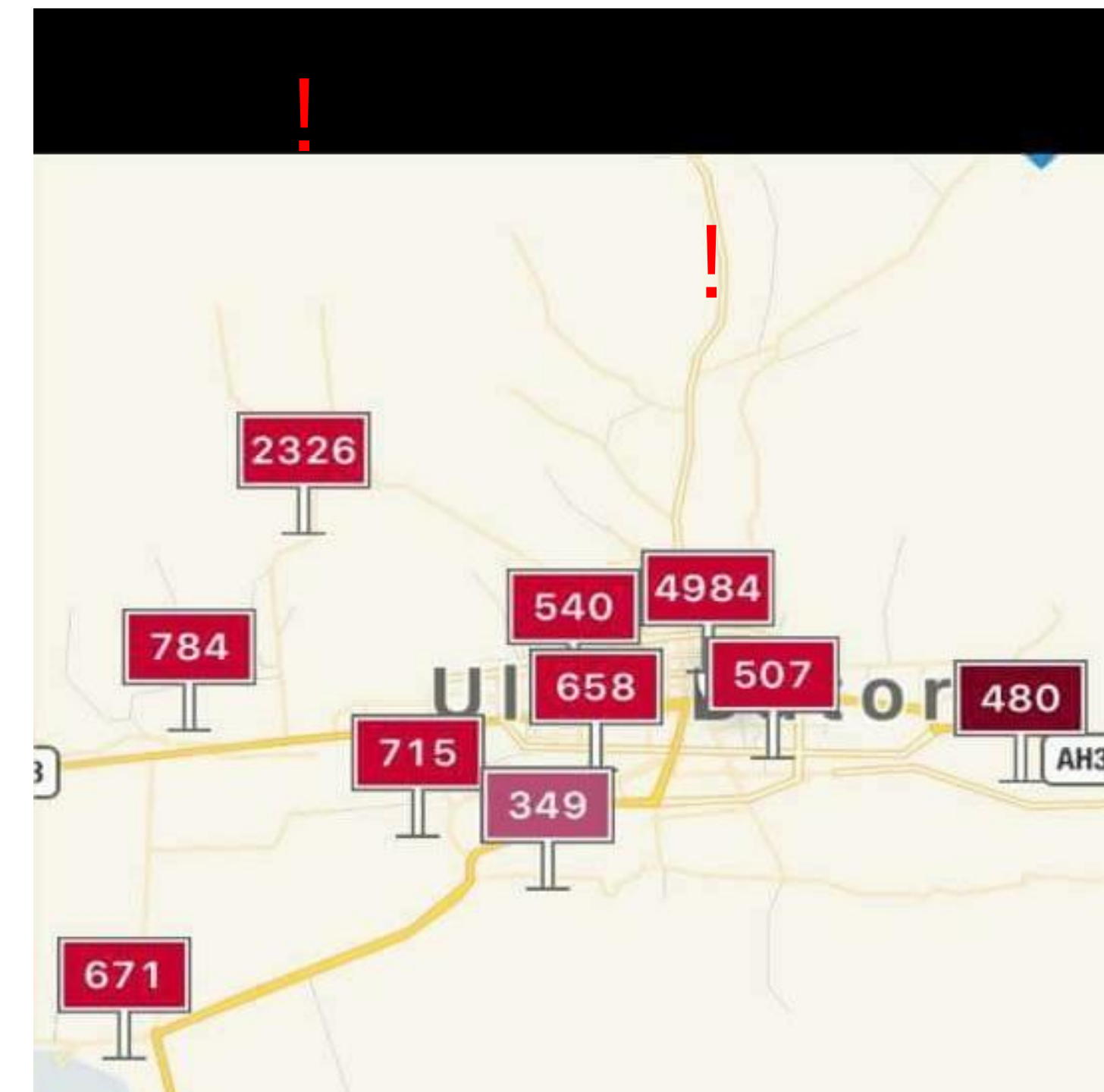


PM₁₀ Average daily and
average of 11 monitoring stations: 500

PM₁₀ Peak heating hour in the
evening:

- 2326 Bayankhoshuu Area

- 4984 100 Ail Area

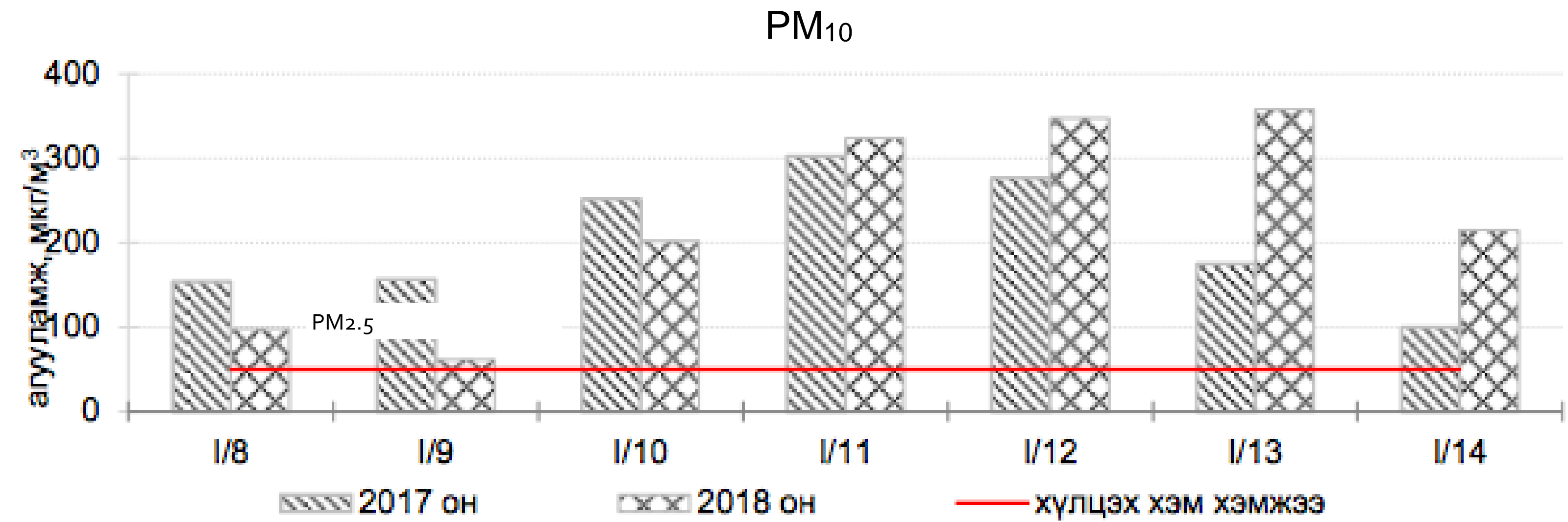


Examples of very polluted days this winter

PM_{2.5} µg/m³

(Average of 11 Monitoring Stations)

January, 12th



2018.1.12	PM10	PM10	PM10	PM10	PM10	NO ₂ , PM10 PM2.5	PM10, PM2.5	PM10 PM2.5	PM10	PM10
	NO ₂	PM2.5, CO	PM2.5	PM2.5 SO ₂	PM2.5		PM2.5	PM2.5		



AFFORDABILITY- MAIN CHALLENGE

FROM all the initial pilots, tests and studies — one of the main barriers is:
Affordability

- Almost all the other interventions are more expensive than the current raw coal burning option and therefore subsidies, at least initial, are needed for deployment of clean technologies

A step-by-step approach to setting up an affordability mechanism is needed

- Not possible to go solo (infrastructure) for heating only – integrated solution is a must — and that becomes expensive

GCF-ADB project AHURP:

Example of Addressing Barriers

- Ulaanbaatar Green Affordable Housing and Resilient Urban Renewal Project
- to deliver **10,000** green housing units that are energy efficient, affordable, and designed to maximize the use of renewable energy. 100 hectares of *ger* areas will be redeveloped into green eco-districts
- GCF funding would be used to reduce the barriers towards the implementation of AHURP
- “Integrating modern energy efficiency technology into prevailing standards for design, construction and operation of buildings, and utilities services. The policy and legal framework for energy efficiency in building construction and renewable energy are mostly in place, but the regulatory framework and the institutional capacity to implement these policies are still in development. Most importantly, the economic and environmental benefits that are recognized at government levels have not been translated into economic incentives for building owners and developers to adopt energy efficiency measures”

instability of policies - barrier

- Political aspects – political will, public attitude, unstable policies, public awareness raising
- President's office 2011-2013 – in charge of NC
- Then PM's office 2014-till now
- CAF 2012-2014; dissolved 2015; recreated 2018
- Secretariat to NC created in 2011 and dissolved 2015
- A new agency may be created in 2018

