行政院所屬各機關因公出國人員出國報告書

（出國類別：考察）

# 考察蒙古空氣污染長程傳輸影響亞洲及我國空氣品質情形暨改善對策交流


服務機關：環境部

姓名職稱：呂澄洋簡任技正、鄭春菊簡任技正、

許庭菲環境技術師


派赴國家：蒙古烏蘭巴托

出國時間：**112** 年 **10** 月 **22** 至 **10** 月 **28** 日

報告日期：**112** 年 **12** 月

# 摘要

本次考察由美國環保署發起，主要目的在於了解蒙古的空氣污染問題，評估可以推動與蒙古國際環境合作的議題，同時研擬東亞區域合作需求，並邀請我國共同參與，盼能借助臺灣之經驗和技術，進行空氣品質管理學習及經驗交流，來共同協助蒙古解決空氣污染問題。行程受訪機構及人士由蒙古美國大使館排定，活動時間自 112 年 10 月 23 日至 27 日共計 5 天赴蒙古烏蘭巴托，本次出國計畫主要參與活動涵蓋：拜訪、會晤政府部門、國際組織、NGO 等機構人員 14 場次，田野訪查 3 場次。會議中，我國代表團由呂澄洋簡任技正，率領本部同仁參與該考察。藉此，利用考察蒙古空氣污染之契機，與美國環保署及蒙古政府部門協商與討論，我國與蒙古可藉由取得對方環境監測項目為基礎，由大氣司與監資司所委託國內產學機構針對長程傳輸掌控、空氣品質模式模擬需求進行評估，提出我方需求，透過環境監測、研究交流合作掌握蒙古污染物伴隨冷高壓氣流影響至本國之變化情形，另外，我國可就空氣污染管理經驗分享，作為後續與美國環保署推動 SSEA-Air 之規劃方向。

# 目錄

# 壹、 蒙古國情概要

蒙古人口約 340 萬，人均 GDP 約 4800 美元，地理位於亞洲內陸，領土面積為 156 萬平方公里，約為臺灣陸域面積 43 倍，為僅次於哈薩克的世界第二大內陸國家，北與俄羅斯為鄰，東、南、西三面與中國接壤，領土夾處於中、俄兩大強國之間，其 95%的能源(汽柴油)需仰賴俄國，95%的對外貿易需仰賴中國，蒙古之生命線皆由俄國和中國所掌控，故在對外關係經常受制於這兩國利益取向與看法；為了減緩地緣不利的因素，蒙古發展「第三鄰國」政策，加強建立與中、俄以外之國家各項往來關係，以平衡對兩大強鄰之依賴，並爭取各類援助，以增進國家經濟發展。對於已發展民主國家蒙古被視為該區域的可突破、交流重點，其遊牧經濟生活型態使其成為所在區域至中亞一帶國際上游牧經濟代表國，相關政策以蒙古馬首是瞻，故成為國際合作/援助的重點國家，具備特殊的重要性。

蒙古首都烏蘭巴托位於蒙古高原中部，其地形類似盆地，烏蘭巴托是全世界最冷的城市、冬季時間超過 8 個月(每年九月至隔年五月)，最冷月氣溫最低可達零下 40 度，蒙古人口(據統計數據超過 53%人口)湧入城市聚集在烏蘭巴托市及周邊地區，使烏蘭巴托呈現人口與車輛密集都會型態，市區以火力燃煤發電供應電源，再生能源發展不及所有電力 1%，全日成現交通壅塞，而尖峰時更顯壅擠，此外，市民多購買二手車輛，車齡十分老舊、少於保養再加上汽車燃油油品不良，車輛排放廢氣嚴重。烏蘭巴托周邊裙帶區域有眾多蒙古包居民（貧民），以傳統燃煤火爐取暖抵抗長期酷嚴寒冬，同時也燃燒生活垃圾等可燃物，在嚴冬需暖房期間，大量燃燒活動加上大氣垂直擴散不良使空氣品質惡化，造成當地孩童、孕婦、老人等敏感族群者呼吸道疾病問題。

蒙古空氣品質問題長期以來備受關注，特別是在冬季，傳統燃煤取暖、工業排放以及交通污染等造成之空氣污染，對蒙古人的健康造成了危害，特別是兒童和老年人，此外，政府與相關國際組織也有採取一些措施來改善空氣品質，藉此，希望能提供解決空氣污染的可行性建議，以改善蒙古人民的生活環境。

# 貳、 出國行程

本次赴蒙古考察由環境部大氣司呂簡任技正澄洋、許環境技術師庭菲及監資司鄭簡任技正春菊（如表 1）組團前往，出國行程為 112 年 10 月 22 日至 10 月 28 日，共計 7 日，其中考察行程為 10 月 23 日至 27 日，全程會同美國環保署資深空氣品質規劃員 Justin 及美國大使館二等秘書 Kevin Moore 進行參訪會談，詳如表 2 所示：

表 1 我國代表團成員名單

| 服務單位 | | 職稱 | 姓名 |
|---|---|---|---|
| 環境部 | 大氣環境司 | 簡任技正 | 呂澄洋 |
| | | 環境技術師 | 許庭菲 |
| | 監測資訊司 | 簡任技正 | 鄭春菊 |

表 2 蒙古考察出國行程

| 日　期 | 說明 |
|---|---|
| 112.10.22<br>（日） | 啟程，出發至蒙古(臺北-韓國-蒙古烏蘭巴托) |
| 112.10.23<br>（一） | 1. 拜會駐烏蘭巴托台北貿易經濟代表處。<br>2. 會同我國駐烏蘭巴托台北貿易經濟代表處代表拜會美國駐蒙古大使館。<br>3. 餐會 NGO People in Need，討論空氣品質監測數據公開及 APP 應用（臺灣環境即時通和 Agaar.mn)議題。<br>4. 拜會蒙古氣象水文環境資訊研究所(Information & Research Institute of Meteorology, Hydrology and Environment)，了解所參與 NASA PANDORA 計畫。<br>5. 拜會蒙古 NGO Breathe Mongolia 討論蒙古空氣品質與當地空氣污染健康危害議題。 |
| 112.10.24<br>（二） | 1. 拜會日本國際協力機構（JICA，行政法人），了解其協助蒙古烏蘭巴托推動空氣品質改善、污染削減對策措施。<br>2. 拜會蒙古 NGO Public Lab Mongolia，了解其空品感測器應用於室內室外場所與需求 。<br>3. 參訪 Tavan Tolgoi Fuel coal briquette company 造煤磚塊廠、煤磚塊生產線，了解其目的供應服務。 |

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| 112.10.25<br>（三） | 1. 參訪烏蘭巴托市區空氣品質監測站（二站）與對環境影響及數據品保技術交流。<br>2. 拜會國家衛生中心（National Center for Public Health），了解蒙古空氣污染來源、室內空氣品質管理與當地空氣污染健康危害議題。<br>3. 餐會蒙古國家氣象及環境監測局(National Agency for Meteorology and Environmental Monitoring)環境監測部門主管(Director)，了解蒙古污染監測 AQI 計算依據、世界衛生組織 AQI 計算及我國 AQI 計算之相關議題。<br>4. 拜會國家環境污染削減委員會（National Committee on the Reduction of air pollution）辦公室，了解蒙古空氣污染管制策略，簡報分享我國近年推動空氣污染工作具體成果至推廣我國建置環境即時通 App，建置全國監測數據便民措施經驗。<br>5. 會晤亞洲開發銀行（Asian Development Bank, ADB） 了解其透過提供貸款、技術援助、贈款和股權投資來協助蒙古各項規劃之推動。 |
| 112.10.26<br>（四） | 1. 拜會聯合國兒童基金會（UNICEF），了解該基金會募款協助弱勢蒙古包區居民，改善長期酷寒嚴冬之蒙古包居民之烹飪、電暖爐產品 CHIPS stove，取代蒙古包火爐燃煤與空氣污染議題。<br>2. 實地參訪蒙古包區 CHIPS stove 設置設施情形。<br>3. 餐會德蒙資源與技術研究所（German-Mongolian Institute for Resources and Technology, GMIT）資深研究員，了解蒙古推動污染削減困境。<br>4. 烏蘭巴托空氣污染削減委員會（Ulaanbaatar City Air Pollution Reduction Committee），了解該市污染來源、比例，簡報交流我方空污防制經驗。 |
| 112.10.27<br>（五） | 1. 再度會晤蒙古國家氣象及環境監測局(National Agency for Meteorology and Environmental Monitoring)環境監測部門主管(Director)，討論空氣品質議題與技術交流烏蘭巴托混合層垂直擴散相關議題。<br>2. 美國環保 Justin Spenillo 說明其規劃後續 SSEA-Air 與臺灣共同合作推動方向。 |
| 112.10.28<br>（六） | 返程，搭機返回臺北（蒙古烏蘭巴托-韓國-臺北） |

# 參、考察目的

蒙古長期因氣候乾燥及部分土地管理不當導致草地退化，產生沙土揚塵問題，除了影響鄰近國家空氣品質，甚至空氣污染物隨著氣流傳遞之跨境傳輸現象，亦會對我國空氣品質造成影響。為即時掌握我國境外污染傳輸，並透過國際合作共同應對跨國空氣污染問題，本部與美國環保署先前已多次就蒙古空氣污染議題進行討論及交流，爰規劃此次考察及交流，以利我國掌握蒙古空氣污染問題及空氣污染對於我國未來的影響性。

# 肆、考察內容

## 一、 拜會美國駐蒙古大使館

環境部代表團會同我國駐烏蘭巴托台北貿易經濟代表處羅代表，拜會美國大使 Buangan，美國大使表示，蒙古在冬季時空氣污染相當嚴重，污染來源主要為火力發電廠及蒙古包區（貧戶區）燃燒生煤所導致，為了協助蒙古解決空氣污染為使館之重點工作，盼能借助臺灣經驗技術，共同協助蒙古一起改善空氣污染問題。此外，大使表示能源議題在蒙古係高度敏感之政治問題，該國火力發電由蘇聯協助建造，不僅設備老舊且仍仰賴俄國進行維護，由歐美國家介入設備改良恐觸動政治敏感神經。而蒙古包區燃燒生煤取暖，該區廢氣佔首都總體空氣污染 60%，受害最深多為兒童，且罹患嚴重肺部疾病者比比皆是，因此美方為改善蒙古包區燃燒生煤所造成之空氣污染，10 年前即引進補貼潔淨暖爐（clean stove）每台以 3000 美元之三分之一價格補貼給民眾，惟貧戶取得後隨即轉售取得價差作為家用，而仍續用傳統火爐燒煤，故經濟能力為空污改善所遇主要問題點。另外，當夏季來臨時，空污問題消散，居民即集體遺忘，社會對空污防制難以形成共識。若想防制空污，需先改變觀念及消費模式，惟以蒙古包區之貧窮程度，實非易事。

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|---|---|
|  |  |
| 與美國大使會議討論情形 | 與美國大使、駐蒙代表處代表等人合照 |

## 二、 會晤 People in Need（捷克 NGO）人員

People in Need（以下簡稱 PIN）為一個捷克非營利非政府組織，於 1992 年成立，總部位於捷克共和國布拉格，成立 30 年來，已成為中歐最大的非營利組織之一。PIN 致力於全球各地受到危機、貧窮和自然災害影響的個人和國家提供援助和支持的人道組織，他們提供多種形式的支援，包含緊急救援、提供清潔飲用水、糧食援助、醫療保健、教育和生計等計畫。

本次交流重點說明如下：

（一） PIN 發展 APP 可提供烏蘭巴托即時的環境資訊，此外，PIN 反映蒙古國家空氣品質監測儀器老舊，且儀器連續 24 小時運轉，為了確保監測儀器功能正常，維持數據品質，需每周、月保養，避免儀器發生故障，後續的監測數據，如何分辨數據是否合理等這些都需要完善的品質保證制度來確保監測儀器及數據品質，對此 PIN 對於蒙古國家監測儀器和數據品質準確性皆抱有存疑的態度。

（二） 我方介紹我國「環境即時通」APP，其監測數據為一小時一筆，介面包含空氣品質、紫外線指數、戶外活動建議等資訊，讓使用者可隨時掌握周遭環境狀況，且可自設預警等級：當污染物濃度的敏感程度達到自主設定時，可主動發出通知，達到提醒防護的目的。

| | |
|---|---|
|  |  |
| 與 PIN 會議討論情形 | 「Agaar.mn」APP 頁面 |

## 三、 拜會蒙古氣象水文環境資訊研究所 (Information & Research Institute of Meteorology, Hydrology and Environment)

蒙古氣象水文環境資訊研究所為負責監測和研究氣象、水文和環境相關資訊的機構，該研究所具備基本的資料調查蒐集與研究能力，由於人力與經費短缺，需要外送訓練或招募方式增進作業能量，協助空氣污染管制。

該研究所下蒙古國家氣象及環境監測部門與美國 NASA 合作進行 Pandora 計畫，Pandora 計畫是使用 Pandora 光譜儀儀器來監測大氣中各種氣體和氣膠成分的研究項目。此儀器主要安裝在地面觀測站，目前 2 測站地點位於烏蘭巴托與戈壁南方，通過採集大氣中光譜數據來分析氣體和氣膠成分，是一種高分辨率、高靈敏度的光譜儀器，可以用於測量大氣中各種氣體，如二氧化氮、二氧化硫、甲烷等，以及氣膠種類和濃度。透過 Pandora 計畫的數據收集，能夠更準確地了解大氣中各種氣體的濃度和分佈情況，從而更好地理解空氣污染問題。

本次交流重點說明如下：

（一）　本計畫在烏蘭巴托有一個站點，其測項為二氧化氮、二氧化硫、氧化碳、甲醛等...，由於該站附近無監測站，故其數值無從與跟地面濃度值相互比較。

（二）　該監測部門主管主張未來可做區域性數據分享合作，我國可在大氣環境科研與對我國影響研究需求的基礎上與對方進一步接洽合作可行性。

於蒙古氣象水文環境資訊研究所會議討論情形

## 四、 會晤 Breathe Mongolia（蒙古 NGO）

Breathe Mongolia 是一個由國際專業人士組成的國際團隊，主要是致力於降低蒙古的空氣污染問題，並希望能為聯合國提出的永續發展目標（SDG）做出貢獻，並於蒙古地區提出 3 個目標，分別為改善居住環境、維護生態平衡，和建立良好的治理。此外，他們將各種不同感測器的來源收集彙整一起，並利用這些數據來推動環境教育、建立民眾的意識、推動且協助友善制度之綠色貸款，和社群媒體的運用訓練。

本次交流重點說明如下：

（一）　營運主管詢問我方對於目前蒙古的看法。我方表示從機場至烏蘭巴托這段路程，可看到有四個火力電廠的煙囪、於上、下班尖峰時段，交通壅塞怠速，且路上都是二手車，加上汽車都欠缺維修保養，造成汽車排出嚴重的廢氣味，另外，路上也很多營建工程都

是呈現裸露的的狀態，無綠色植披，使得塵土飄揚，若蒙古將這些污染源做好防制措施，空氣污染將可改善許多。

（二） 另外，我方也有介紹我國「環境即時通」APP，其監測數據為一小時一筆，介面包含空氣品質、紫外線指數、戶外活動建議等資訊，讓使用者可隨時掌握周遭環境狀況，且可自設預警等級，當污染物濃度的敏感程度達到自主設定時，可主動發出通知，達到提醒防護的目的。

<table>
<tr><td>  </td><td>  </td></tr>
<tr><td>與 Breathe Mongolia 會議討論情形</td><td>介紹我國環境即時通 APP</td></tr>
<tr><td>  </td><td>  </td></tr>
<tr><td>路旁野火燃燒</td><td>下班時間交通狀態</td></tr>
</table>

## 五、 拜會日本國際協力機構（JICA，行政法人）

日本國際協力機構（Japan International Cooperation Agency，以下簡稱JICA），此機構為日本政府機構，致力於提供國際發展援助和合作，其活動範圍涵蓋了多個領域，如:環境保護、醫療衛生、經濟發展等…，並與發展中國

家進行合作，透過提供技術合作、經濟援助、建設基礎設施等方式，共同解決這些國家所面臨的各種挑戰，以利促進經濟和社會發展。

JICA 在評估蒙古空氣污染過程中，利用空氣品質模式模擬烏蘭巴托空氣污染情形，以利後續制定空氣污染削減對策措施，其援助基本方針共三點，分別為：

（一） 引進再生能源來取代傳統燃煤火爐，地熱可作為一種可再生能源，能夠有效替代傳統燃煤，對於減少碳排放和提高能源利用效率具有潛力，JICA 參與推動地熱能源的開發和利用，已提高能古的能源使用效率和減少對傳統能源的依賴，後續也會訂定鍋爐操作的指引規範，並根據此規範來做稽查。

（二） 針對改善交通網訂定有效的防制對策，如在公車上加裝柴油微粒過濾器（Diesel Particulate Filter，簡稱 DPF），以利去除柴油引擎排出的廢氣中的有害碳微粒（俗稱黑煙）。

（三） 日本有捐贈空氣品質監測站給蒙古，後續將協助蒙古政府建立具備監測空氣污染的能力，以利後續制定改善空氣污染之對策和將空品監測數值提供蒙古居民和推廣環境教育。

與 JICA 會議討論情形

## 六、 拜會 Public Lab Mongolia（蒙古 NGO）

Public Lab Mongolia 是一個非政府營利組織，致力於推動開放是科學和民眾參與科學研究，通常提供開放式的科學工具和資源，並鼓勵民眾參與環境監測、科學實驗和數據收集等活動。

此組織主要於 5 年前開始利用感測器數據來推動環境教育，其感測器主要量測溫度、濕度、超細懸浮微粒（$PM_1$）、細懸浮微粒（$PM_{2.5}$）、懸浮微粒（$PM_{10}$）等測項。監測數據以秒為周期產生，產生的數據是以兩台感測器互相做比較，無跟當地空氣品質監測站做比較，因此數據無校正基準點。感測器一般可設置於屋頂、路邊等地方，且感測器年限較臺灣的（1-2 年）短。

與 Public Lab Mongolia 會議討論情形

## 七、 參訪煤球磚工廠 Tavan Tolgoi Fuel coal briquette company

該公司製造煤球磚的過程為：南方 300 公里處的生煤清洗過後，運送到工廠進行壓碎，加入水和膠合物質製成煤球磚，並生產出來販售給民眾。會選用南方 300 公里處的煤礦，主要是因為此區的煤礦較適合家庭（無防制設備）型態使用，煤是蒙古民生必需品，價格處於相當低廉的水準，1 袋 25 公斤的售價約新台幣 34 元，低價而高污染的能源燃料增加了蒙古改善空氣品質的困難度，較其他地區的煤礦燃燒後少 22%的空氣污染物，因此選用此區的煤礦。

