

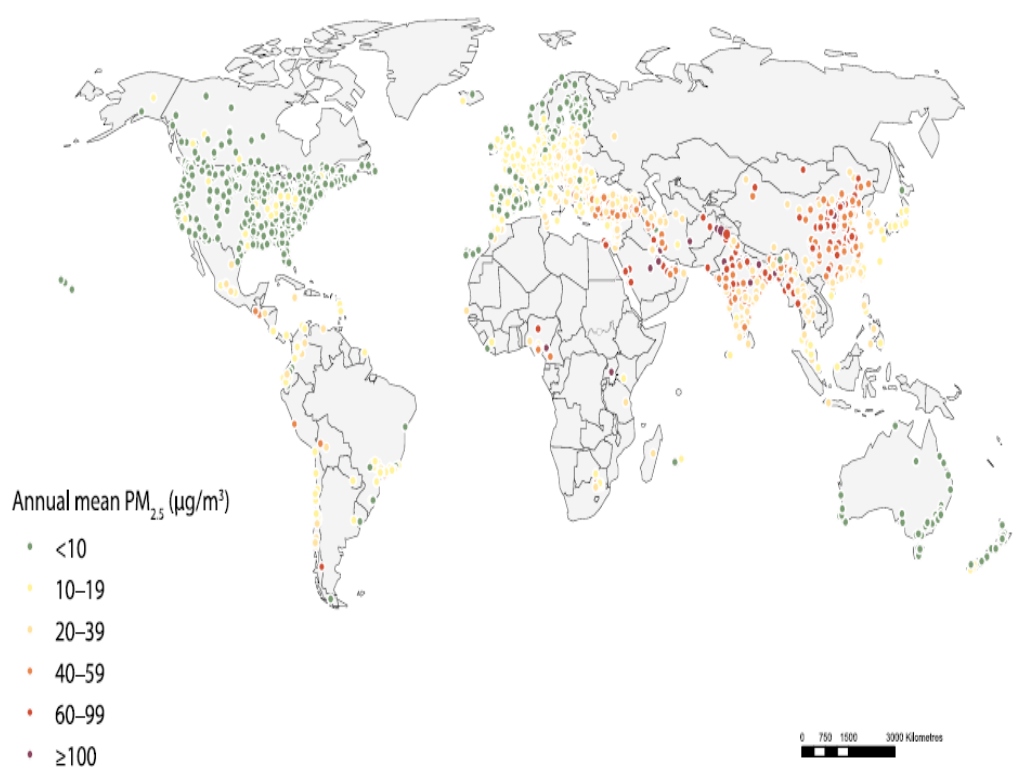
AIR POLLUTION IN MONGOLIA: POLICY BRIEF

1) Air pollution level

Air pollution is contamination of the indoor and outdoor environment by any physical, chemical, and biological agents that modify the natural characteristics of the atmosphere. Common sources of air pollution are industries, motor vehicles, household combustion devices, open waste burning and forest fires. Air pollutants of major public health concern include particulate matter (PM), carbon monoxide (CO), sulfur dioxide (SO₂), nitrogen dioxide (NO₂) and ozone (O₃). Among them, PM is the most harmful pollutant, associated with millions of premature deaths globally every year.

The 2016 version of the WHO ambient air quality database consists mainly of urban air quality data on annual means for PM₁₀ and/or PM_{2.5}, covering about 3 000 human settlements in 103 countries, for the years 2008-2015. The below global map provides information on population-weighted exposure to PM_{2.5} and indicates data on monitoring stations for particulate matter (Figure 1).¹ For Mongolia's air pollution level, annual mean of PM_{2.5} in the capital Ulaanbaatar city are 6-10 times higher than those considered safe by the WHO air quality guidelines (Figure 1).¹

Figure 1. Annual mean of PM_{2.5} concentration in nearly 3000 human settlements, 2008-2015