SOLUTIONS & WAY FORWARD

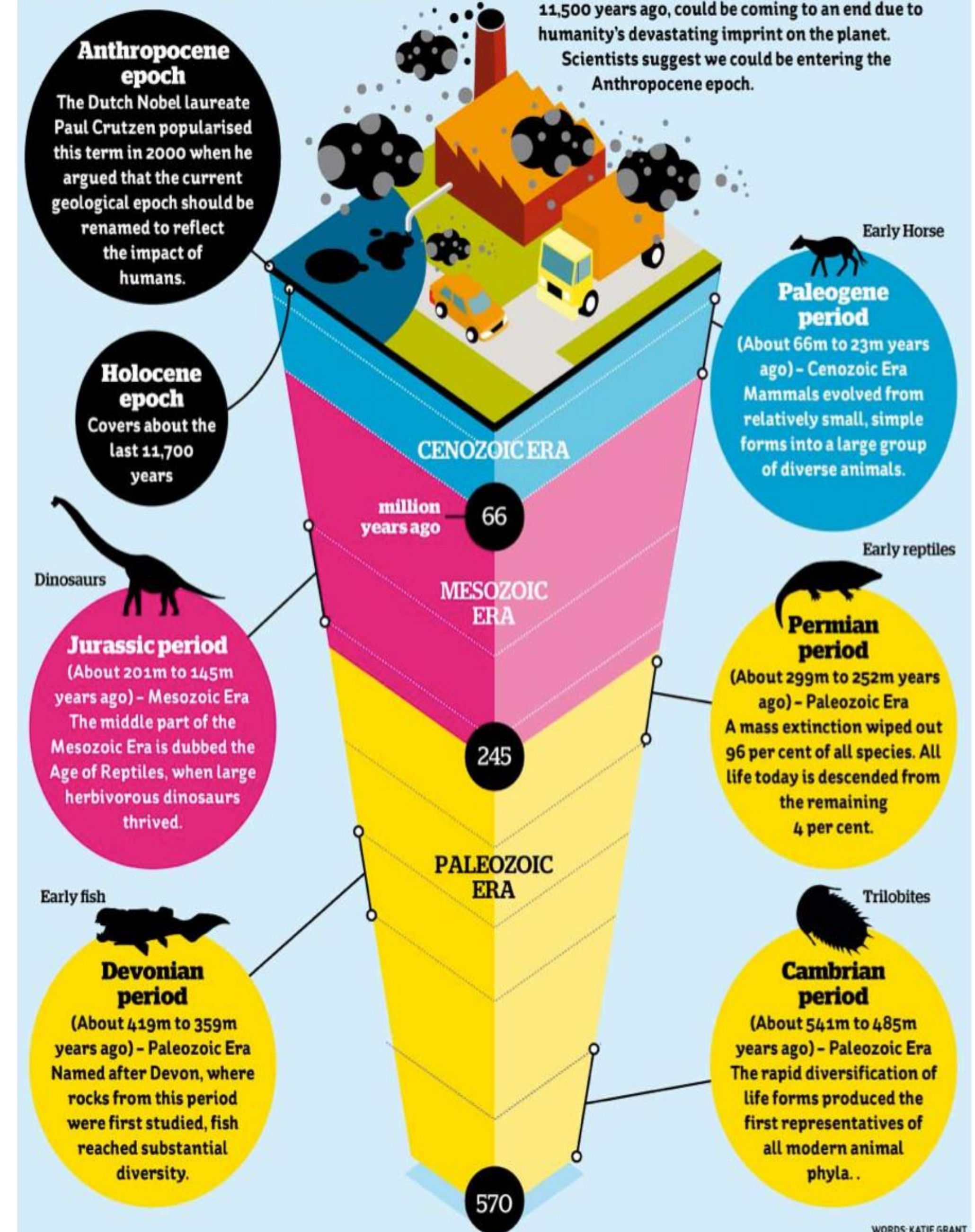
- GOVERNANCE, political will and public participation
- Low-emission stoves
- Clean fuel (e.g. semi-coke briquettes)
- Electrical and gas heaters
- Insulation and energy-efficient buildings
- Re-development of ger district/infrastructure
- Moving to flats/mortgage schemes
- Renewables including geothermal

The Anthropocene Epoch

TIMELINE

An epoch for humankind?