經由煤球磚工廠代表的說明，在蒙古地區約有 20 萬個傳統火爐，約一半的火爐皆位在蒙古包區，為了減少空氣污染問題，蒙古政府在 2018 年全面禁止燃燒生煤，並汰換成煤球磚來取代，這些煤球磚的燃燒時間為原來的兩

倍，排放的污染也可減少為原來之 50%。其中有 40%的火爐是使用該公司的專用爐，因此該公司除了開發煤球磚外，也有對外提供民眾一些服務，如: 設備操作使用諮詢、洗煙囪等...目前該公司也正在研發新技術的火爐，並由 200 戶的家庭測試中，希望未來能降低蒙古空氣污染問題。

<table>
<tr><td>  </td><td>  </td></tr>
<tr><td>與煤球場公司會議討論情形</td><td>與煤球磚廠公司人員合照</td></tr>
<tr><td>  </td><td>  </td></tr>
<tr><td>參觀製造煤球磚過程</td><td>製作完成之煤球</td></tr>
</table>

## 八、 參觀烏蘭巴托市區空氣品質監測站

蒙古現有空氣品質監測站共有 19 座，其中 13 座為中央測站，監測站儀器廠牌 12 個為法國廠牌、1 個為韓國廠牌；6 座為地方測站，監測站儀器廠牌皆為日本 HORIBA 廠牌，設置監測站 1 座需 30 萬美金，監測站維護費一年約 3 萬-5 萬美金，相關費用皆較臺灣昂貴。為取得代表大區域範圍空氣擴散混合良好之監測數據，蒙古空氣品質監測站設置時會避開人為活動之地區，其設站地點皆為地面上，監測站站房也較臺灣的小，監測站在烏蘭巴托地區的密度尚符合歐盟的要求，每 25 萬人 1 站。

蒙古監測站設置儀器大致與我國相同，主要測量項目為懸浮微粒（$PM_{10}$）、細懸浮微粒（$PM_{2.5}$）、臭氧（$O_3$）、氮氧化物（NOx、NO、$NO_2$）、一氧化碳（CO）、二氧化硫（$SO_2$），及氣象資料，其中僅只有 15 站監測站測量 $PM_{2.5}$,其監測數校正和維修皆由國家實驗室管理,校正頻率為每周一次,為了維護監測作業品質，必須定期以標準氣體做校正檢查，其校正是用標準氣體(mutiple gas)。目前蒙古建置之 19 個空氣品質監測站之運作型態為全天候 24 小時連續運轉，其監測數據為一小時一筆，並將空氣品質監測數據換算成空氣品質指標（AQI）後，每小時自動公布於監測網及 APP。

當天有發現 $PM_{2.5}$ 數值 10 秒鐘內從 35.4 降至 19.48 微克/立方米，數據變動非常大，此跳動顯示數據不合理，對於監測數據之品保程序仍可精進。

<table>
<tr><td>  </td><td>  </td></tr>
<tr><td>蒙古空氣品質監測站外觀</td><td>講解空品監測站</td></tr>
<tr><td> 
</td><td>  </td></tr>
<tr><td>蒙古空氣品質 APP 即時 AQI</td><td>討論蒙古空氣品質 APP 相關問題</td></tr>
</table>

## 九、 拜會國家衛生中心（National Center for Public Health）

國家衛生中心主要是負責監管和協調公共衛生事務的機構。該中心致力於提高蒙古民眾的健康水平，並透過宣導和教育活動，來提高民眾對於空氣品質和環境衛生之意識。

本次交流重點說明如下：

（一） 該中心表示空氣品質議題在蒙古一直是一大挑戰，國家衛生中心表示蒙古空氣品質監測站在 21 個省中只有 19 個省佈站，其監測結果轉換為 AQI 對外發布，惟數據無法即時取得。

（二） 該中心認為蒙古空氣污染來源主要為蒙古包區的燒煤和劣化二手車，加上蒙古冬季很長且溫度很低，蒙古包區大多使用傳統火爐在室內燃煤供暖和煮東西，由於室內通風不良，煤炭在氧氣不足的情況下燃燒不完全，容易造成一氧化碳中毒，統計至 2023 年 10 月共有 2300 個案例一氧化碳中毒，推測可能是疫情後加上不適當的燃燒，造成案例增加。

（三） 此外，該中心特別關注室內空氣品質，大多數的人 80~90% 的時間處在室內環境中（包括住家、辦公室或其他建築物內），幼兒、老年人和患有慢性疾病的人往往在室內待的時間更長，其室內空氣品質將會直接影響民眾健康、工作效率及品質，因此室內空氣污染物對民眾健康影響應受到重視。相較目前紐約每間教室內都佈有室內空品感測器，而蒙古室內空品監測器數量少，且也無訂定相關室內空氣品質法規，根據統計指出室內空品監測出的 $PM_{2.5}$ 濃度數值遠高於 WHO 標準 4 倍，希望推動系統性管理確保室內空氣品質，會中我方分享臺灣室內空氣品質立法管理概況與戶外空氣惡化因應做法。

與國家衛生中心會議討論情形

## 十、 拜會蒙古國家氣象及環境監測局(National Agency for Meteorology and Environmental Monitoring)

蒙古國家氣象及環境監測局負責監測和分析水、氣候和環境狀況，以真實、預防性的資訊提供給民眾，並對潛在的自然災害風險進行預警，減少對社會和經濟的損害，確保國家中期永續發展。該監測局對於氣象資料監測已有100 年經驗，而空氣品質監測從 2013 年後才開始執行，並且因應政府部門需求，將數據提供給他們。此外，他們也擴大對外合作，並與日本、韓國有一個資料交換的平台，以利與國際間資訊交換，確保測量技術的統一和標準。

本次交流重點說明如下：

（一） 環境監測部門主管表示該部門僅 8 人負責空氣、水質、土壤監測，其中僅 3 人負責空氣部分，因此在科學研究方面與其他國家相比量能較低。

（二） 該主管表示蒙古四座火力電廠檢測數據有 90%達標，這四座電廠每年燒 600 萬噸的煤，加上冬季時整體擴散條件差，因此在冬季時空氣污染相對嚴重。蒙古空氣品質標準 $PM_{2.5}$ 濃度 24 小時平均為 50 微克/立方米，年平均濃度為 20 微克/立方米，而 WHO 標準年平均濃度為 5 微克/立方米，蒙古年平均濃度為 WHO 標準之 4 倍。

（三） 蒙古於 2018 年後才轉換使用美國空氣品質污染指標(Air Quality Index, AQI)方式。 AQI 是由各污染物平均換算得出，而 $PM_{2.5}$ 是以 24 小時平均換算，其蒙古最重要指標污染物即為 $PM_{2.5}$，因此 AQI 並不能即時反映當下空氣品質狀況，造成會有延遲情形發生，對此會有民眾認為這樣的計算方式不妥，且認為如何訂定不同空品等級的分界點也是極其重要。

（四） 烏蘭巴托其地理位置剛好北方及南方有山脈，使其氣流只能東西向流通，當於冬季時，由於氣溫低，垂直混合程度與混合層高度亦下降，使污染物容易累積，造成高污染濃度事件發生。

與蒙古國家氣象及環境監測局人員會議討論情形

## 十一、 拜會國家空氣污染削減委員會（National Committee on the Reduction of air pollution）

國家空氣污染削減委員會共 21 人，召集人為總統，成員由市長、相關部會（空氣污染、能源、運輸等部門）首長、技術專家等組成，考察團由委員會執行秘書(Head of Office)代表接待會談，表示蒙古致力改善（烏蘭巴托）空氣污染，2018 年公告禁止燃燒生煤，民眾以煤球磚為替代燃料，並規劃引進半焦煤(Semi coking coal)為蒙古包火爐燃料，預計能大幅減少空氣污染物排放，惟蒙古未掌握半焦煤生產技術，須從中國引進成品或技術。本部考察團於會議中簡報，說明我國過去也有季節性空氣品質不良的情況，經由近年空氣污

染防制策略推動，已達成空氣品質改善成果，蒙古對我國環境即時通的各項資訊服務表達高度興趣。

<table>
<tr><td>  </td><td>  </td></tr>
<tr><td>與國家環境污染削減委員會代表<br>會議討論情形</td><td>介紹我國環境即時通 APP</td></tr>
<tr><td>  </td><td>  </td></tr>
<tr><td>呂澄洋簡任技正簡報</td><td>與國家環境污染削減委員會代表合影</td></tr>
</table>

## 十二、 會晤亞洲開發銀行（Asian Development Bank，簡稱：ADB）

亞洲開發銀行是一個國際性金融機構，成立於 1966 年，總部位於菲律賓馬尼拉，成員來自亞洲和太平洋地區的 68 個國家和地區。ADB 主要目標是促進亞洲和太平洋地區的經濟發展和合作，並減少貧困和提高生活水平。為實現這些目標，ADB 致力於提供金融資源、技術援助和政策建議，並支持可持續發展的基礎設施建設、教育、能源、交通、環境保護等領域的項目和計畫，其主要活動包括：提供融資和貸款、技術援助和

知識共享、推動可持續發展項目，和區域合作與整合。ADB 是蒙古外部融資的主要來源。2017 年至 2022 年，亞銀平均每年提供 3.085 億美元。迄今為止，亞銀已向蒙古承諾提供 357 項公共部門貸款、贈款和技術援助，總額達 37 億美元。

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| 與 ADB 會議討論情形 | 與 ADB 合影 |

## 十三、 拜會聯合國兒童基金會（UNICEF）

聯合國兒童基金會（United Nations International Children's Emergency Fund，簡稱 UNICEF）成立於 1946 年，是一個全球性致力於保障兒童權利和福祉的國際組織，主要與各國政府、非政府組織、民間社會組織和其他聯合國機構合作，通過執行各種項目和計畫來實現其目標和使命：包括兒童健康與教育、幫助弱勢兒童族群、兒童保護和衛生保健。

冬季期間蒙古包居民烹煮、取暖皆使用傳統火爐，易造成一氧化碳中毒及空氣污染，進而影響孩童、孕婦、和老人健康，因此發展電爐（CHIP）用來取代傳統火爐， CHIP 方案由聯合國兒童基金會、瑞士發展與合作署(Swiss Agency for Development and Cooperation，SDC)、曼尼托巴國際合作委員會，和蒙古政府資助，並由 People In Need 和蒙古科技大學實施，由領先的國際和當地科學家和專家設計了一種經濟實惠且有效的解決方案來拆除煙囪並消除蒙古包中煤炭的使用。

CHIP 加熱器安裝在櫃子上，並含有電器插座，其內件包含自動調節溫度的恆溫器，當蒙古包室內溫度達 30℃時，它會自動關閉；當室內溫度接近 20℃時，則會自動開啟。目前於蒙古國內已建置完成 1000 台，預計於 2024 年完成建置 4000 台，由於 CHIP 電力來源為火力發電廠，未來想利用太陽能發電該技術來取代火力發電，減少煤炭和木材的消耗，可為蒙古包居民帶來低碳、潔淨和舒適的環境。UNICEF 在推廣 CHIP 時每台補助 50%費用，並提供綠色貸款方式，讓蒙古包居民能以便宜的價格購入，未來預計於推廣 5 萬台，約為蒙古包居民的 1/10。

此外，為了因應氣候變遷衝擊，UNICEF 想發展室內空品感測器和安裝通風系統，以改善室內空品狀況，並推動環境教育，來加深蒙古居民對環境知識及環境的關懷，促使他們重新檢視人類的生活方式，進而改變習慣，選擇友善環境的行為，降低環境衝擊，並強化蒙古居民之韌性。

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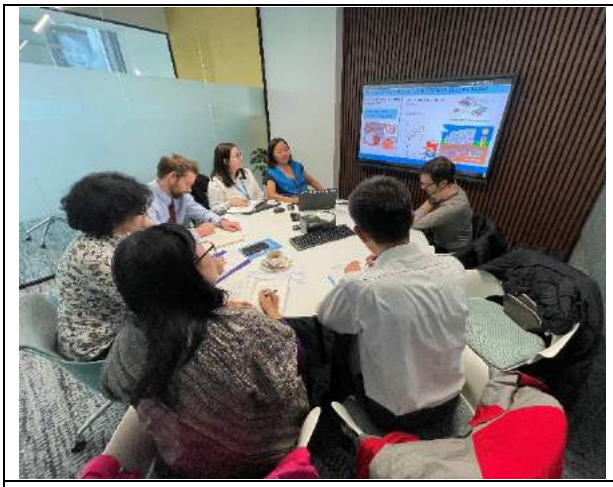
|  |  |
| 與 UNICEF 會議討論情形 | 與 UNICEF 職員合影 |

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|  |  |
| CHIP 實體 | 參訪蒙古包 |
|  |  |
| 當地室外街景 | 與 UNICEF 及蒙古包居民合影 |

## 十四、 餐會德蒙資源與技術研究所（German-Mongolian Institute for Resources and Technology, GMIT）

德蒙資源與技術研究所曾受世界銀行委託，針對蒙古的空氣污染議題進行專案調查研究，並於 2011 年提出研究報告 MONGOLIA-Air Quality Analysis of Ulaanbaatar Improving Air Quality to Reduce Health Impacts (報告書下載連結：https://reurl.cc/OGVl9r)，對蒙古的空氣污染問題、污染物排放清冊、對民眾健康影響、解決建議方案、投入改善意願調查等各方面均有著墨，本次會晤資深研究員 Dr. LODOYSAMBA SEREETER 曾參與該計畫，該研究員表示蒙古包火爐若在技術上提升，可減少 80%的燃料使用或污染排放，惟遺憾的是已進行多年的火爐效能提升研發計畫已經停擺。該報告顯示蒙古的空氣污染

主要原因及改善方案均已掌握，惟相關防制減量的工作推動成效似不顯著，故冬季空氣污染仍為嚴重的民生環境問題。

與 GMIT 資深研究員會議討論情形

## 十五、 拜會烏蘭巴托市空氣污染削減委員會（Ulaanbaatar City Air Pollution Reduction Committee）

空氣污染削減委員會召集人為市長，屬地方層級跨部門行政編組，訪談會議由市環保部門主管、稽查管制主管等主要空污業管單位代表出席，該代表表示 20 萬居民居住在蒙古包地區，其蒙古包燃煤供暖占整體空氣污染 55-60%，在蒙古空污費僅向車主（固定費率）、煤礦業主徵收，對於本部考察團簡報我國各項防制策略與改善成果，該委員會對我國制定空氣污染防制法、空污費收費制度及油品查驗制度提問表達相當的興趣，後續將會學習我國和美國空氣污染相關法律和政策之訂定。

| | |
|---|---|
|  |  |
| 與烏蘭巴托空氣污染削減委員會議討論情形 | 呂澄洋簡任技正簡報我國空氣污染防制 |

## 十六、 與美國環保署 Justin Spenillo 研商規畫後續 SSEA-Air 與臺灣共同合作推動方向

本部與美國環保署自 1993 年簽訂「駐美國臺北經濟文化代表處與美國在臺協會環境保護技術合作協定」後開始合作與交流，為了加強國際合作，藉由與創始夥伴-美國環保署合作，於 2014 年 4 月 14 日共同推動「國際環境夥伴計畫(International Environmental Partnership, IEP)」，協助我國與其他國家發展雙邊及區域性國際合作，並將我國的經驗貢獻國際社會。

美國環保署代表於所安排訪談中多次強調，此行是為了「臺美國際環境夥伴計畫」下之「東南亞及東亞區域空氣改善計畫(South and Southeast Asia-Air Improvements in the Region, SSEA-AIR)」推動，本次蒙古考察目的在於了解蒙古的空氣污染問題，評估可以推動蒙古國際環境合作的議題，同時美方初步研擬空氣污染管制及法規訂定等方向，可作為未來東亞區域合作重點議題。

與美國環保署代表會議討論情形

# 伍、 心得與建議

## 一、 我國私部門研發製造專長可與國際組織計畫合作

臺灣比較少接觸到聯合國附屬單位及國際援助機構，這些機構提供貸款、補助和技術援助來協助計畫開發中國家推動，我國學術、民間公司、團體等具備靈活的反應能力與製造開發技術，由民間社團參與這類組織計畫合作、運用我國專長優勢，應有助於該國加速改善環境問題。

## 二、 蒙古土地遼闊具備發展太陽能與風力發電空間

蒙古地廣人稀，且有廣大緩坡地形，目前再生能源比率未達 1 % (2020, IEA)，評估因發展經費與國內消費力不足為限制條件，若設置成本降低或國際碳權上升至一定價位後，應可誘發大規模應用，發揮共利效果減少空氣污染。

## 三、 我國與蒙古可先就環境資訊技術合作

我國空氣品質於冬季時，除了本土污染累積外，也會受到鄰近國家排放空氣污染物長程傳輸之影響，因此鄰近國家的污染減量對臺灣空氣品質的改善也相當重要。雙方可藉由取得對方環境監測項目為基礎，由大氣環境司與監測資訊司所委託國內產學機構針對長程傳輸掌控、空氣品質模式模擬需求進行評估，提出我方需求，透過環境監

測、研究交流合作掌握蒙古污染物伴隨冷高壓氣流影響至本國之變化情形。

### 四、 我國與美國環保署就 SSEA-Air 規劃推動方向

我國空氣品質在中央及地方政府積極推動下，空氣污染防制改善成效顯著，未來我方可針對空氣品質管制策略進行深度交流外，並特別針對蒙古較感興趣且有相同背景的議題，如監測數據品保程序與資料管理應用、公開及呈現、移動污染源之執行管制措施、固定污染源防制設備及法規制度交流等進行經驗分享，並安排實地參訪，同步展示國內固定污染源和移動污染源不定期檢驗實施等方式，讓與會者充分了解臺灣在空氣污染管制上所做的努力及各項技術作為，並協助他國執行空氣污染防制工作。