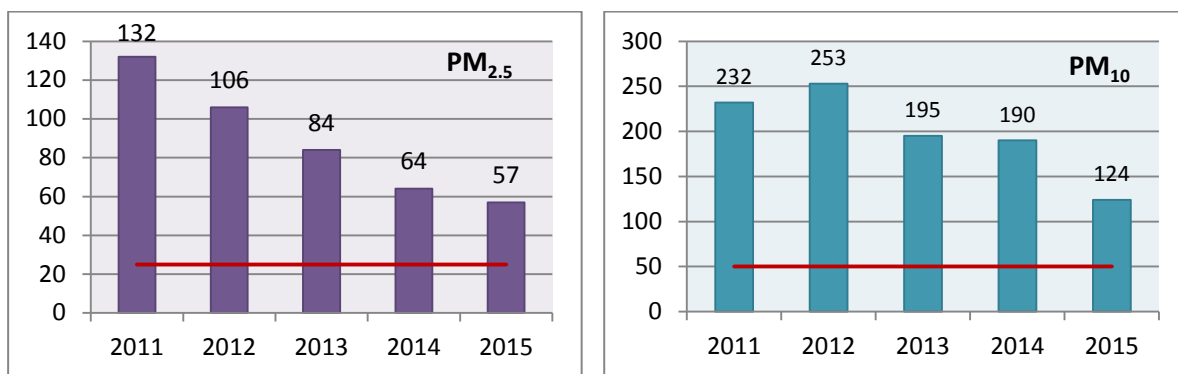
Air pollution has become one of the most challenging issues in Mongolia, exacerbated during winter time because of solid fuel combustion. Especially, the capital city Ulaanbaatar where more than 47% of total population live in is the most air pollution affected area in the country. In fact, during winter, Ulaanbaatar's air pollution is caused by households and low pressure boilers burning raw coal in Ger

district (80%); motor vehicle (10%); coal-fired power plants (6%); and solid waste and soil degradation (4%).²

Overall, the single largest source of particulate pollution in Ulaanbaatar is coal combustion in households and low pressure boilers, followed by power plants. Other sources include traffic, dust resuspension, open burning of waste and the brick industry.³⁻⁴ In addition to be a large source of ambient air pollution, polluting fuels such as raw coal and biomass use for cooking and heating contribute to a significant additional burden to the health of the population from household air pollution.⁵

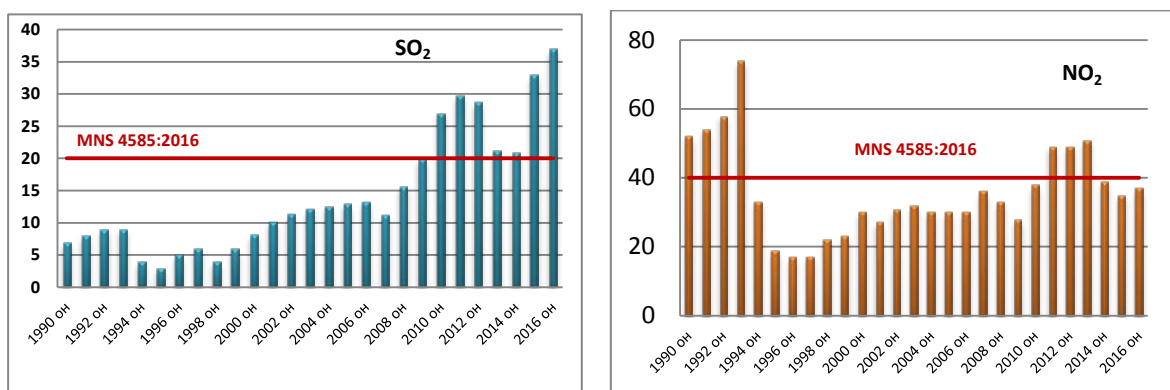
A total of 40 air quality sentinel monitoring stations are located in Mongolia including Ulaanbaatar city and provincial centers and measure major pollutants such as particulates (PM_{2.5} and PM₁₀), CO, SO₂ and NO₂. But apparently only 8 stations out of 15 in Ulaanbaatar measure fine particulate. The data from 2011 to 2015 on air quality in Ulaanbaatar city provided by the National Agency for Meteorology and Environmental Monitoring shows that annual mean concentrations of PM has been decreasing, however, annual mean concentrations are around 2-3 folds higher than the national guideline values (Figure 3).