Humankind is entering a new epoch, according to an influential group of geologists, ecologists and climate experts. The Holocene epoch, which began roughly 11,500 years ago, could be coming to an end due to humanity's devastating imprint on the planet. Scientists suggest we could be entering the Anthropocene epoch.



Critical Need for Planetary Health



- Unhealthy environments already linked to 23% of global deaths
- Unprecedented scale of global environmental change

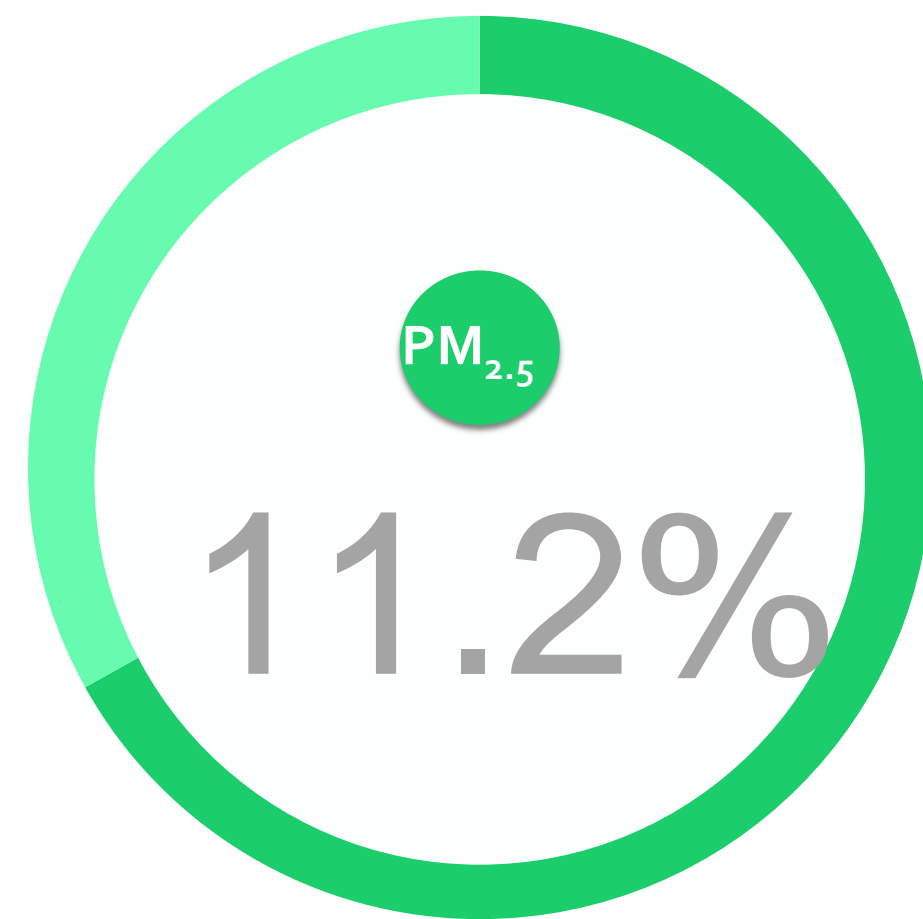


- Pressures on health are increasing (e.g. food, water, natural disasters, pollution, infectious disease, toxin exposure)