## 陸、附錄

一、 出國報告摘要版

二、 本次考察接洽人員名片

三、 向蒙古委員會介紹臺灣空氣污染防制簡報

四、 蒙古氣象水文環境資訊研究所簡章

五、 **Unicef** 簡章

# 出國報告摘要

一、 出國計畫名稱：考察蒙古空氣污染長程傳輸影響亞洲及我國空氣品質情形暨改善對策交流

二、 出國人：本部大氣司呂澄洋簡任技正、許庭菲環境技術師、監資司鄭春菊簡任技正

三、 出國日期：112 年 10 月 22 日至 112 年 10 月 28 日

四、 出國行程與內容概要：

| 日　期 | 工 作 內 容 概 要 |
|---|---|
| 112.10.22 | 啟程，出發至蒙古(臺北-韓國-蒙古烏蘭巴托) |
| 112.10.23 | ➢ 拜會駐烏蘭巴托台北貿易經濟代表處<br>➢ 拜會美國駐蒙古大使館<br>➢ 餐會 People in Need（捷克 NGO），討論空氣品質監測數據公開及 APP 應用（臺灣環境即時通和 Agaar.mn)議題<br>➢ 拜會蒙古氣象水文環境資訊研究所(Information & Research Institute of Meteorology, Hydrology and Environment)，了解所參與 NASA 潘朵拉計畫<br>➢ 拜會 Breathe Mongolia（蒙古 NGO）討論蒙古空氣品質與當地空氣污染健康危害議題 |
| 112.10.24 | ➢ 拜會日本國際協力機構（JICA，行政法人），了解其協助蒙古烏蘭巴托推動空氣品質改善、污染削減對策措施<br>➢ 拜會 Public Lab Mongolia（蒙古 NGO），了解其空品感測器應用於室內室外場所與需求<br>➢ 參訪 Tavan Tolgoi Fuel coal briquette company 造媒球塊廠、媒球塊生產線，了解其含硫分與對貿易供應服務 |
| 112.10.25 | ➢ 參訪烏蘭巴托市區空氣品質監測站（二站）與數據品保技術交流<br>➢ 拜會國家衛生中心（National Center for Public |

Health)，了解蒙古空氣污染來源、室內空氣品質管理與當地空氣污染健康危害議題

- 餐會蒙古國家氣象及環境監測局(National Agency for Meteorology and Environmental Monitoring)環境監測部門主管(Director)，了解蒙古污染監測 AQI 計算依據、世界衛生組織 AQI 計算及我國 AQI 計算之相關議題
- 拜會國家環境污染削減委員會（National Committee on the Reduction of air pollution）辦公室，了解蒙古空氣污染管制策略，簡報分享我國近年推動空氣污染工作具體成果至推廣我國建置環境即時通 App，建置全國監測數據便民措施經驗
- 會晤亞洲開發銀行（Asian Development Bank, ADB） 了解其透過提供貸款、技術援助、贈款和股權投資來協助蒙古各項規劃之推動

112.10.26

- 拜會聯合國兒童基金會（UNICEF），了解募款協助弱勢蒙古包區居民，改善長期酷寒嚴冬之蒙古包居民之烹飪、暖氣技術產品 CHIPS stove，取代蒙古包火爐燃煤與空氣污染議題
- 實地參訪蒙古包區 CHIPS stove 設置設施情形
- 餐會德蒙資源與技術研究所（German-Mongolian Institute for Resources and Technology, GMIT）資深研究員，了解蒙古推動污染削減困境
- 烏蘭巴托空氣污染削減委員會(Ulaanbaatar City Air Pollution Reduction Committee)，了解該市污染來源、比例，簡報交流我方防制經驗

112.10.27

- 再度會晤蒙古國家氣象及環境監測局(National Agency for Meteorology and Environmental Monitoring)環境監測部門主管(Director)，討論空氣品質議題與技術交流烏蘭巴托混合層垂直擴散相關議題

- 美國環保 Justin Spenillo 說明其規劃後續 SSEA-Air 與臺灣共同合作推動方向

112.10.28　返程，搭機返回臺北（蒙古烏蘭巴托-韓國-臺北）

五、 行程成果評估及心得建議：

（一） 蒙古政經情勢背景綜整

蒙古人口約 340 萬，人均 GDP 約 4800 美元，地理位於亞洲內陸，領土面積為 156 萬平方公里，約為臺灣陸域面積 43 倍，為僅次於哈薩克的世界第二大內陸國家，北與俄羅斯為鄰，東、南、西三面與中國接壤，領土夾處於中、俄兩大強國之間，其95%的能源(汽柴油)需仰賴俄國，95%的對外貿易需仰賴中國，蒙古之生命線皆由俄國和中國所掌控，故在對外關係經常受制於這兩國利益取向與看法；為了減緩地緣不利的因素，蒙古發展「第三鄰國」政策，加強建立與中、俄以外之國家各項往來關係，以平衡對兩大強鄰之依賴，並爭取各類援助，以增進國家經濟發展。

（二） 蒙古（烏蘭巴托）空氣污染議題

蒙古首都烏蘭巴托位於蒙古高原中部，其地形類似盆地，烏蘭巴托是全世界最冷的城市、冬季時間超過 8 個月(每年九月至隔年五月)，最冷月氣溫最低可達零下 40 度，蒙古人口(據統計數據超過 53%人口)湧入城市聚集在烏蘭巴托市及周邊地區，使烏蘭巴托呈現人口與車輛密集都會型態，市區以火力燃煤發電供應電源，再生能源發展不及所有電力1%，全日成現交通壅塞，而尖峰時更顯壅擠，此外，市民購買多為二手車輛，車齡十分老舊、少於保養再加上汽車燃油油品不良，車輛排放廢氣嚴重。

烏蘭巴托周邊裙帶區域有眾多蒙古包居民（貧民），以傳統燃煤火爐取暖抵抗長期酷嚴寒冬，同時也燃燒生活垃圾等可燃物，在嚴冬需暖房期間，

大量燃燒活動加上大氣垂直擴散不良使空氣品質惡化，造成當地孩童、孕婦、老人等敏感族群者呼吸道疾病問題。

（三） 考察會談所見重點

本次考察由美國環保署發起，邀請我國共同參與，行程受訪機構及人士由蒙古美國大使館排定，環境部(以下簡稱本部)代表團成員 3 名會同美國環保署資深空氣品質規劃員 Justin Spenillo 及美國大使館二等秘書 Kevin Moore、大使館職員 Darisuren Purevsuren（隨行翻譯）共一行 6 人，於 10 月 23 日至 10 月 27 日共拜訪、會晤政府部門、國際組織、NGO 等機構人員 14 場次，田野訪查 3 場次，考察所見重點如下：

1. **美國大使館致力協助當地空氣污染改善：**環境部代表團會同我國駐烏蘭巴托台北貿易經濟代表處羅代表，拜會美國大使 Buangan，美國大使表示協助蒙古解決空污為使館重點工作，盼能借助臺灣經驗技術。大使表示為改善蒙古包區燒生煤取暖排放空污，10 年前即引進補貼潔淨暖爐（clean stove）每台以 3000 美元之三分之一價格，惟貧戶取得後隨即轉售作為家用，而仍用傳統火爐燒煤，經濟能力為主要問題點。另當夏季來臨空污問題消散善，居民即集體遺忘，社會對空污防制難以形成共識。

2. **美國環保署目的在於蒐集區域性合作議題**：美國環保署代表於所安排訪談中多次強調，此行是為了「臺美國際環境夥伴計畫(International Environment Partnership, IEP)」下之「東南亞及東亞區域空氣改善計畫(South and Southeast Asia-Air Improvements in the Region, SSEA-AIR)」推動，本次蒙古考察目的在於了解蒙古的空氣污染問題，評估可以推動蒙古國際環境合作的議題，同時研擬東亞區域合作需

求。

3. **蒙古在地理、民族、政體上具特殊地位：**蒙古領土是夾在俄羅斯、中國之間的民主政體國家，被已發展民主國家視為該區域的可突破、交流重點，其遊牧經濟生活型態使其成為所在區域至中亞一帶國際上游牧經濟代表國，相關政策以蒙古馬首是瞻。故成為國際合作/援助的重點國家，具備特殊的重要性。

4. **國際組織投入蒙古推動空氣污染改善合作/援助項目廣泛：**法國、日本及韓國均曾捐助設置空氣品質監測站，聯合國國際兒童福利基金會亦推動蒙古包使用電熱器/爐取代燃煤火爐、以地熱交換系統替換社區機構（學校、幼兒園）暖氣鍋爐等計畫，限於所需經費不昂貴，推動廣度及深度仍屬示範階段，依據受訪單位所呈現的訊息，以日本國際協力機構的空氣污染防制援助措施最具系統性，在污染源調查掌握、空氣品質監測設備、發電廠排煙連續自動監測設備、交通污染削減（大客車加裝濾煙器）等均可見到該機構援助的項目。

5. **蒙古 NGO 發展公民環境意識及與政府部門觀點差異**：認為蒙古政府的空氣品質監測數量（密度）不足、囿於儀器老舊數據品質存疑、指標反應即時性落後及監測數據未能公開等多有意見，並希望藉由裝設價格便宜之空品感測器增進空氣品質即時資訊反應，讓民眾了解並注意自身衛生防護。另由於室外空氣品質於冬季空污季期間長期處於不良情形，短期內改善不易，故希望空氣品質感測器安裝於室內協助維護、確保民眾室內空氣品質，故評估穩定適用室內的空氣品質感測器具備一定需求。

6. **蒙古政府機構具備調查研究功能，雙方有合作可能**：蒙古空氣品質監測機關-大氣環境監測署

及研究所具備基本的資料調查蒐集與研究能力，由於人力與經費短缺，需要外送訓練或招募方式增進作業能量，協助空氣污染管制。該研究所與美國 NASA 合作合作進行 PANDORA 計畫，所蒐集觀測資料可評估研析長程傳輸影響（我國）的潛力；另蒙古國家氣象及環境監測局監測部門主管(Director)亦主張區域性數據分享合作，我國可在大氣環境科研與對我國影響研究需求的基礎上與對方進一步接洽合作可行性。

7. 蒙古國家衛生中心特別關注室內空氣品質，希望推動系統性管理確保室內空氣品質，會中我方分享臺灣室內空氣品質立法管理概況與戶外空氣惡化因應做法。

8. **蒙古規劃藉替換燃料改善空氣品質**：蒙古國家環境污染削減委員會(21 人)召集人及成員包括總統、6 位市長、相關部會首長、技術專家等，考察團由委員會執行秘書(Head of Office)代表接待會談，表示蒙古致力改善（烏蘭巴托）空污，2018 年公告禁止燃燒生煤，民眾以媒球磚為替代燃料，並規劃引進半焦煤(Semi coking coal)為蒙古包火爐燃料，預計能大幅減少空氣污染物排放，惟未掌握半焦煤生產技術，須從中國引進成品或技術。本部考察團於會議中簡報，說明我國過去也有季節性空氣品質不良的情況，經由近年空氣污染防制策略推動，已達成空氣品質改善成果，蒙古對我國環境即時通的各項資訊服務表達高度興趣。

9. **烏蘭巴托市詢問我國空污費與燃料管理制度**：空氣污染削減委員會召集人為市長，屬地方層級跨部門行政編組，訪談會議由市環保部門主管、稽查管制主管等主要空污業管單位代表出席，對於本部考察團簡報我國各項防制策略與

改善成果，該委員會對於我國制定空氣污染防制法、空污費收費制度及油品查驗制度提問表達相當的興趣。蒙古空污費僅向車主（固定費率）、煤礦業主徵收。

10. **蒙古採行新低污染技術、設備受限經濟能力**：蒙古礦產資源豐富，盛產煤礦，因此煤成為蒙古所能運用成本最低的燃料，煤成為定居都會裙帶區域蒙古包民眾用以度過漫漫酷嚴寒冬所必需、能負擔的必要燃料，蒙古包區的民眾(佔53%)屬於經濟弱勢的族群，且數量龐大，固然有其他更環境友善的燃料、火爐技術，囿於負擔能力，對各種的改善策略推動也形成一定的侷限，如何讓蒙古採行有具體效果且能負擔的空氣污染減量措施是蒙古最大挑戰。

11. **短中程內改善蒙古包使用火爐、暖房使用效率仍具效益**：德蒙資源與技術研究所資深研究員表示，蒙古包火爐若在技術上提升，可減少 80% 的燃料使用或污染排放，惟遺憾的是已進行多年的火爐效能提升研發計畫已經停擺。

（四）心得與建議事項

1、 我私部門研發製造專長可與國際組織計畫合作

臺灣比較少接觸到聯合國附屬單位及國際援助機構，這些機構提供貸款、補助和技術援助來協助計畫推動，我國學術、民間公司、團體等具備靈活的反應能力與製造開發技術，由民間社團參與這類組織計畫合作、運用我國專長優勢，應有助於該國加速改善環境問題。

2、 蒙古土地遼闊具備發展太陽能與風力發電空間

蒙古地廣人稀，且有廣大緩坡地形，目前再生能源比率未達 1 % (2020, IEA)，評估因發展經費與國內消費力不足為限制條件，若設置成本降低或

國際碳權上升至一定價位後，應可誘發大規模應用，發揮共利效果減少空氣污染。

3、 我國與蒙古可先就環境資訊技術合作

雙方可藉由取得對方環境監測項目為基礎，由大氣司與監資司所委託國內產學機構針對長程傳輸掌控、空氣品質模式模擬需求進行評估，提出我方需求，透過環境監測、研究交流合作掌握蒙古污染物伴隨冷高壓氣流影響至本國之變化情形。

4、 我國與美國環保署就 SSEA-Air 規劃推動方向

我方空氣污染管理經驗分享：

（1） 移動污染源之管制措施及規劃經驗分享。
（2） 固定污染源防制設備及法規制度交流。
（3） 監測數據品保程序與資料管理應用、公開及呈現。
（4） 各項環境業務人員交流見習訓練。

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環境部
Ministry of Environment

# Ambient Air Quality Management In Taiwan


Cheng-Young Lyu (Vito), Senior Technical Specialist

Chun-Chu Cheng (Joy), Senior Technical Specialist

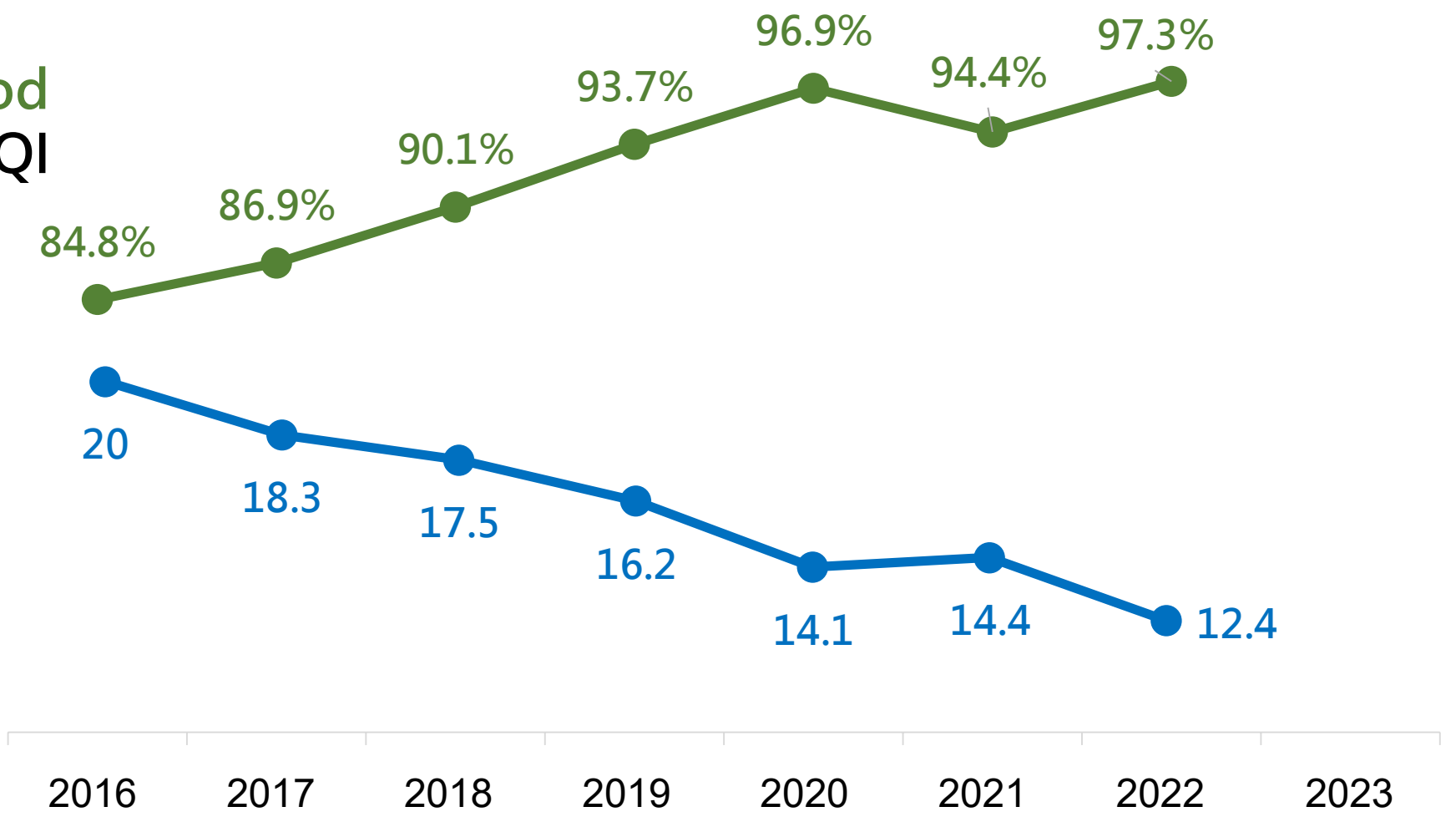
Ting-Fei Hsu, Environmental Technical Specialist

Ministry of Environment, Republic of China (TAIWAN MOENV)