Figure 3. Annual mean concentration [$\mu\text{g}/\text{m}^3$] of particulate matters by years 2011-2015⁶



Other pollutants such as SO₂ have progressively augmented in the last twenty years and NO₂ values have remained high.

Figure 3. Annual mean concentration [$\mu\text{g}/\text{m}^3$] of SO₂ and NO₂ by years 1990-2016⁷



Looking at mean concentration of major pollutants by month in 2017, in the 4 winter months from November to March the mean concentration of particulate matters are from 8-14 times higher than the WHO guideline values.⁶

2) Health impacts

Air pollution represents the biggest environmental risk to health. Approximately 92% of the world population live in places where air quality level exceeds WHO limits.⁸ Air pollution is one of largest causes of the top four non-communicable diseases such as stroke, lung cancer, chronic respiratory disease, and heart disease. In 2012, one out of 9 deaths was the result of air pollution-related diseases.¹ Over half of deaths among children less than 5 years old from acute lower respiratory infections are due to particulate matter inhaled from indoor air pollution from household solid fuels.⁹

Everyone's health is affected by air pollution, but low- and middle-income countries as well as poor and marginalized groups in high-income countries are at greater risk. Children, the elderly, and people with heart diseases or respiratory diseases are more vulnerable.

In 2012, an estimated 6.5 million deaths (11.6% of all global deaths) were associated with indoor and outdoor air pollution together.¹ According to this global estimation, in Mongolia 1123 people die from air pollution-related diseases each year: Acute low respiratory infection-39; chronic obstructive pulmonary disease-18; lung cancer-60; ischemic heart disease-572 and stroke-434. Age standardized death rate attributable ambient air pollution in 2012, Mongolia was 70 per 100 000 capita.¹ In addition, some 3010 additional deaths are accounted from household air pollution alone.¹⁰ Altogether, the age-standardized mortality rate from the joint effects of both ambient and household air pollution account for 132 deaths per 100 000 capita, which places Mongolia among the high-impacted countries (the world mean is 92 deaths per 100 000 capita).¹¹

Last decade a couple of surveys on ambient and household air pollution and its impact were locally conducted and findings of these surveys have been used for evidence-informed decision making. A joint research team of Mongolia and Canada estimated in 2011 that 29% of cardiopulmonary deaths and 40% of lung cancer deaths in the UB city are attributable to ambient air pollution.¹² Moreover, as a result of the study carried out in the National Center for Maternal and Child health in collaboration with the USA research team, spontaneous abortion incidence per calendar month ranged over more than 3.6 times in December of 2011 than in May, revealing a striking seasonal pattern of variation and indicating the possible impacts of air pollution on reproductive health.¹³

The prevalence of childhood asthma in UB was estimated higher than that in the world and Asia-Pacific countries reported by the International Study of Asthma and Allergies in Childhood¹⁴ and the prevalence of asthma in adults has increased for the past one decade.¹⁵

3) Government responses

Since 2000s the Mongolian Government put devoted efforts into identifying comprehensive solutions for reduction of air pollution: removing low pressure steam boilers, replacing traditional stoves by low smoke-stoves, increasing energy sources, promoting renewable energy, increasing the number of air quality monitoring stations, introducing new mode of public transportation service; providing processed fuel to target groups and running a campaign on reducing heat loss particularly in traditional houses and dwellings. In addition the Mongolian Government has introduced a night-time electricity discount for households in *Ger* districts in 2016 to encourage people, who use raw coal for heating, to use electric heaters.

In the last decade a noticeable progress was made in air quality monitoring. Common air pollutants including particulate matters are measured at stationary points of air quality monitoring in the capital city and province centers. Real time information on air pollution using Air Quality Index has become publicly accessible.

In March, 2017, the Mongolian Government approved a National Program on Reduction of Air and Environmental Pollution. This national programme aims to decrease air pollutants by 80%, prohibit the use of unprocessed coal anywhere except for thermal power plants in Ulaanbaatar, and reduce air and environmental pollution by at least 50% by 2025.