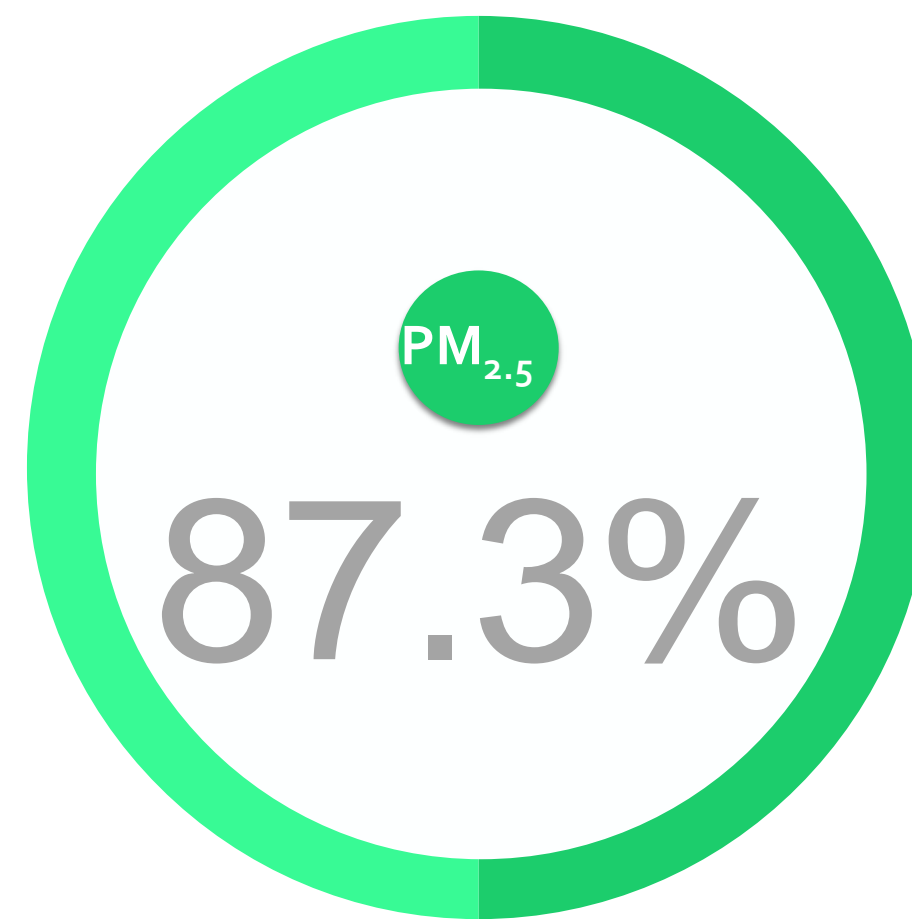


- A more preventive approach is critical
- Critical need for coordination/integration for long-term environment and health issues

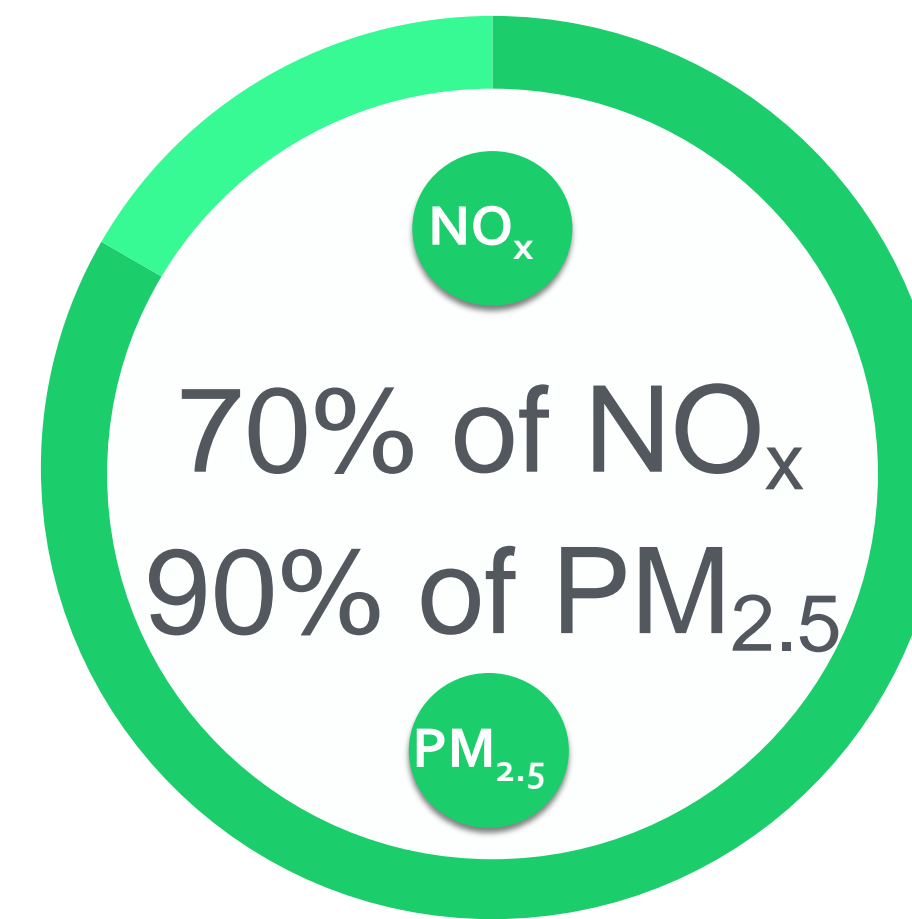
Global Statistics from Lancet Countdown on Health & Climate Change