# Consistent Compliance with National Air Quality Standards for 3 Consecutive Years

AQ
Moderate / Good
Ratio of $PM_{2.5}$AQI
≦100

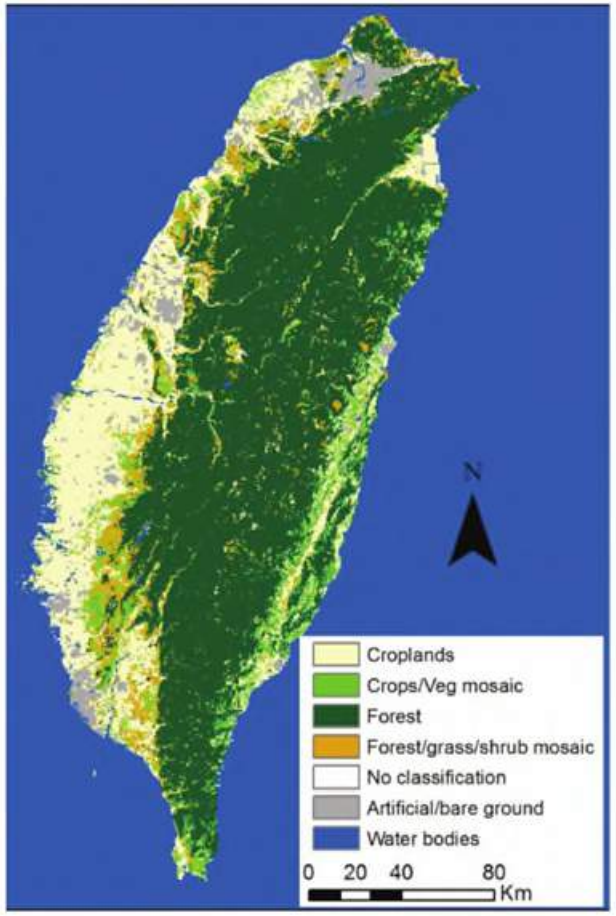
Annual mean
$PM_{2.5}$
concentration
(μg/m³)

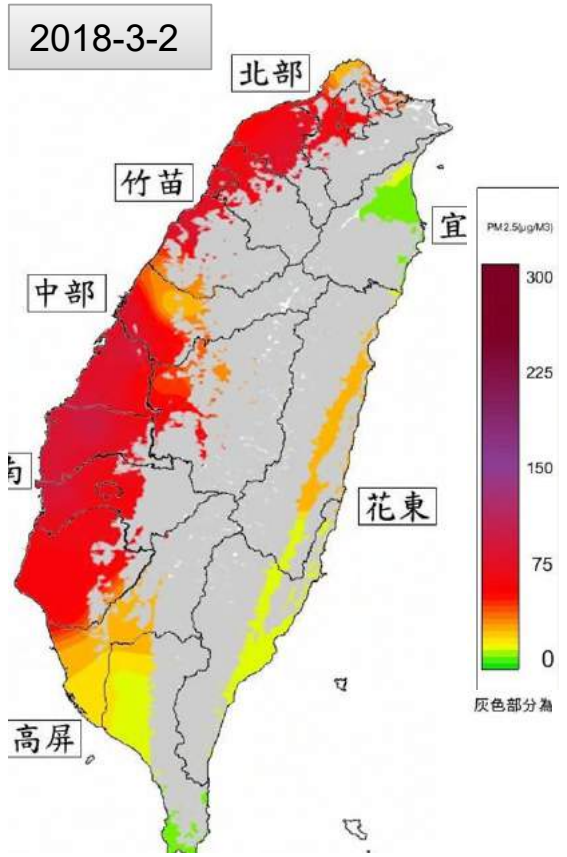


環境部
Ministry of Environment

# 01 Challenges on air quality improvement

# Geography of Taiwan


The Taiwan's area is **35,808 km²** and lies some 180 kilometers from the southeastern coast of mainland China across the **Taiwan Strait**.

- **2/3** of the island mostly consists of rugged mountains and most of Taiwan's population.
- Mountain Ranges cover the central area through the **island**.

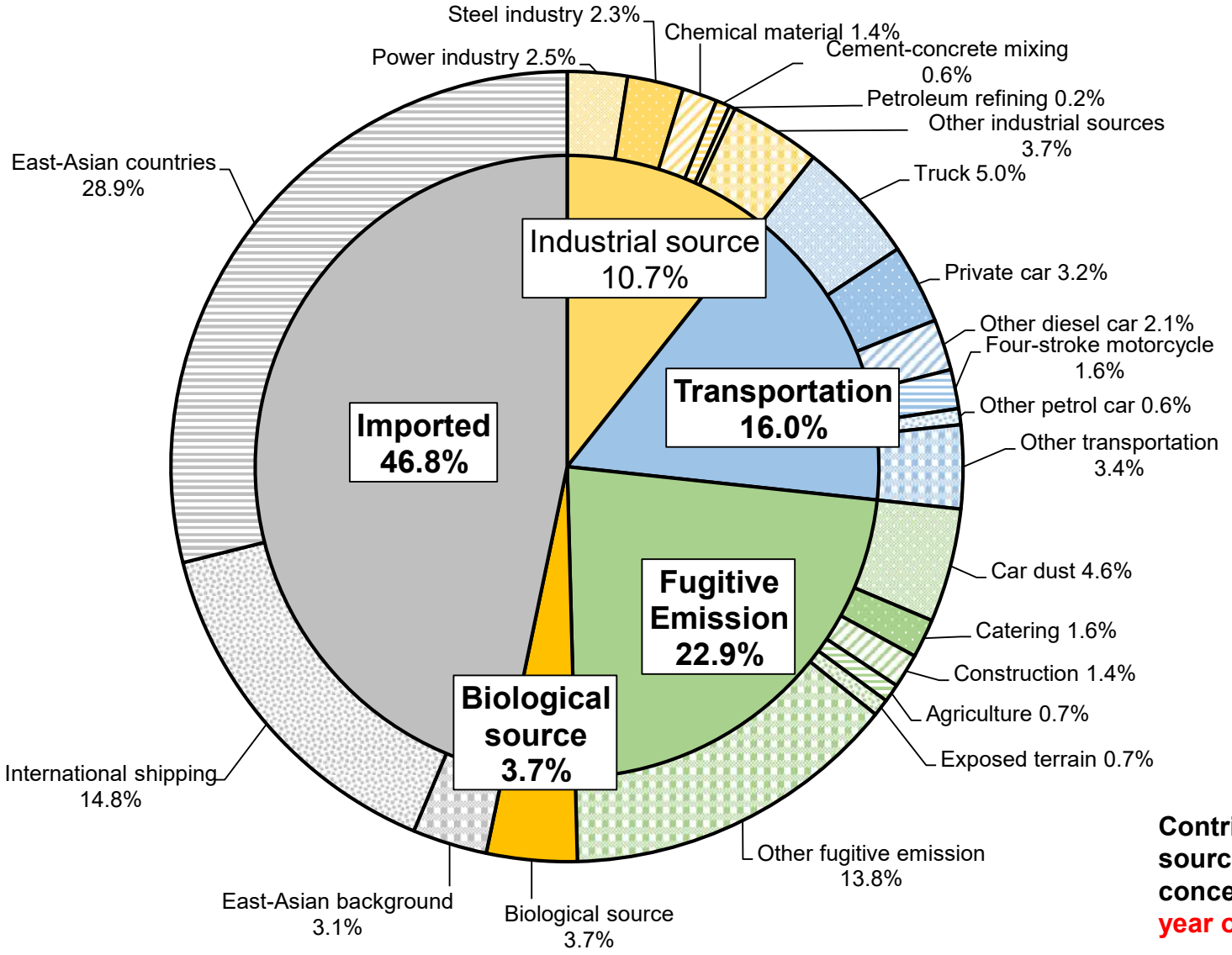
# Direct control of air pollutants imported by monsoon is unfeasible

Sand Dust

Pollutant Emission

Biomass Burning

# Complex Source of $PM_{2.5}$ : Multi-Sector Collaboration Needed

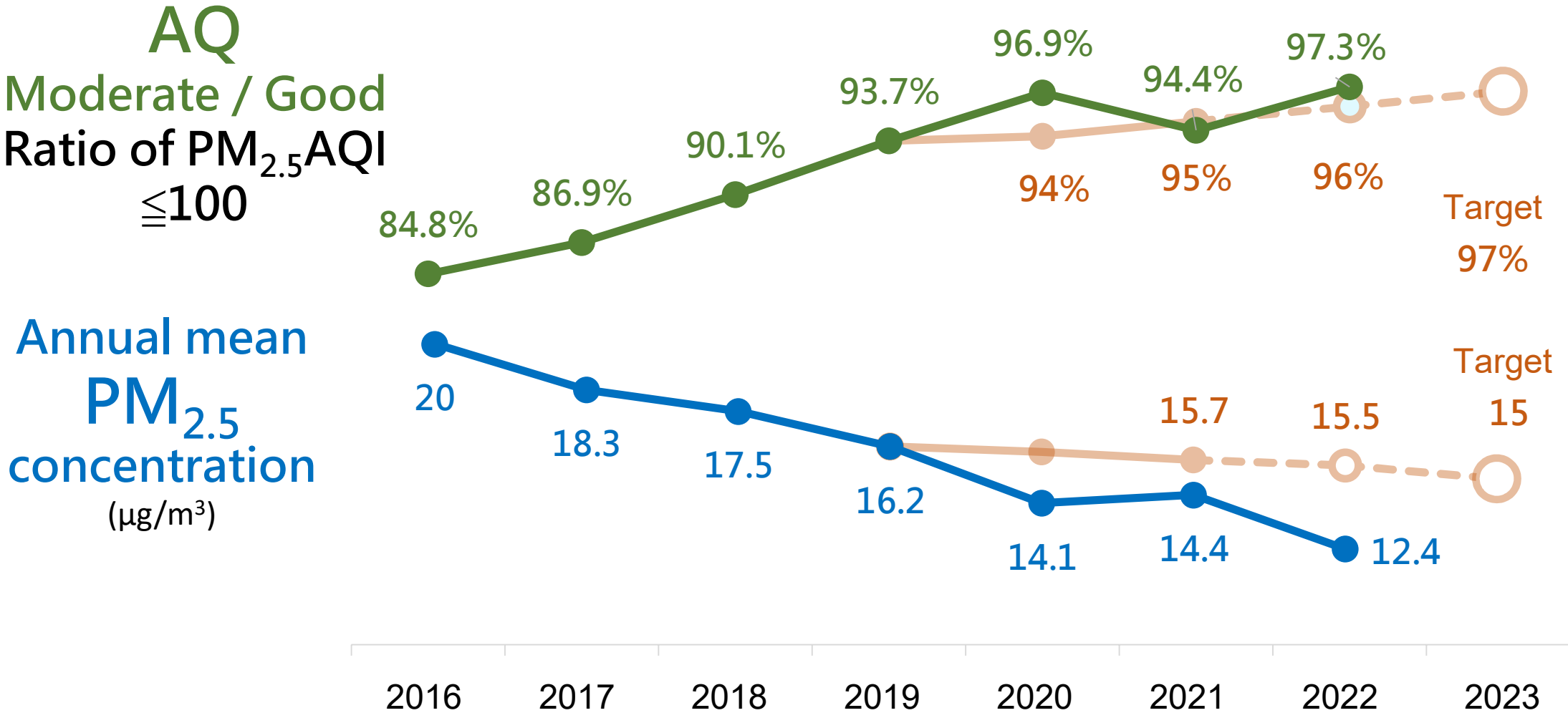



**Contribution ratio of various emission sources to the annual mean $PM_{2.5}$ concentration in Taiwan in the base year of 2019**

環境部
Ministry of Environment

# 02 / Progress on $PM_{2.5}$ control

# Consistent Compliance with National Air Quality Standards for 3 Consecutive Years



# Air Pollution Prevention and Control in Taiwan: Policies and Strategies


| 2017 | 2018 | 2020 |
|---|---|---|
| **Air Pollution Control Action Plan: Halving Red Alert Days** | **Air Pollution Control Act** | **Air Pollution Control Plan (2020-2023)** |
| •Halving red alert days by 2019<br>•Promote pollution reduction in state-owned enterprises<br>•Tighten mobile source control | •Strengthen management of AQ<br>•Tighten stationary air pollution source control<br>•Heavier penalties | • Enhance particulate and ozone reduction<br>• Expand mobile source control |

# Air Pollution Control Plan (2020~2023)

## Law

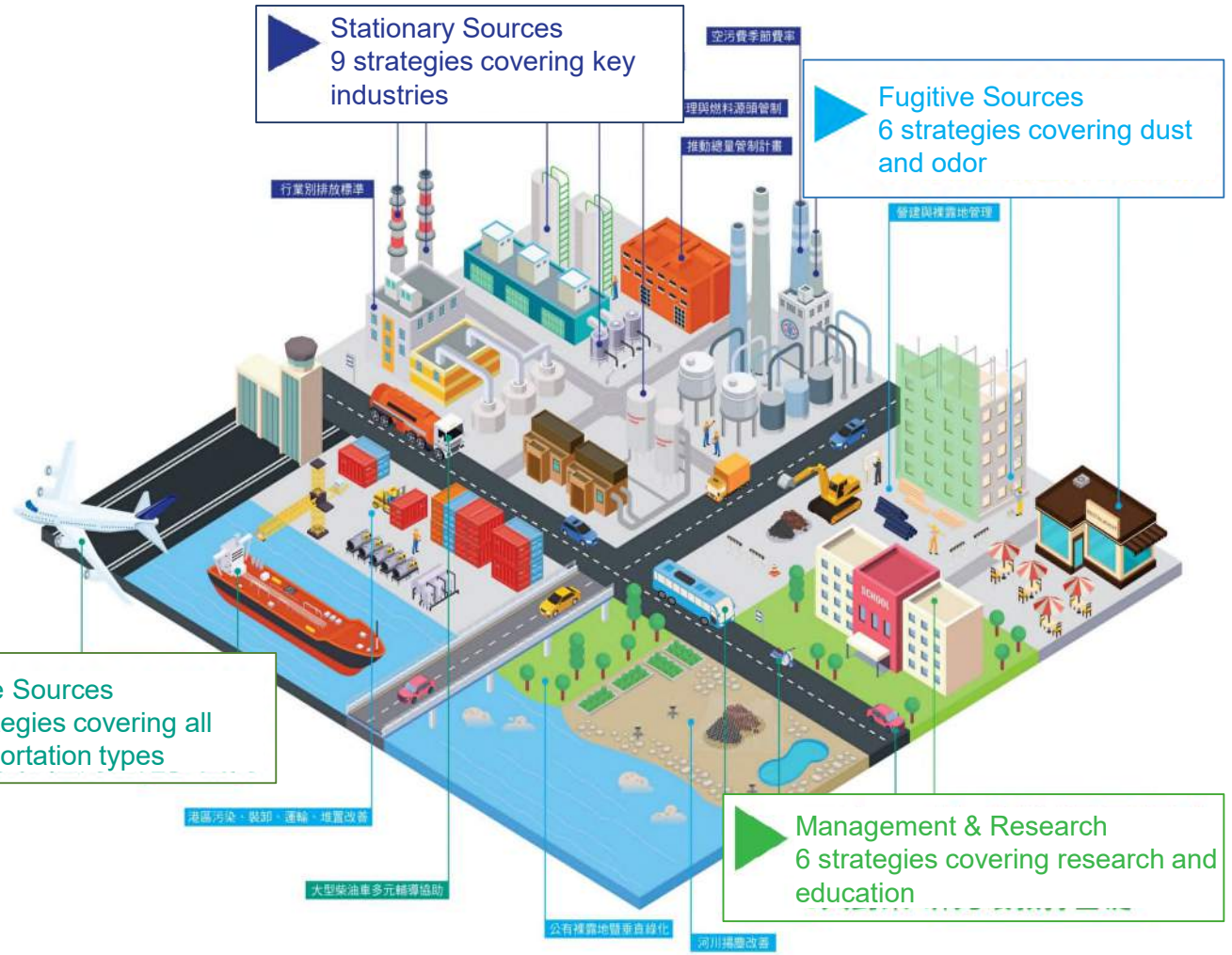
**Air Pollution Control Act Article 7**
**EPA develops control plans, reviews, and revises every four years.**

## Goal

**$PM_{2.5}$ consistently below 15μg/m³, achieving 97% good AQI.**

## Execution Framework

- 4 aspects
- 27 strategies



# State-Owned Enterprises Leading Air Pollution Improvement

- MOENV and the Ministry of Economic Affairs (MOEA) collaborate across departments to track pollution improvement progress in state-owned enterprises.


# Boiler Improvement and Air Pollution Reduction

- Accelerated boiler replacement enhances emission reduction. Focus on fuel, combustion technology, and pollution control..