4) Examples of success stories from other countries

Ban on domestic coal burning in Ireland: short-term and long-term effects on health¹⁶

On Sep 1, 1990, the Irish Government banned the marketing, sale, and distribution of bituminous coals within the city of Dublin. The effects of the ban on air pollution were significant: within 6 years of the ban, average black smoke and SO₂ concentrations in Dublin declined by 70% and 35%, respectively. The effects of the decrease of air pollution on health happened in few years after the ban. During the initial 72-month period after the ban, total mortality decreased by 6% and the largest effects were seen for respiratory and cardiovascular deaths, with decreases of 16% and 10%, respectively.

Historic Success of the Clean Air Act in the United States¹⁷

After World War II, economic growth, population growth, rapid suburbanization, and the closing of some public transit systems led to more reliance on personal vehicles for transportation. One result of the rapid increase of motor vehicles was air pollution, especially in cities, that had serious impacts on public health and the environment. The USA vehicle pollution control under the Clean Air Act is a major success story by many measures: 1) New passenger vehicles are 98-99% cleaner for most tailpipe pollutants compared to the 1960s; 2) Fuels are much cleaner-lead has been eliminated, and sulfur levels are more than 90% lower than they were prior to regulation; 3) U.S. cities have much improved air quality, despite ever increasing population and increasing vehicle miles traveled and 4) Standards have sparked technology innovation from industry. Reducing pollution from transportation sources has led to healthier air for Americans.

5) Recommendations^{5,18-20}

The 2017 National Program on Reduction of Air and Environmental Pollution provides a roadmap to decrease air pollutants by 80%, prohibit the use of unprocessed coal anywhere except for thermal power plants in Ulaanbaatar, and reduce air and environmental pollution by at least 50% by 2025. It is crucial to conduct systematic assessment of the sources of air pollution, and identify the most effective interventions to eliminate or control them. The government may consider various policies to reduce emissions. Examples of recommended interventions are listed below.

▪ Ambient air-specific recommendations

Long-term

a) General

- In terms of health benefits long-term measures to reduce pollution are the most effective ones to protect public health.

- There is the need for setting a mechanism to implement at the highest political level interventions effectively able to reduce air pollution exposure.
- There are various sectors and activities responsible for all the air pollution. Concerted multi-sectoral action and regular involvement of various stakeholders is needed.

b) Sectorial

- Implement sustainable plans for energy options, efficient, renewable and clean, both at production and consumption level.
- Integrate environmental and health considerations in urban planning, including locating offices and commercial space in areas convenient for pedestrians and bicyclists in order to reduce the need for motorized transport and preventing traffic congestion, creating green areas.

Medium-term

a) General

- Set up more stringent ambient air quality standards to reduce air pollution concentrations to WHO Air Quality Guideline.

b) Sectorial

- Improvement of urban solid waste management
- Conversion of unpaved roads to paved roads in particular in Ger areas
- Involvement of local authorities is fundamental and UB joining WHO Breathelife campaign can be an important step.
- There is the need for a proper communication campaign on air pollution (see Breathelife and other WHO information materials).

Short-term

a) General

- Expand monitoring air quality through obtaining more timely and detailed information about air quality in residential locations and define clear responsibility for regular reporting.
- Implement emission control mechanisms of sources
- Intensify raising public awareness about individual pollution reduction activities and associated health benefits.

b) Sectorial

- Increase pollution control at power plants and implement alternative clean energy production plan
- Take into account for special care patients with respiratory diseases
- Ban waste burning
- Reduce unnecessary physical activities during extreme events of air pollution
- Do not generally encourage the use of personal masks, as most respirators are ineffective (e.g. inexpensive options found in markets and stores) in reducing cardiovascular and respiratory risks. Similarly, indoor air filtration does not generally constitute an alternative measure to reduce health risks.

Indoor-air specific recommendations

- Create sustainable support schemes for low-income groups in adopting affordable cleaner technology.

- Substitute solid fuel use with clean fuels for home cooking and heating with plans at districts and khoroos level.
- Discourage use of fuels such as plastics, tire pieces, and vinyl promptly.
- Substitute solid fuels to processed fuels in poor communities where raw coal and biomass remains the most practical fuel as interim measure;
- Educate people to maintain indoor temperature at reasonable level through controlling over use of solid fuels in terms of frequency and amount.
- Prohibit smoking in public buildings and eliminate or reduce tobacco smoking indoors.
- Improve ventilation in homes, kindergartens, schools and the working environment.

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