- Global population PM_{2.5} exposure has increased by 11.2% since 1990



- PM_{2.5} concentrations in most cities (87.3%) exceed the suggested annual guideline of WHO which is 10µg/m³



- Energy sector is responsible for 70% of NO_x and 90% of PM_{2.5} emissions



- Each year, the number of premature deaths caused by outdoors and indoor activities are 3 and 4.3 million people respectively

Trend: Consumption

Current and Future

300%

2030:

- 300% growth of Middle classes in developing countries
- Middle-class consumers will triple

325%

- World GDP is projected to grow by 325% between 2007 and 2050

60%

- 60% of GDP is consumer spending on goods & services
- 70 million people each year are

\$ 30K

- entering an income bracket equivalent to between \$ 6 000 (US) and \$ 30 000 (US)

er of middle-class consumers worldwide 1 to triple by 2030.

es in the GDP of developing countries are accompany a three-fold increase in the number come consumers. By 2025 there are expected illion middle-income consumer households in – approximately four times as many as there 4.⁸ According to Goldman Sachs, 70 million year are entering an income bracket equivalent JS\$ 6,000 and US\$ 30,000 in purchasing / terms. This phenomenon may continue for nty years, accelerating to 90 million new

The expanding world middle class
me consumers per year by 2030. This proves e, then 2 billion people will have joined the middle class by that date, bringing almost 80% population into the middle-income bracket.⁹

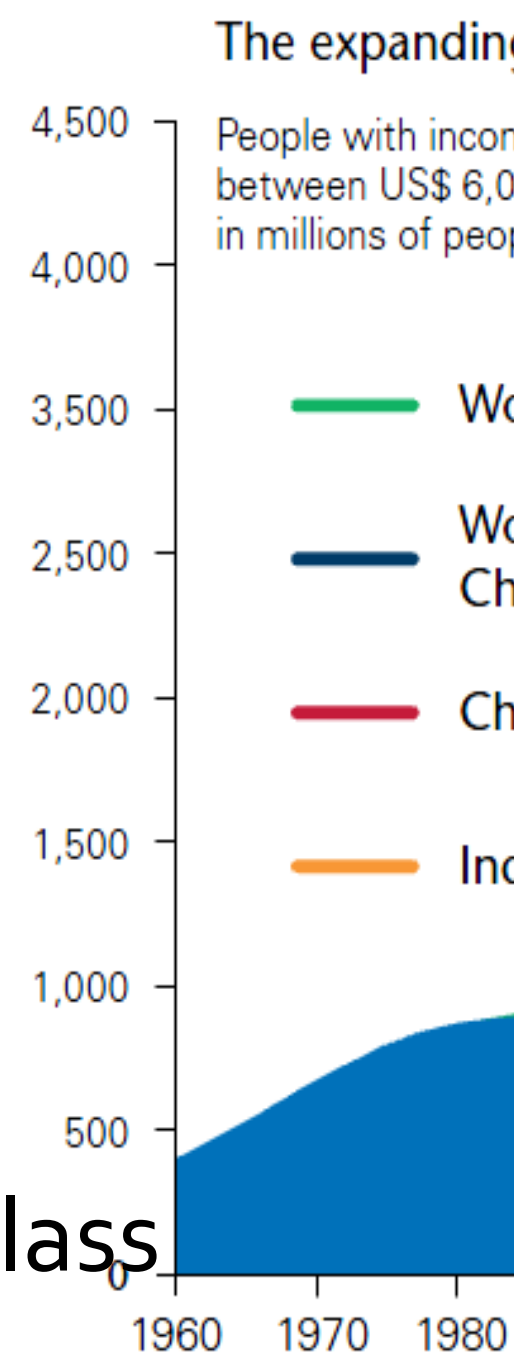


Figure 2: Middle classes in 2030.
Source: Goldman Sachs, 2008

2 400 000 Deaths Averted from Measures Aiming to Reduce Black Carbon Emissions (*UNEP 2011*)

Improved biomass stoves



Cooking with clean fuel



Coal briquettes replacing coal



Modern coke ovens



Pellet biomass heating stoves



Reduce agricultural burning



Remove big smokers / DPF



Improved brick kilns



Reduce flaring



Beijing, nation get breath of fresh air

By ZHENG JINRAN
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Beijing residents experienced a December unlike any in recent memory, with the air quality as good as in southern coastal regions like tropical Hainan island. The clean air placed the capital for the first time among the 10 best cities for air quality, the top environment authority said on Thursday.