**96%(6,725) boilers improved**

**#Gas boilers increased by 3 times.**

**SOx**

Reduced 7,138 ton equivalent to

1 Taichung Power Plant

(Power plant capacity 5500MW)

**NOx**

Reduced 4,441 ton equivalent to

0.5 Taichung Power Plant

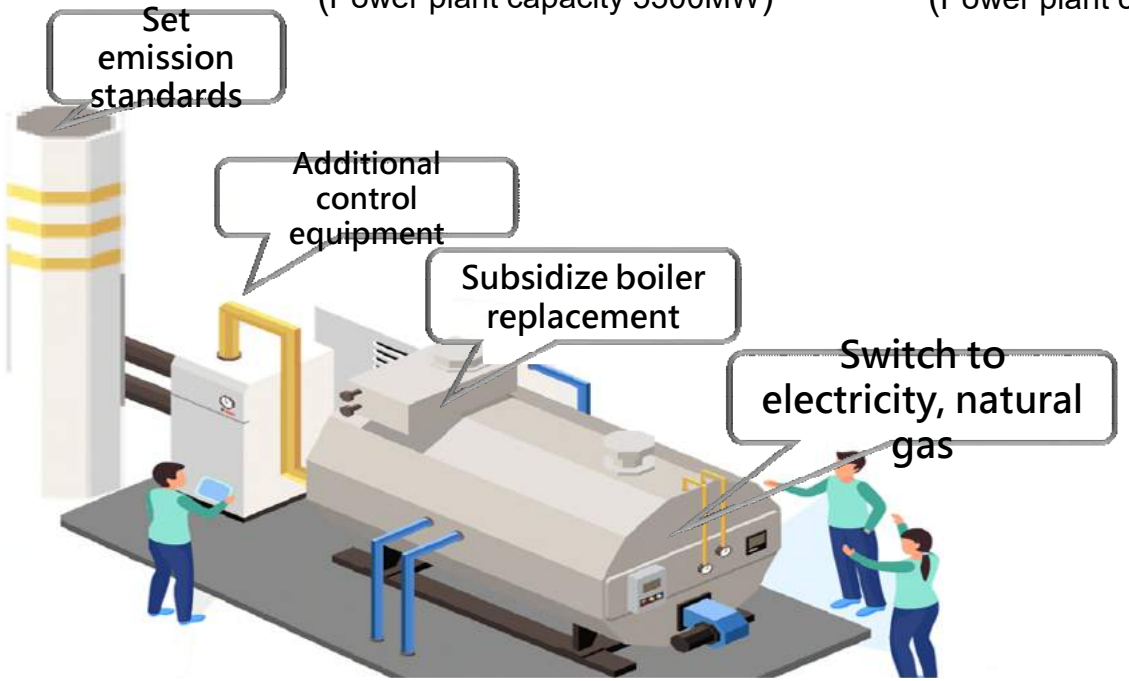
(Power plant capacity 5500MW)

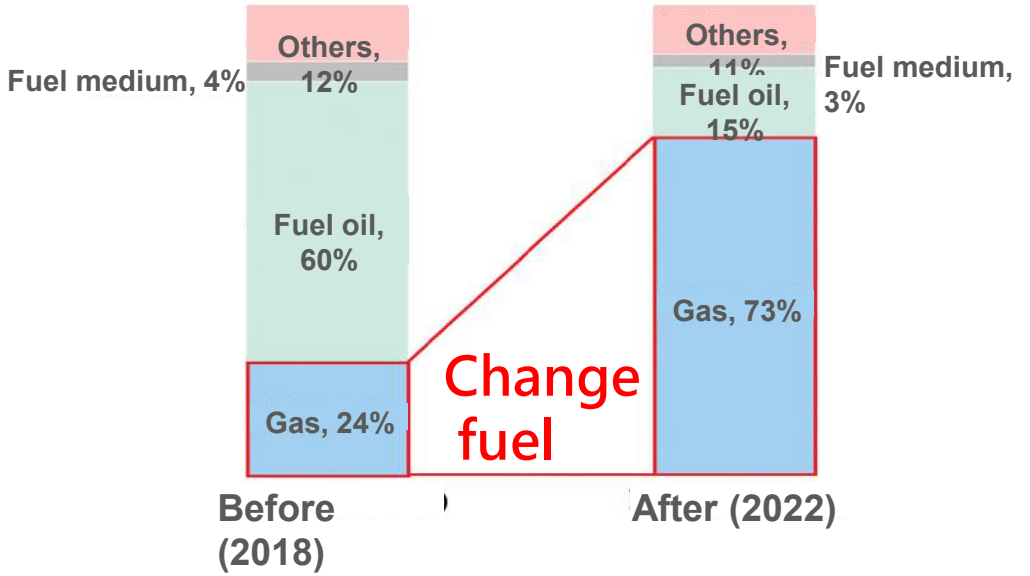
**$CO_2$**

Reduced 1,060 kiloton equivalent to

2,171 Daan Park's Carbon Adsorption

(26 hectares metropolitan park)



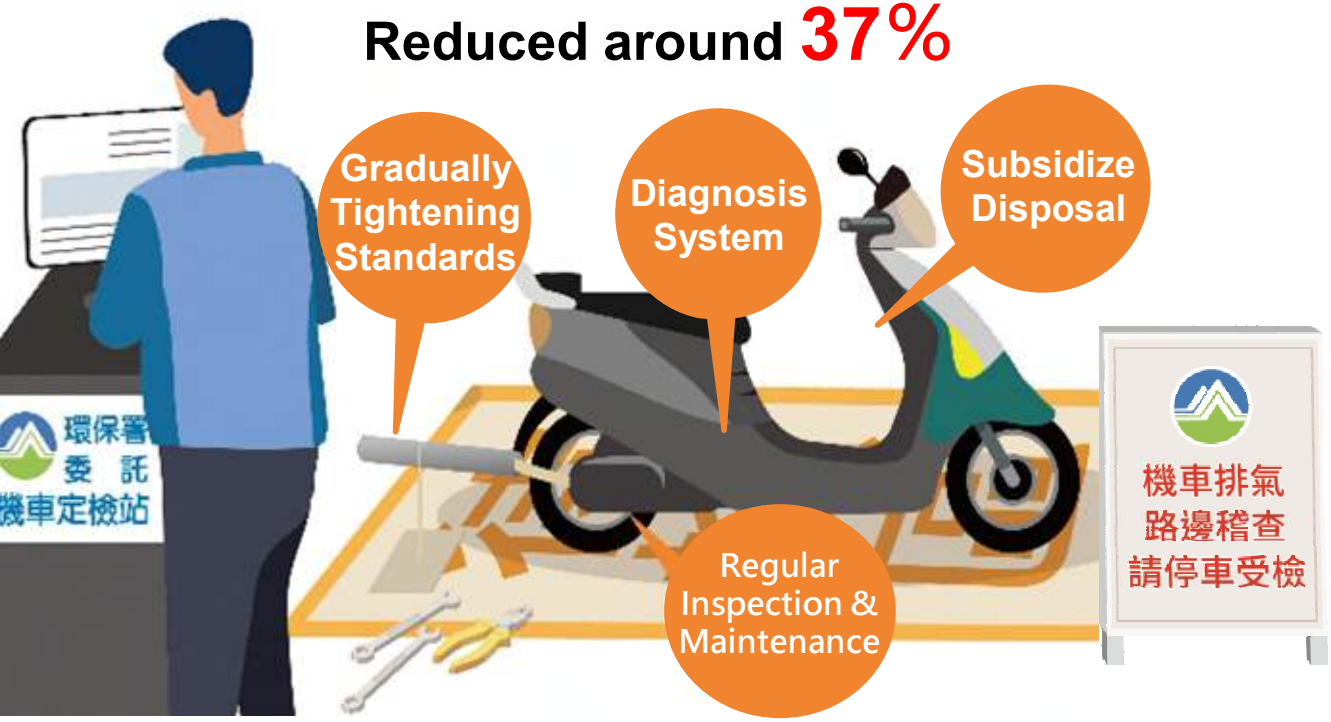



# Phasing Out Old and Highly Polluting Vehicles

## Expand benefits of eliminating old motorcycles

Eliminated **1.733 M** in total

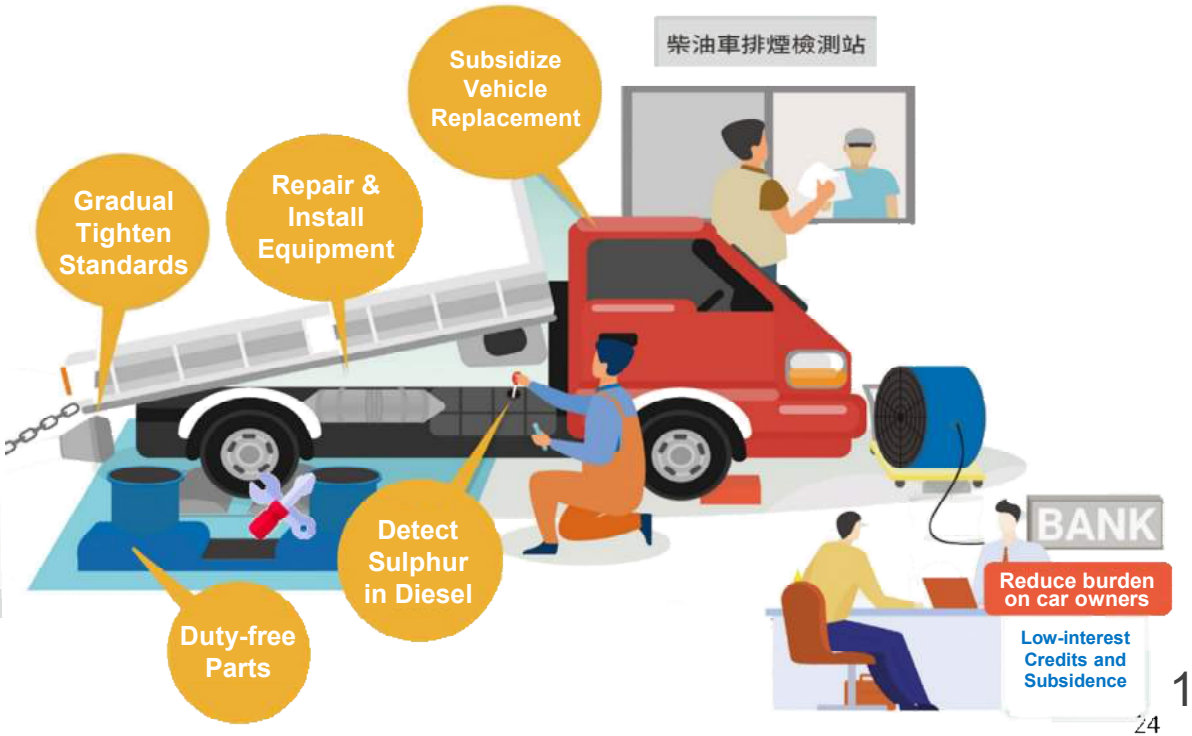
Reduced around **37%**




## Accelerate replacement of large diesel vehicles

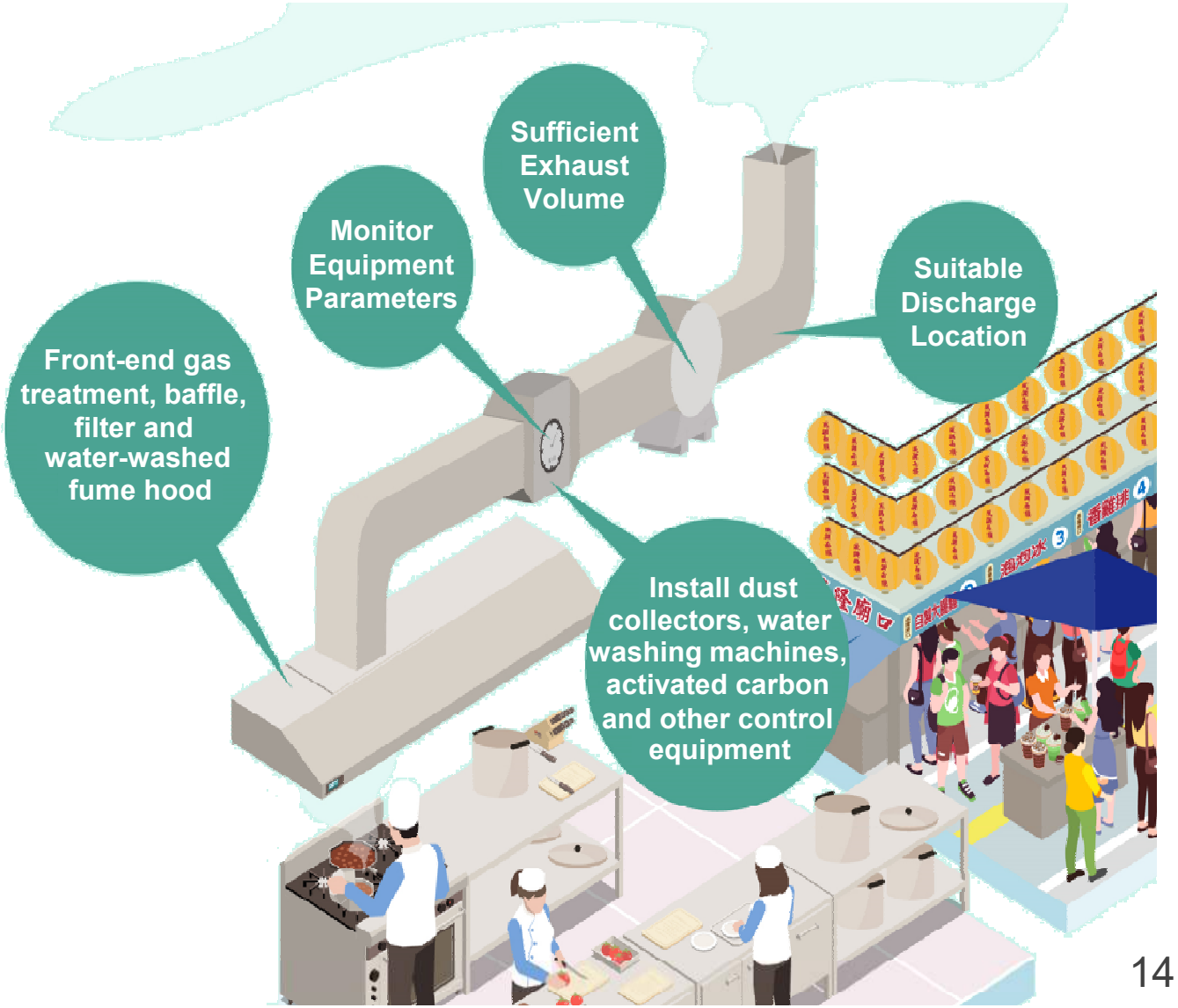
Eliminated old diesel vehicles

Reduced around **47%**



# Air Pollution Control in Catering Industry

- 5th Feb, 2021: Enforced "Air Pollution Control Facility Management Regulations for Catering Industry" (amended on 24th Aug, 2021)
  - ✓ Applicable to restaurants with area > 1,000m² or > 300 seats
  - ✓ Taipei City and New Taipei City adjust measures according to local conditions
- Provide guidance for fume handling
  - ✓ Vendors in night markets shall install oil fume prevention equipment
  - ✓ Compliance and management of air pollution control facilities in chain restaurants

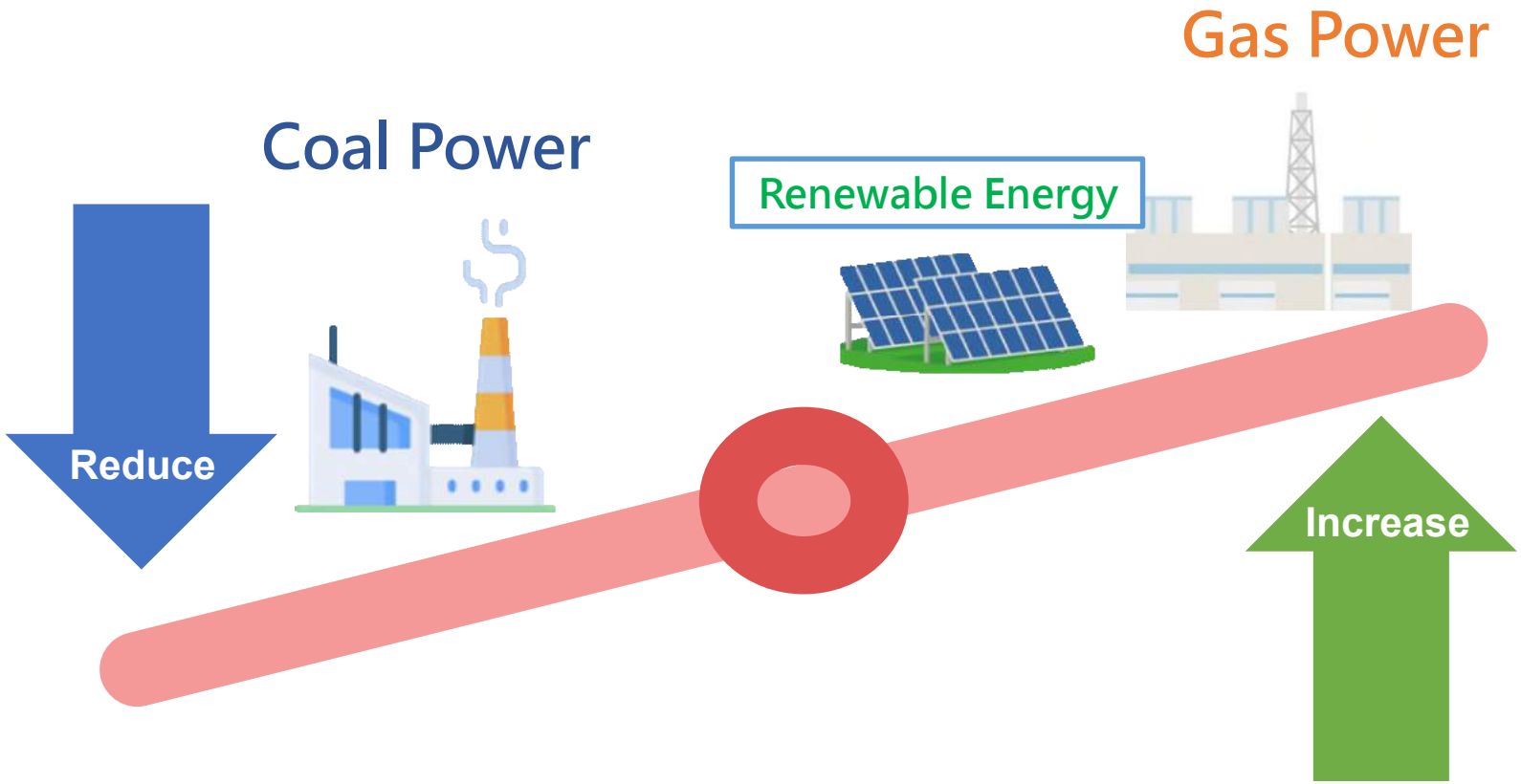


# Control in Construction

- Whole building covered
- Material convert control
- Earthwork, gravel and sand covered
- Trunk body covered completely
- Clean up before dump trunks leave sites
- Grass plant on Bare ground

# Balance Power Stability and Air Quality Improvement

- Promotion of 'less coal, more gas' strategy in compliance with Air Pollution Law
- Taichung and Xingda power plants: reduced coal consumption by ~22.76%, and increased natural gas usage by ~1.76 billion $m^3$ (12.50%)



# Directions of Air Pollution Prevention Plan for 2024-2027

## 1 Visions

Persistent Air Quality Improvement Aligned with 2050 Net-Zero and Pollution Reduction Goals

## 2 Indicators

$PM_{2.5}$ Annual mean concentration

$O_{3,\ 8\text{-}hr}$ red alert improvement：

## 3 Goals

National level ： 13 μg/m$^3$

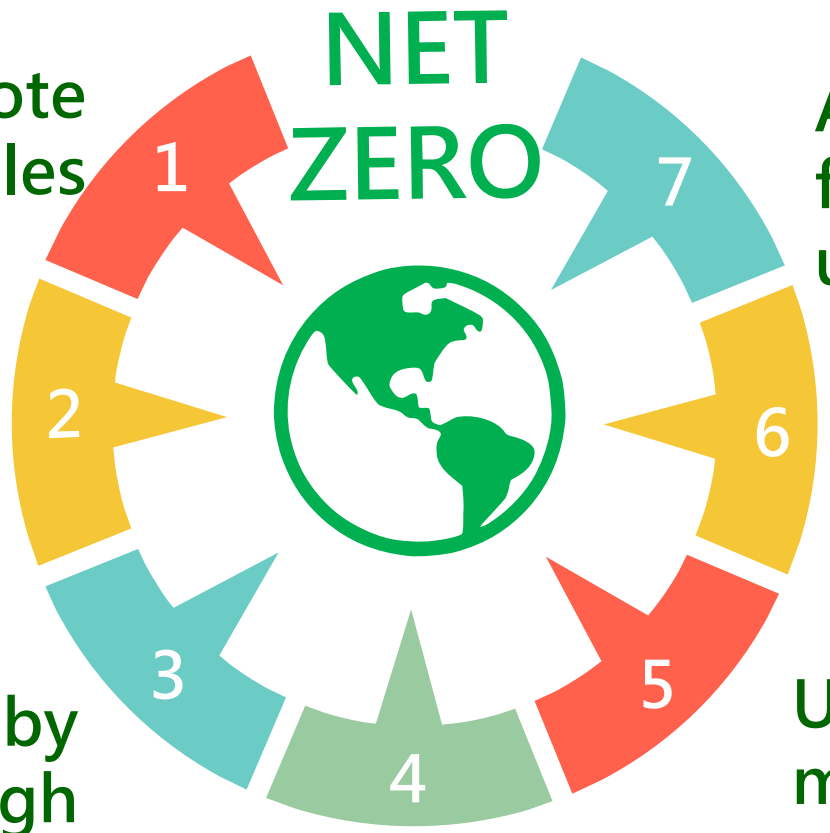
Central/Southern Region ： 15 μg/m$^3$

80 % (compared to 2019)

## 8 Cross Ministries Collaboration

(MOI, MOEA, MOTC, COA, NSTC, PCC, EDU, EPA)

# Achieving Co-Benefits of 2050 Net-Zero Emissions and Pollution Reduction




1. Promote electric vehicles
2. Build support systems for electric vehicles
3. Reduce air pollution by transforming high carbon-emitting industries
4. Control and reduce pollution from renewable fuels
5. Utilization of livestock manure to reduce odor & methane
6. Assess air pollution from hydrogen energy
7. Assess air pollution from power facilities using recycled fuels

環境部
Ministry of Environment

# Thank you

# National Air Pollution Improvement and Implementation Plan (2020 to 2023)

## Four Major Areas

## 27 Control Measures

**Stationary Sources**
***9 control measures***

- Establish or revise emission standards for specific industry
- Enhance emission reduction of exist stationary pollution sources
- Emission reduction in state-owned and public enterprises
- Pollution emissions improvement from boiler
- Permit management and source control of fuel
- Promote the cap control program
- Control of hazardous air pollutants (HAP)
- Continuous emission monitoring systems (CEMS) management
- Review air pollution control fees

**Fugitive Sources**
***6 control measures***

- Control of volatile organic compounds (Vocs) in coatings
- Management of construction site and exposed area (PM)
- Control of oil fume in the catering
- Improvement of pollution from folk activities, agricultural work, and port areas
- Public bare lands and exposed area greening
- Riverbed fugitive dust improvement in jhuoshuei river

# National Air Pollution Improvement and Implementation Plan (2020 to 2023)

## Four Major Areas

## 27 Control Measures

**Mobile Sources**
***6 control measures***

- Multiple subsidies for replacement the large diesel trucks
- Subsidies for replacement the phases I to IV motorcycles
- Emission reduction of gasoline vehicles
- Electrification of urban buses
- Low-sulfur content of ship fuels and maintenance of aviation fuel quality
- Transportation control at port area

**General Management & Research**
***6 control measures***

- Improving air pollution response mechanisms
- Enhanced simulation evaluation models
- Improve the representativeness of emissions inventories
- Deepen basic research on air pollution
- Monitoring equipment renew and maintenance
- Environmental education and specialized personnel training

## SCIENTIFIC PUBLISH

Researchers have been published following main scientific papers and books as internationally as well internally in the country.

- Papers in meteorology, IRIMHE, 1967-present
- National atlas for climate and surface water, and books
- Proceeding of Joint Workshop on Regional Climate Change, 2002-present
- Report of Science Technological Fund, 1994-present
- National Report on the Rangeland Health of Mongolia, 2015 and 2018
- Scientific papers in internal and international journals for weather, climate, water and environment


## INTERNATIONAL COOPERATION

IRIMHE has established long term partnerships with more than 20 research institutes, universities and international organizations.

- Climate change and water cycle, permafrost and glacier
- Long range forecast technology
- Asian dust and environmental change
- Dust emission research and monitoring
- Satellite greenhouse gas monitoring and ground validation and modelling
- Multi purpose satellite and joint hydrometeorological study
- Satellite ground validation and calibration
- Livestock insurance based on satellite index
- Crop watching and monitoring

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www.tsag-agaar.gov.mn; www.icc.mn

# INFORMATION AND RESEARCH INSTITUTE OF METEOROLOGY, HYDROLOGY AND ENVIRONMENT

WEATHER

CLIMATE

ENVIRONMENT

WATER

2019

## VISION

To produce and disseminate accurate hydrometeorological and environmental information based on experienced human strength and modern technology.

## MISSION

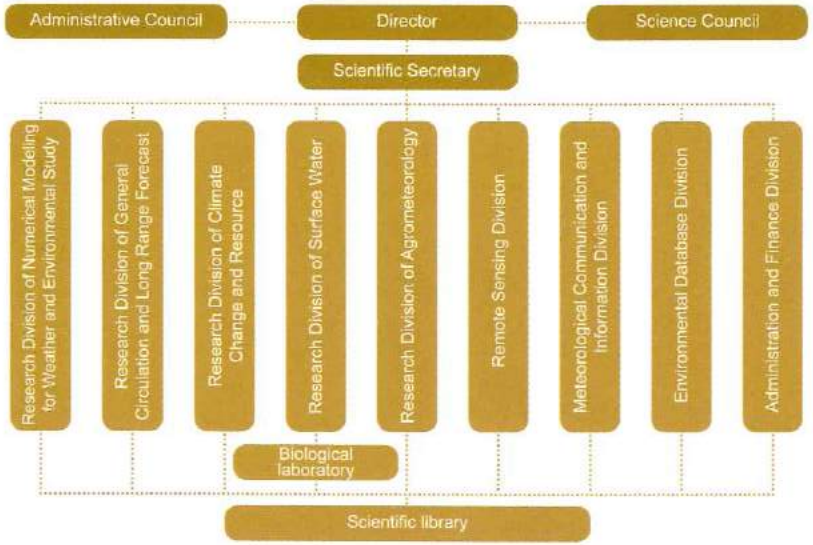
To serve real-time and predicted information of weather, climate, water and environment as operationally as based on scientific research output.

## GOALS

- To disseminate and serve real-time and predicted information of weather, climate, water and environmental information with government, public and users
- To advise national hydrometeorological and environmental network with methodology and technology
- To carry out research study involving with weather, climate, water, agrometeorology, remote sensing and environment, develop its related methodology, technology and modelling, and introduce in practice at national level
- To implement national mission of meteorological telecommunication center within World Meteorological Organization
- To implement national mission of Remote Sensing Center
- To implement charge of Environmental Information Center and manage daily activities of State environmental database

## ORGANIZATIONAL STRUCTURE

The Information and Research Institute of Meteorology, Hydrology and Environment (IRIMHE) was established in 1966 as named Research Institute of Meteorology and Hydrology. The organizational structure of IRIMHE is shown as following:

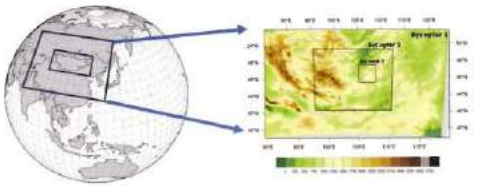



11% of total number staffs have Ph.D and 36% have M.Sc degree.

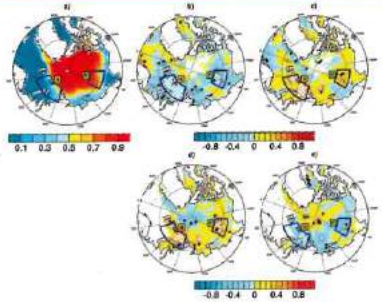
## RESEARCH INTERESTS

The institute does research work involving with weather, climate, water and environment at nationally. Main field is shown as following:

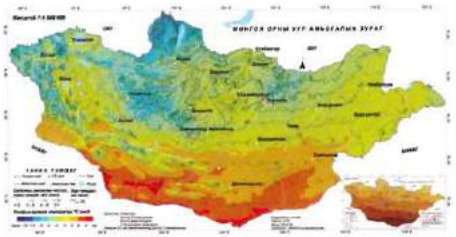
- To develop and research on technology, statistic and dynamic modelling for short, medium and long range forecasting
- General circulation effect on regional weather and climate, and their teleconnection
- Climate monitoring, climate change and its future projection
- Extreme weather and climate events (snow and dust storm, drought, dzud, flood etc.), their simulation and mechanism
- Water resource and regime, runoff calculaton estimation and modelling, glacier and permafrost study
- Rangeland and crop monitoring and ecosystem modelling
- Air pollution, dust storm and greenhouse gas monitoring and their modelling
- Environmental and natural resource study using remote sensing technology



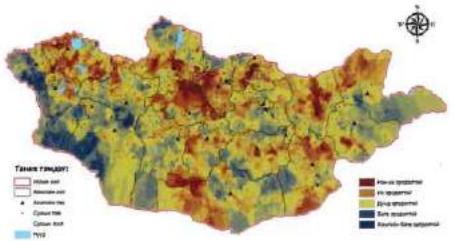
*Regional atmospheric dynamic MM5 and WRF modelling at supercomputer system*



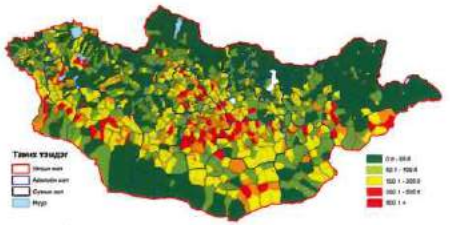
*Atmospheric general circulation and teleconnection*



*Climate resource map*



*Dzud risk map*

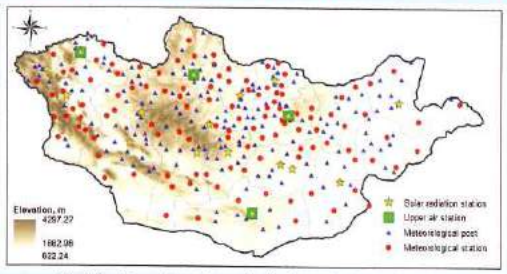


*Pasture carrying capacity*

*Glacier and its change*

*Supercomputing technology*

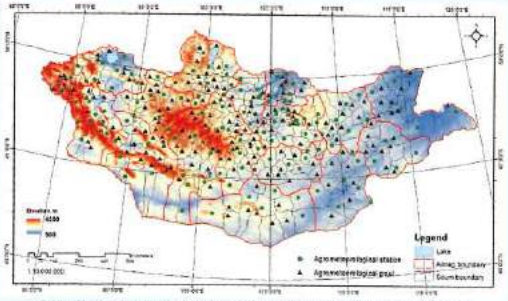
## METEOROLOGICAL NETWORK, CLIMATE OBSERVATION AND MONITORING




*Distribution of meteorological stations and posts*

- 318 meteorological stations and posts
- 17 solar radiation stations
- 4 upper air stations
- 9 dust storm sites
- 1 greenhouse gas (GHG) monitoring station

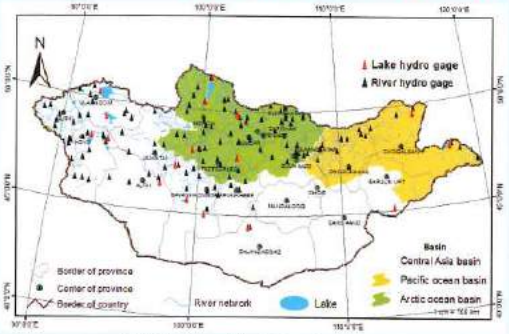
## AGROMETEOROLOGICAL OBSERVATION AND MONITORING




*Distribution of agrometeorological stations and posts*

- 318 stations and posts for rangeland phenology monitoring
- 1500 research sites for rangeland condition
- 38 stations and posts for crop phenology
- 54 soil moisture stations and posts
- 318 stations and posts for dominant pests and disease for pasture
- 7 zoo-meteorological posts

## HYDROLOGICAL OBSERVATION AND NETWORK

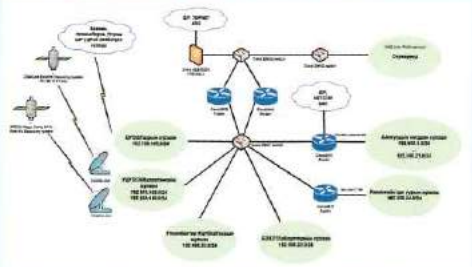



*Distribution of hydrological posts*

- 153 posts for river and lake monitoring
- 4 glacier stations
- 30 points for permafrost monitoring
- 38 boreholes for groundwater monitoring
- 19 springs for monitoring spring
- 99 hydro-biological sampling points

## METEOROLOGICAL TELECOMMUNICATION AND NETWORK

To implement to transfer and receive national hydrometeorological and environmental observation data and information as well as their exchanging between international and regional centers. Also to maintain ground receiving system such as NOAA, MODIS and FY satellite.



*Integrated hydrometeorological network*

## RESEARCH, INFORMATION AND SERVICE

**Weather and climate forecast:**
- Short, medium and long range forecasting using NWP system
- Monthly forecast
- Warm and cold season climate outlook

**Climate information, service:**
- Monthly climate review and summary
- Climate norm and standard
- Climate atlas and reference
- Climate change monitoring
- Assessment of wind and solar energy resources

**Agrometeorological service:**
- Decadal, monthly and seasonal agrometereological review
- Drought and dzud assessment and outlook
- Pasture carrying capacity
- Soil moisture study
- Pasture pests and disease review
- Forecast for soil freeze and thawing
- Rangeland, wheat and potatoes yield forecast
- Sheep weight change study

**Hydrological information:**
- Decadal, monthly, seasonal and yearly review
- River level short range forecast
- Monthly runoff forecast
- River freezing and thawing forecast
- Flush flood and ice break warning
- Water biological quality information

**Satellite product:**
- Snow cover map
- Fire map
- Vegetation and its deviation map
- Drought map
- Land cover map

**Environmental information database:**
- Forest resource, reforestation database
- Water and mineral database
- Taxonomy information of flora and fauna
- National and local SPA database
- Environmental impact assessment reports
- Forest, water and SPA cadaster
- Environmental thematic maps etc.

## RECENT IMPLEMENTED TECHNIQUE AND TECHNOLOGY

Here, table is shown some newly introduced technique and technology since 2011.

| Date | Updated technique and technology |
|---|---|
| 2011.08 | Rangeland health monitoring and assessment system |
| 2011.11 | Supercomputing and numerical modelling technology |
| 2014.03 | Receiving and processing system for 15 minute data of automated weather station |
| 2016.03 | Hydrological information service and database technology |
| 2016.10 | Operated HIMAWARI geostationary satellite system |
| 2018.06 | Measurement of river channel deformation with use of GPS technology |
| 2018.08 | "Реки режим" software for hydrological year book and runoff computation |
| 2018.10 | Regional WRF numerical modelling with data assimilation module |
| 2019.02 | Transfering and controlling system for hydrometeorological observation and information |
| 2019.02 | Long range forecast system of Winter outlook for anticyclone and air temperature |
| 2019.03 | "Мон-Метео" software for spatial and controlling screening in meteorological data |
| 2019.04 | Upgrade of satellite receiver system |

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GOVERNMENT OF MONGOLIA

Schweizerische Eidgenossenschaft
Confédération suisse
Confederazione Svizzera
Confederaziun svizra

Swiss Agency for Development and Cooperation SDC

unicef
for every child

# IMPACT OF AIR POLLUTION ON MATERNAL AND CHILD HEALTH PROJECT (2018-2023)

DATA AND EVIDENCE | TRANSFORMATIVE ACTIONS | POLICY AND PLANS

This magazine was produced as part of "Impact of Air Pollution on Maternal and Child health" project 2018-2023 funded by the Swiss Agency for Development and Cooperation (SDC).