Like the capital's, the country's air quality also underwent improvements in 2017, the Ministry of Environmental Protection said.

In 2017, the average concentration of PM2.5 — particulate matter that measures 2.5 microns or less and is dangerous to humans — in 338 cities in China had been reduced by 6.5 percent from 2016 levels, reaching 43 micrograms per cubic meter, the ministry said. There were 284 blue sky days last year, it said.

Blue sky days refer to the days with good air quality, when the day's average air quality index is lower than 100.

"By 2035, China will see the fundamental turn for good in the environment," Li Ganjie, minister of environmental protection, said when presenting the ministry's goals in October. One index that should illustrate the improved air quality by then is the PM2.5 concentration, which is projected to fall to 35

See *Smog*, page 3

China Daily

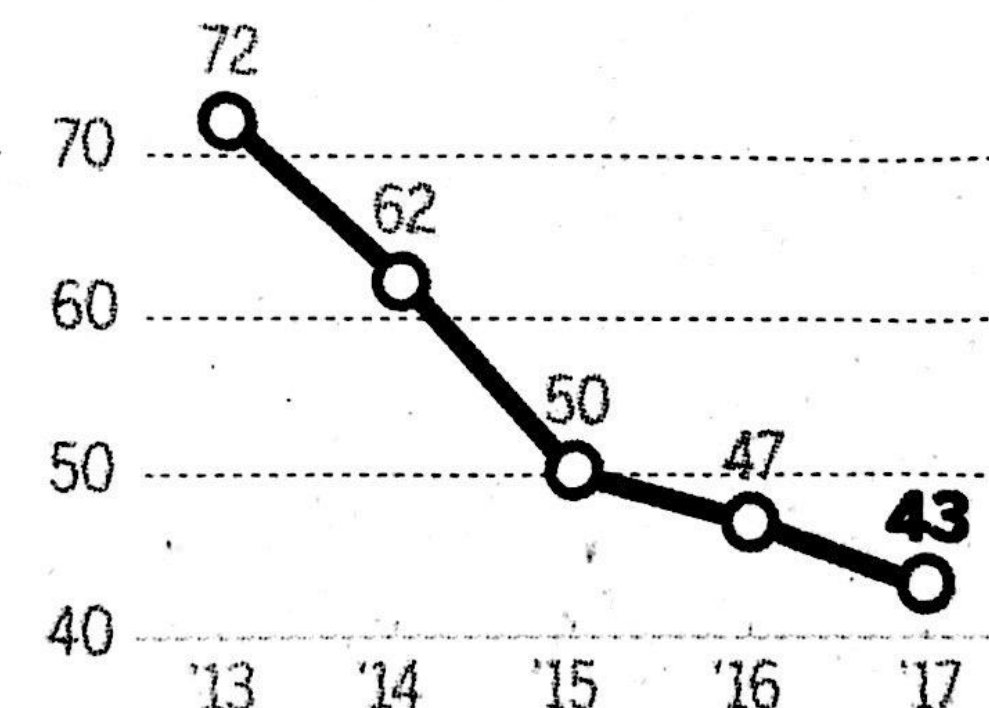
19 January, 2018

... In 338 cities in China, PM2.5 had been reduced by 6.5 percent from 2016 levels, reaching 43 micrograms per cubic meter,...

Average PM2.5 concentration

PM2.5 refers to fine particles with a diameter less than 2.5 microns that are hazardous to human health. Its concentration has been listed on major indexes for air quality in China.

Unit: microgram per cubic meter



Source: Ministry of Environmental
Protection

CHINA DAILY



Solutions lie within reach and should be based on the redefinition of prosperity to focus on the enhancement of quality of life and delivery of improved health for all, together with respect for the integrity of natural systems.