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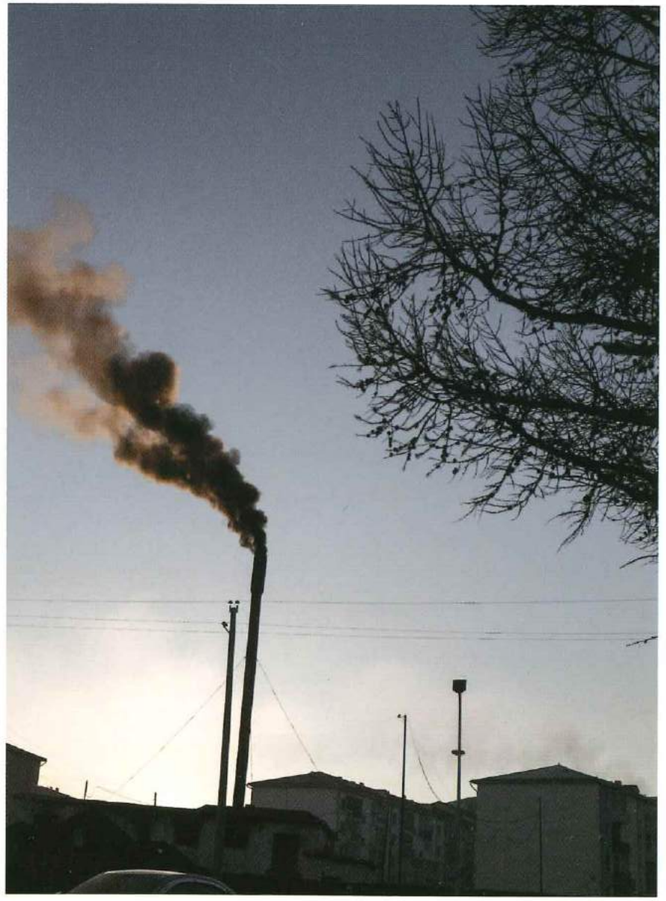
# PAGES











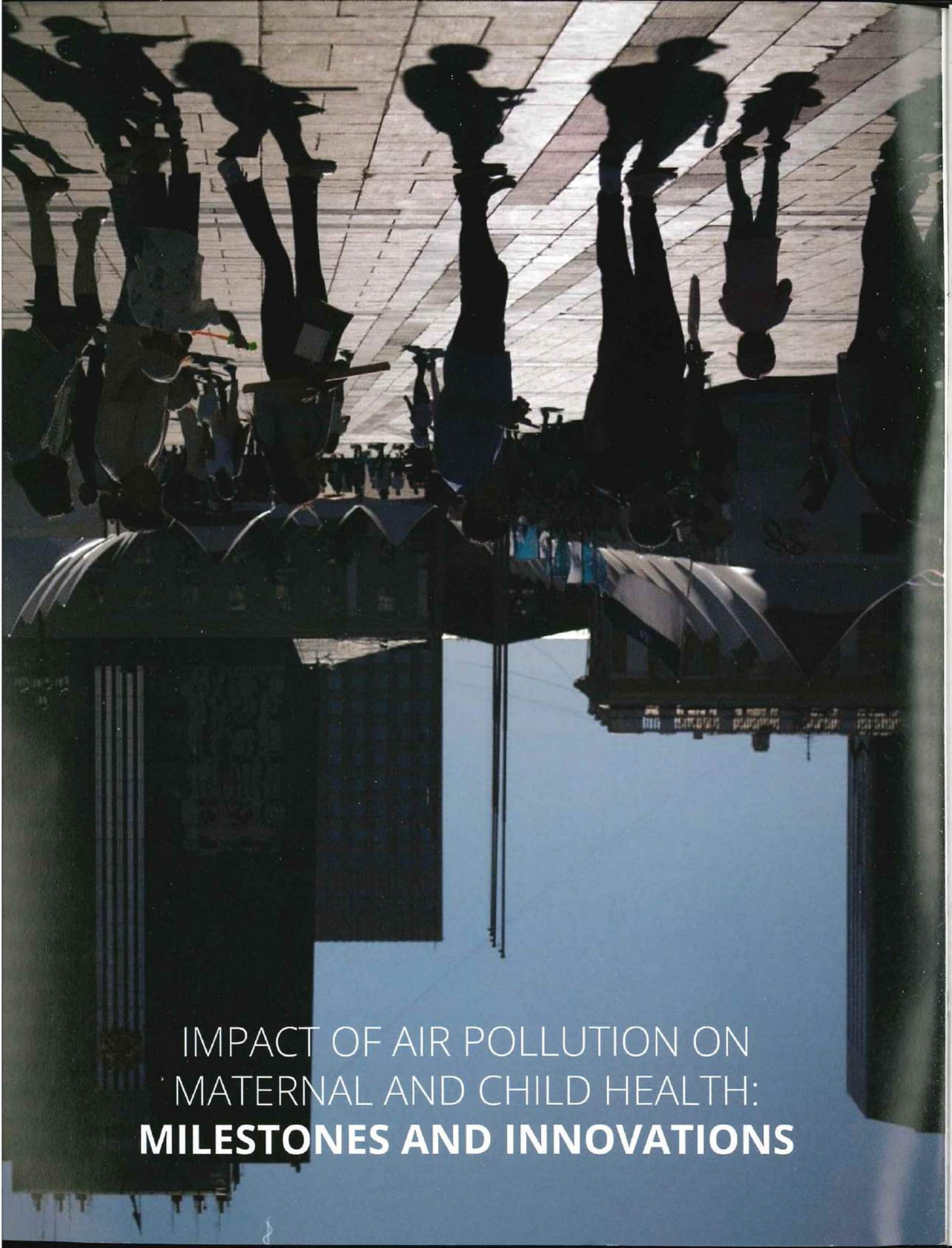












# IMPACT OF AIR POLLUTION ON MATERNAL AND CHILD HEALTH: **MILESTONES AND INNOVATIONS**



**Bat-Erdene Bat-Ulzii**

*Minister of Environment and Tourism of Mongolia*

In Mongolia, almost 90 per cent of the overall energy supply is used only for heating purposes. Coal is the primary energy source, which has led to increasing levels of GHG emissions and air pollution. Air pollution has devastating effects on the country's environment and socio-economic sectors, including citizens' health—especially children and pregnant women exposed to toxic pollutants—leading to a higher incidence of stillbirth, preterm birth, pneumonia, asthma, lung dysfunction and nervous system damage.

The Ministry of Environment and Tourism has been at the forefront of tackling air pollution with other ministries agencies, and development partners. As part of the National Programme for Reducing Air and Environmental Pollution, the Government of Mongolia has banned the use of raw coal in Ulaanbaatar, provided discounts on night electricity tariffs in ger districts, supported the shift to electric heating, and replaced coal-fired heat-only boilers in public buildings with clean alternative heating technologies. As a result of these measures, fine particulate matter (PM2.5) concentrations in Ulaanbaatar have decreased by up to 40 per cent.

With contributions from donors, the Government of Mongolia has been implementing a number of projects to reduce air pollution in urban areas. One successful project is the Impact of Air Pollution on Maternal and Child Health, funded by the Swiss Agency for Development and Cooperation and implemented by the United Nations Children's Fund.

With technical assistance from UNICEF, we have approved priority research on air pollution and an action plan for implementation, an action plan for the implementation of Nationally Determined Contributions to Climate Change, an action plan for the implementation of environmental health, and national building planning and design codes for health facilities, schools, and kindergartens. The AgaarNeg knowledge management platform, managed and maintained by the Secretariat of the National Committee for Reducing Environmental Pollution, serves as a central knowledge resource and collaboration hub for stakeholders working to reduce air pollution in Mongolia.

The project has made possible the installation of advanced mechanical ventilation systems in six kindergartens and three health facilities, allowing a constant flow of outside air into rooms and providing filtration, dehumidification, and the conditioning of incoming outside air. This quieter and lower-cost ventilation system has brought a range of benefits, such as improved IAQ, elimination of mold and moisture, and a reduction of health problems caused by indoor air pollutants. Over 100 low-cost sensors for IAQ monitoring were installed in kindergartens and health facilities, and community-based maternal and child healthcare was institutionalized.

In 2019, the Ministry of Environment and Tourism and the National Committee for Environmental Pollution Reduction signed an agreement with State Bank, XacBank, and Khan Bank to subsidize loans targeted for the home insulation, electric heating, and eco-toilets of ger area residents. UNICEF's flagship Cooking, Heating and Insulation Products (CHIP) package has been recognized as a green product and is eligible for green loans issued by commercial banks. I am pleased to acknowledge that the CHIP package has helped improve indoor air quality for over 1,600 households in Ulaanbaatar and six provinces, benefiting the population in these areas, which totals 1,765,160 people. To make CHIP more affordable for people living in ger areas, the Ministry of Environment and Tourism has taken the strategic step of reducing the annual interest rate for green loans from eight per cent to three per cent per annum.

On behalf of the Ministry of Environment and Tourism and its agencies, I express my sincere gratitude to SDC, UNICEF, contributing donors, and partners. ■

**Stefanie Burri, PhD**

*Head of Swiss Agency for Development and Cooperation (SDC), General Consul*

Switzerland and Mongolia are committed to implement the Agenda 2030 for Sustainable Development. The Swiss Agency for Development and Cooperation (SDC) globally supports initiatives that contribute to a 'greener world' and measures to reduce air pollution. We are convinced that these measures not only make our world much more liveable, but can also very concretely impact people's improved health and livelihood. The Impact of Air Pollution on Maternal and Child Health project is an excellent example.

On behalf of the Swiss Agency for Development and Cooperation, it is my pleasure to share the results of this project implemented by UNICEF and supported by the Swiss government.

Since transitioning from a centrally planned socialist economy to a free market system, Mongolia has faced social and environmental challenges associated with rapid urban development. Air pollution is a distinctive problem among the various challenges because it affects almost everyone, from unborn children to the very old and those who suffer from pre-existing health issues.

While most of the efforts made by the government and development partners focus on cleaner energy solutions and infrastructure, the project successfully piloted and introduced solutions to reduce on-site risks for children and pregnant women in households, kindergartens and health facilities, as well as to influence relevant policies.

With different key players, we have contributed significantly to improving primary healthcare services for children and pregnant women to cope better with indoor air pollution and, consequently, reduced incidences of pneumonia amongst children and air pollution-related pregnancy risks.

Ulaanbaatar is one of the coldest cities in the world. With long winter months, keeping houses warm and heated is of utmost importance. Successfully tested solutions using electricity instead of coal for the most vulnerable families in Ulaanbaatar and provincial centre of Bayankhongor Province are being introduced to the local market. Among these solutions, the Cooking, Heating and Insulation Products (CHIP) enables the replacement of traditional coal-based stoves in gers. A crucial factor for deciding to replace stoves is the affordability of solutions, which is addressed through green loans provided by the Government of Mongolia, banks and non-banking financial institutions.

With UNICEF and project partners, the project established the AgaarNeg knowledge platform accessible to all citizens, researchers, and policymakers. The platform creates access to evidence and information on air pollution and tools for awareness-raising on actions to be taken in households and childcare and healthcare facilities. The http://www.agaarneg.mn platform creates an opportunity for citizens, civil society organizations, researchers and policymakers to coordinate and synergize their actions on air pollution.

Through these innovative solutions and joint efforts, air pollution and its harmful impacts on maternal and child health can be reduced significantly. The key role here is attributed to the young Mongolians who increasingly advocate for concrete actions to claim their rights to clean air and a safe environment. Youth empowerment activities through Teen Parliament and the Scout Association of Mongolia will continue beyond SDC's support.

On behalf of the Swiss Agency for Development and Cooperation, I would like to thank the Government of Mongolia, the UNICEF Mongolia team, international research partners and my SDC colleagues here in Mongolia. We are confident that our Mongolian partners will sustain the project results and continue their efforts with other partners worldwide and in-country for clean air and healthy people. ■

[1] Traditional felt tents of nomads (yurts).
[2] The "Teen Parliament" is an initiative of the Mongolian Parliament to bring the voices of young people into decision-making.





**Evariste Kouassi-Komlan**

*Representative*
*UNICEF Mongolia*

Today, air pollution affects our daily work and life and limits opportunities for a safe, healthy and sustainable future. We understand that air pollution is caused by many factors: the infrastructure we build, the services we provide, and our attitude and behavior. We are increasingly aware of how to tackle exposure to air pollution and its impacts on public health.

With the contribution of the Government of Switzerland and many other donors, UNICEF implemented the Impact of Air Pollution on Maternal and Child Health project in 2018-2022. Today, we are proud to acknowledge our achievements in the fight against air pollution, which happened as a result of increased data and evidence, strengthened systems and policies, air quality and healthcare interventions on the ground, community and youth empowerment, innovations to enable coal-to-clean technology transformation such as cooking, heating and insulation products (CHIP), and inclusive financial services.

UNICEF acknowledges that the data and evidence generated through scientific inquiries, research and studies under the project have proven tremendously helpful in advocating policies and informing communities. In this regard, we highly appreciate the contributions of academic and research institutions, namely, the Mongolian University of Science and Technology, the Mongolian National University of Medical Sciences, the National Center for Public Health, Washington University in St. Louis, the University of Waterloo, the University of Pennsylvania, and the University of Birmingham, among many others. Unsurprisingly, academic collaboration between national and international universities and institutions has created new interest and is now leading to more scientific research and analysis opportunities. I also believe the young scientists and students involved in the research and studies have gained a competitive advantage in their professions and subject fields.

Young people have expanded their knowledge of air pollution and climate change and learnt critical leadership, advocacy and persuasive skills by talking to their classmates, friends, parents, teachers, citizens and decision-makers and acting in their communities. In their journey to learning, advocating, and acting, these children and young people have gained adaptation and mitigation skills—how to anticipate and overcome challenges and find alternative solutions. Three young people participated in large international events: the UNICEF Generation Unlimited event in New York City and the 27th Conference of Parties (COP 27) on Climate Change in Sharm El-Sheikh, Egypt. I believe that through such global programmes and events, they have been exposed to a global dimension of learning and various examples of youth engagement. They understand what they can aspire to and how they can better engage in climate change and air pollution actions to improve the situation.

I would like to acknowledge and commend the generous and tireless efforts of our partners in implementing the project, including the Sub-standing Committees of Parliament; the Ministry of Environment and Tourism; the Ministry of Health; the Ministry of Construction and Urban Development; the Ministry of Education and Science; the governments of Bayankhongor, Govi-Altai, and Umnugovi provinces; the Municipality of Ulaanbaatar; Bayanzurkh and Songinokhairkhan districts; the Mongolian Sustainable Finance Development Association (MSFA); People in Need; the Scout Association of Mongolia; and the private sector represented by banks, non-banking financial institutions and CHIP producers, among many others. Their important role and committed leadership have enhanced the likelihood of our success in achieving our goals.

Throughout the project's implementation, we have worked with community members, community health workers, volunteers, influencers, and members of different social groups. They never stopped working, not even during the most challenging times of the COVID-19 pandemic, reaching communities and the most vulnerable.

Looking back, I remain immensely grateful to our donors, partners, colleagues, friends and people of Mongolia who have contributed to this wonderful project towards **CLEAN AIR FOR EVERY CHILD.** ■

DATA AND EVIDENCE

COMMUNICATION

# AIR POLLUTION & OUR FUTURE

**ONE** of the biggest threats to Mongolia's future is air pollution.

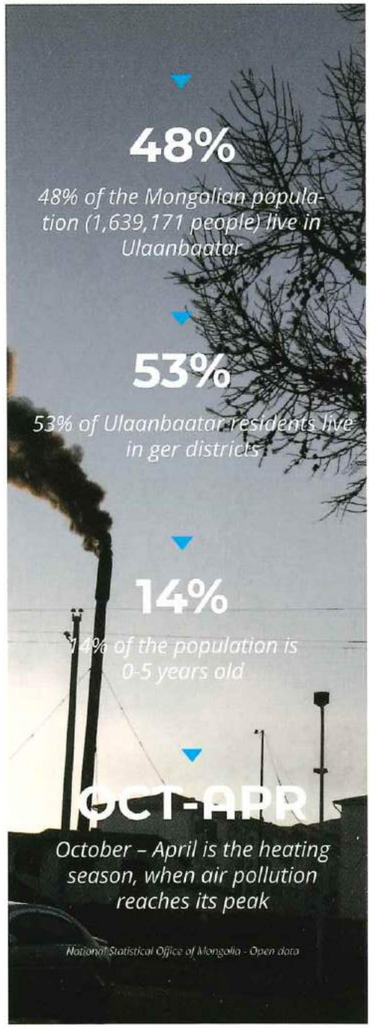
In urban settlements across the country, where 60 per cent of the population now live, air pollution can sometimes be tens of times higher than the World Health Organization's recommended levels. However, this is only one part of the picture.

Influenza, pneumonia, and other flu-like diseases have always been common during Mongolia's winter months. Sadly, however, these illnesses have drastically increased in severity due to air pollution. Currently, 300 people die each year due to air pollution-related illnesses, of which 240 are children under the age of five. This figure unequivocally demonstrates that children are the most negatively impacted by air pollution.

So what's causing this crisis? Here, in the world's coldest capital city, the household use of raw coal contributes between 70 to 80 per cent of air pollution, with traffic congestion and coal-fired heat-only boilers contributing to the rest.

The Government of Mongolia has taken considerable measures as part of the National Program for Reducing Air and Environmental Pollution—banning the use of raw coal, switching to coal briquettes, and reducing the cost of nighttime electricity. Alongside these actions, the government has also put forward additional ambitious plans and policies, but the lack of noticeable improvements demonstrates that the actions taken so far are inadequate.

Whilst these policies and plans are well-intentioned, Ulaanbaatar's air toxicity has not improved and, concurrently, the air pollution in Bayankhongor, Orkhon, Umnogovi, Khovd, and Khuvsgul's provincial centres has significantly worsened.




Stand-alone policies, no matter how sound they may be, are not enough. To bring about long-term, meaningful change, investments in independent research, accessible and reliable information, and citizen participation remain critical. It is also vital to carry out advocacy and training initiatives geared toward reducing heat loss, improving indoor air quality, and ceasing the use of raw coal.

It is here that the Swiss Agency for Development Cooperation, UNICEF, and partners have played an important role to support the government and communities across Mongolia.

The agreement between SDC Mongolia and UNICEF Mongolia to implement the four-year programme on the Impact of Air Pollution on MCH was signed on 5 October 2018. At the impact level, the programme aims to contribute to: 1) reduced prevalence of pneumonia among children under five; and 2) reduced incidence of pregnancy risks related to air pollution. The programme aims to achieve the following outcomes:

1. Improved capacity to generate and disseminate data, research, analysis and information on air pollution and MCH.
2. Preschool children and pregnant women are at lower health risk from air pollution through community-level risk reduction measures.
3. MCH risk reduction measures are integrated into relevant national and local policies.■



1 Ministry of Health, National Center for Public Health, MNUMS, UNICEF. "The Links Between Air Pollution and Childhood Asthma" study. 2019.

# SCIENCE TELLS THE TRUTH ABOUT AIR POLLUTION

For nearly a decade, air pollution has remained one of the most debated topics among Mongolia's urban residents, but reliable sources and data on how it affects the overall health of mothers and children were previously very scarce. The situation prompted the Government of Mongolia and its partners to capture a complete picture—driven by Mongolia-specific data—of the impact air pollution was having on maternal and child health to find optimal solutions to address the problem.

Building on their partnerships, a team of researchers from national and international institutions carried out compelling studies on air pollution and its health impacts: household IAQ; the monitoring of IAQ using low-cost sensors; the direct and indirect costs of absenteeism in the private sector due to air pollution; the use of the Internet of Things (IoT) and big data to quantify the outcomes and health impacts of air pollution; compound analysis of PM2.5 in Ulaanbaatar; and emission estimations for the thermal power plant and other stationary sources in Dalanzadgad soum centre, Umnugovi Province, and many other sites.

The collaboration included, but was not limited to, the National Center for Public Health, the National Agency for Meteorology and Environmental Monitoring, the Mongolian National University of Medical Sciences, the Mongolian University of Science and Technology, the University of Birmingham, Washington University in St. Louis, and Waterloo University, enabling strengthened capacity for data analysis, data exchange, joint scientific publications, and sustainable, long-term partnerships.

## THE IMPACT OF STUDY RESULTS

> THE RESULTS OF THE STUDIES AND RESEARCH WERE PROFOUND AND INFORMATIVE FOR POLICY DECISIONS, PUBLIC COMMUNICATION AND ADVOCACY.

The results of the studies and research were profound and informative for policy decisions, public communication, and advocacy. In one study conducted from 2019-2020, 80 IAQ samples were collected from 33 schools, kindergartens, and hospitals in Ulaanbaatar. Researchers found that 16 samples had traces of formaldehyde and benzene present. Another 2019 study of IAQ on volatile organic compounds also showed higher levels of formaldehyde and benzene in indoor air compared to the WHO-recommended level.

The average carbon dioxide level ($CO_2$) in kindergartens was 1.2-2.9 times higher on weekdays compared to the Mongolian national standard.

A study on the relationship between air quality and asthma concluded that asthma occurs more in winter and during weekdays, is more prevalent among adults over

*A pregnant woman's exposure to air pollution affects their unborn child's lungs and respiratory tract, leading to a high risk of premature birth, fetal death, and miscarriage.*

*It is observed that women who become pregnant between November and January are significantly more likely to give birth prematurely in May and August. Other abnormal side effects include:*

- *Heavy postpartum bleeding;*
- *Increased abnormal fetal development;*
- *Increased complications during pregnancy and childbirth;*
- *Increased stillbirths, premature births, and lack of oxygen.*

*In the first six months of pregnancy, mothers who breathe air with high levels of PM10 and PM2.5 particles are more likely to have high blood pressure, while nitrogen dioxide and sulfur dioxide in the air at 4-6 months of pregnancy have been observed to cause diabetes.*

**3.5↑**

Fetal death is 3.5 times more common in winter than summer.

EXPERTS STUDIED THE SOURCES OF INDOOR AIR POLLUTION AND FOUND THAT PM2.5 PARTICLES GREATLY EXCEEDED THE WHO-RECOMMENDED GUIDELINE LEVELS ON MOST (82-94 PER CENT) OF THE MEASUREMENT DAYS.

40 and older women, and could be reduced by 80 per cent (five times less) if/when Mongolia achieves its target air quality levels.

The findings allowed the National University of Medical Sciences and the Mongolian State University of Education to integrate the impact of air pollution on MCH and air quality monitoring into medical, public health, and preschool education curricula.

Health complications caused by air pollution also significantly burden household finances and the overall Mongolian economy.

The burden of air pollution also extends to the private sector. During winter months, when air pollution is at its highest, labor productivity declines. The productivity phenomenon during winter months was found to be largely caused by absenteeism as employees or their children get sick, causing them to fall behind on or miss work. According to a UNICEF-led study, an employee of a private organization operating in Ulaanbaatar loses about 10 per cent of their annual income due to air pollution-related causes like absenteeism.

In 2022, building on the knowledge of the past few years, the Ministry of Environment and

**40%↓**

*The lung function of a child who lives in a polluted area of Ulaanbaatar is 40 per cent lower than that of a child breathing unpolluted air.*

**33%↑**

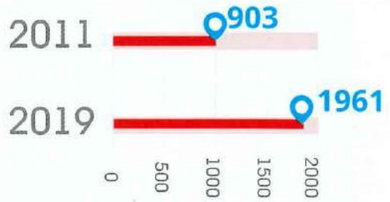
*As a result of high PM2.5 concentrations, the mortality rate of children under five years old increased by 33 per cent due to respiratory diseases.*

**42.4%**

*In 2014, 42.4 per cent of children in Ulaanbaatar under 18 were hospitalized due to puncture wounds.*

The adverse health effects of air pollution:

*Cardiovascular diseases* | *Lung disease* | *Asthma* | *Eye disease* | *Skin inflammation* | *Bronchitis*




*In 2011, 903 out of every 10,000 people in Ulaanbaatar suffered from respiratory diseases. In 2019, this number more than doubled to 1,961. This significant increase is easily attributable to the rise in air pollution.*

**435**

*In 2015, 435 children died of pneumonia.*

*As of 2018, one in five deaths from pneumonia were children under the age of five.*

*Children in Ulaanbaatar are five to 15 times more likely to suffer from bronchial inflammation than children in rural and local areas.*

*In 2018, out of 365 days in the year, the average concentration of PM10 particles exceeded the WHO's recommended tolerance levels on 299 days and PM2.5 particle concentration exceeded recommended levels on 212 days.*

**38.8%**

*As of 2020, 38.8 per cent of all reported respiratory diseases were among children 0-5 years old.*


2 National Center for Public Health "Impact of air pollution on health" report.
3 Ministry of Health "Air Pollution in Ulaanbaatar, its health impact" 2018.
4 National Center for Public Health "Mongolian Guidelines application awareness" activities.
5 Center for Health Development, WHO "Health Indicators 2020" report. 2020.
6 National Center for Public Health, Mongolian Public Health Professionals' Association, UNICEF "Understanding and addressing the impact of air pollution on children's health in Mongolia" report. 2018.
7 National Statistics Office of Mongolia "Air Pollution and Health Concerns in Ulaanbaatar" report. 2019.
8 Ministry of Health, National Center for Public Health, MNUMS, UNICEF "The Links Between Air Pollution and Childhood Asthma" study. 2019.
9 "The National Center for Maternal and Child Health, UNICEF, SDC "Impact of air pollution on MCH and vulnerable groups" 2021".
10 Center for Health Development, WHO "Health and Safety 2020" report. 2020.
11 Ministry of Health report. 2020.
12 National Center for Public Health "Mongolia's air pollution crisis: A call to action to protect children's health" report. 2018.
13 The Government of Mongolia, SDC, UNICEF "Costs of absenteeism due to air pollution among private sector employees in Ulaanbaatar, Mongolia" Observational Report. 2020.
14 UNICEF Mongolia, University of Birmingham, "Air pollution intervention and maternal and child health outcomes and service delivery in Ulaanbaatar, Mongolia" Inception report. 2021.
15 The National Center for Maternal and Child Health, UNICEF, SDC "Impact of air pollution on MCH-Vulnerables" 2021.




*Photo: Combatting Urban Air Pollution Impacts on Maternal and Child health in Asia: A Science and Policy Dialogue, 29-30 Oct, 2019, Ulaanbaatar, Mongolia*

Tourism (MoET) approved an action plan for the implementation of air pollution-related priority research from 2022-2025, providing increased opportunities for coordinated cross-sectoral research and collaboration in six thematic directions and bringing sectoral ministries and agencies together. The action plan created conditions to continue building a foundation of data through comprehensive research covering all aspects of air pollution. For instance, at the request of the MoET, the emission estimation of the coal-fired power plant and emission distribution mapping of the Dalanzadgad soum power plant in Umnugovi Province was carried out to generate new data on the source of pollutants and their impacts on health, and to recommend necessary steps and solutions to reduce air pollution from power plants.

## AGAARNEG PLATFORM

Significant efforts have been made to translate scientific evidence into publicly understandable language and short, simple messages to reach out to the community and protect people from exposure to air pollution. The report "Reducing the Impacts of Air Pollution on Maternal and Child Health: Scientific evidence and key messages for the public" summarizes evidence on the health impacts of prenatal and early life exposure to air pollution, and provides key messages and communication channels to increase public awareness of health risks and strategies to reduce exposure and associated health impacts.

The AgaarNeg platform, launched in March 2021, became operational as a new platform for knowledge management and exchange, enabling better coordination of initiatives and projects, stakeholder collaboration, and transparent and open access to resources, including information on the latest projects, research reports, procurement, consultancy, calls for proposals, and news/stories. The platform's operations have been transferred to the National Committee for Reducing Environmental Pollution, ensuring the sustainability of the platform's functions and further development, and use for policy formulation, dialogues and communication. To date, nearly 50 organizations are using the platform. ■

*Scan the QR code to join AgaarNeg knowledge platform*

# WINNING THE FIGHT AGAINST AIR POLLUTION THROUGH POLICY DIALOGUES

### Combatting Urban Air Pollution Impacts on Maternal and Child Health in Asia: A Science and Policy Dialogue

*29-30 October 2019*

This international conference brought together 50 scientists, experts, delegates of Asian governments, international organisations from 12 countries, and over 150 national delegates. The conference participants called for an urban clean air action plan, knowledge exchange on air pollution and its impacts, and broader regional cooperation, addressed in the outcome document "Facing the rising risks: Roadmap for regional cooperation to combat air pollution and its impacts on health and development". The lessons shared and ideas exchanged at the conference set the tone for UNICEF and the Government of Mongolia to kick-off national level research priorities and university educational programmes on air pollution and health, as well as strengthening government capacities to communicate about air pollution and health.

### Air pollution in the time of the COVID-19 Pandemic: Rights to a clean, safe, healthy and sustainable environment

*14 December 2022*

This high-level consultation meeting, organised with the Parliamentary Subcommittee on Air Pollution Reduction, led to the submission of 18 recommendations to Cabinet to reduce air pollution in accordance with the National Programme for Reducing Air and Environmental Pollution, considering the heightened and specific risks due to the COVID-19 pandemic. The WHO's Global Air Quality Guidelines require more efforts to improve ambient and indoor air quality, and countries' obligation and responsibility to protect children's rights to a healthy environment as indicated in the Universal Declaration of Human Rights and the UN Convention on the Rights of the Child.

### Accelerating National Air and Environmental Pollution Reduction Policy for Transformational Impacts

*24 May 2022 The conference organised with the Parliamentary Subcommittees on Air Pollution Reduction and Sustainable Development Goals recommended that the government:*

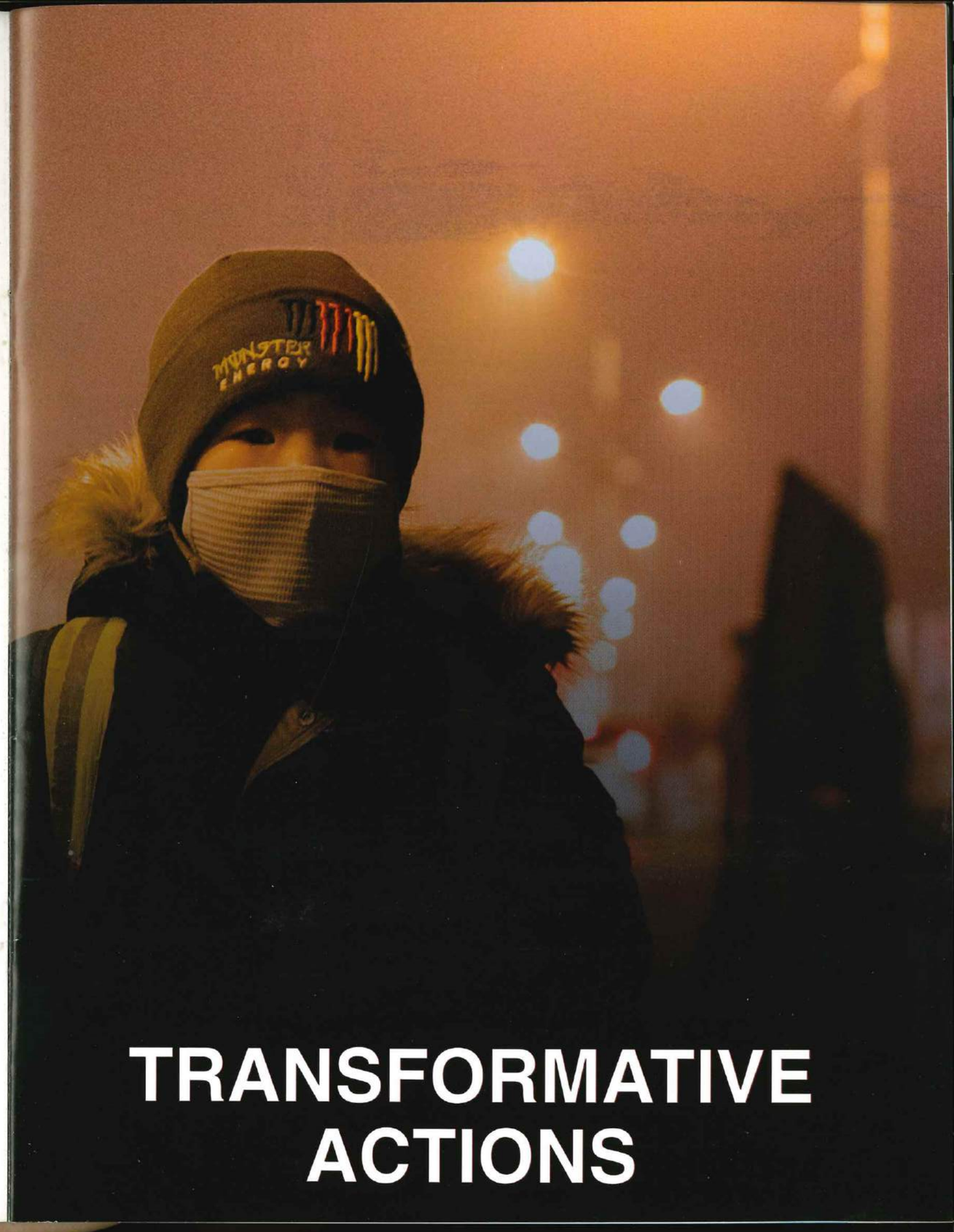
- Stop using coal-fired heat-only boilers in the capital, particularly to heat kindergartens, schools and health facilities, and make immediate decisions to connect to central systems or transfer to clean energy technology;
- Increase green investments in children's institutions, services and infrastructure;
- Increase green public investment and green public procurement in infrastructure, facilities and key services for children;
- Support households from target groups to access clean and energy-efficient heating technologies through social welfare service mechanisms;
- Develop an institutional mechanism to ensure better indoor air quality and predict health risks caused by construction and building materials; and
- Introduce IAQ management at schools, kindergartens and health organizations, making it an integral part of accreditation and performance management.

### Human rights and indoor air quality-Public hearing

*27 June 2022*

A public hearing was organised by the Parliamentary Standing Committee on Social Policy, focused on IAQ in kindergartens and schools and volatile organic compounds emitted from building materials commonly used in repair and maintenance. This high-level public hearing resulted in the recommendation of immediate government action: measures related to the control of imported building materials at the border, capacity enhancement of the state inspection laboratory, and necessary budget allocation in 2023. ■






# TRANSFORMATIVE ACTIONS

# SMALL SOLUTIONS LEAD TO BIG GAINS

## Improving indoor air quality

### INDOOR AIR QUALITY MONITORING

There were still considerable misconceptions among the public that the high levels of outdoor air pollution were a concern, but indoor air was clean. UNICEF, in close partnership with the Ministry of Health, the Ministry of Education and Science, and the National Committee for Reducing Environmental Pollution, worked to educate the public on the risks of poor indoor air quality and the adverse health effects it could bring. To do this, 80 low-cost air quality sensors were installed in 70 kindergartens and 10 health institutions. The findings from the monitoring did three things:

- The data empowered and informed parents and local leaders of the high levels of indoor air pollution in their schools and hospitals. With this knowledge, they were able to advocate for indoor air pollution reduction measures;
- Using data from the sensors, UNICEF demonstrated how to address the high level of indoor air pollution through improved ventilation systems and insulation, as well as prompt and effective actions when indoor air quality is poor; and
- The data demonstrated the need for a comprehensive approach to addressing indoor air pollution, where data collection and analysis were used not just for reporting but also to take action. As a result of this approach, the expansion of air quality monitoring within kindergartens and schools is now underway across the country.

Air ventilation system: With the support of the SDC, UNICEF developed a model air ventilation system suitable for Ulaanbaatar's weather conditions. The model was piloted in six kindergartens and three healthcare facilities: the Bayanzurkh Healthcare Center, Amgalan Maternity Hospital, and Dari-Ekh Hospital in Bayanzurkh District.

### THE AIR VENTILATION SYSTEM

installed in Kindergarten No. 63 is energy-efficient, low-cost, and low-noise. The kindergarten is also heated via electricity; electric heating costs are lower than coal heating.

The newly built 24-hour kindergarten, which has a capacity for 100 children, in Gachuurt village, Bayanzurkh district, has many advanced solutions that meet national and international standards for child-friendly educational institutions.

### AMBIENT AIR QUALITY MONITORING

Technical assistance was provided to the National Agency for Meteorology and Environmental Monitoring to strengthen their capacities, enable real-time measurement of PM2.5 and PM10 nationwide using low-cost air quality monitoring sensors, develop models for air pollution forecasting and mapping, and better analysis of air quality data. In this way, the geographical coverage of ambient air quality monitoring—particularly PM2.5 measurement—has been expanded nationwide. These interventions made it easier for the public, civil society, and independent researchers to access data on the levels of air pollution in their communities.

Over 150 kindergarten teachers and administrators in the Bayanzurkh and Songinokhairkhan districts of Ulaanbaatar, Bayankhongor, Govi-Altai and Umnugovi provinces were trained on indoor air quality, its measurement, and simple but effective measures to improve air indoors.

With the success of these small pilot models, the Government of Mongolia took a giant leap forward.

- The Ministry of Health approved the 2021-2024 Action Plan for Implementation of the National Environmental Health Programme, which includes improved air quality measurement to reduce adverse health effects. To support the ministry in fully realizing its plan, UNICEF committed to contributing to introducing air purification technology, increasing the use of clean fuels, reducing building heat loss, expanding the coverage of vaccines against pneumococcal or pneumonia, and many other measures.
- The Ministry of Construction and Urban Development updated and approved national codes on the building design and planning of hospitals, schools, and kindergartens based on the pilot insulation and ventilation systems demonstrated by the programme interventions. These updates to national building codes mean that tens of thousands of children will one day experience a learning or hospital environment where the air is clean and safe to breathe.



## WHAT HAS BEEN ACHIEVED?

**96** SENSORS

A total of 96 indoor air quality monitoring sensors were installed in 67 kindergartens and 21 health facilities.

**67** locations

By installing small, low-cost air quality sensors (Purple Air) in 67 locations across the country, PM2.5 particles were measured in Ulaanbaatar and all 21 provinces.

**1** monitor

A BAM 1020 PM2.5 continuous reference monitor was installed in Bayankhongor Province.

**6** kindergartens

In Bayankhongor Province, one kindergarten was recognized as a benchmark for retrofitting and having an advanced mechanical ventilation system. In SonginoKhairkhan district, two new kindergartens with advanced automatic ventilation systems were built, and three existing kindergartens were equipped with advanced mechanical ventilation systems.

**1,520** children

Today, more than 1,520 children aged three to five years have the opportunity to breathe clean air as their kindergartens are equipped with air ventilation systems.

## Community-based maternal and child healthcare

. In November 2018, the World Health Organization issued guidelines for the work of community health workers. Community-based maternal and child healthcare (CMCH) seeks to deliver child health interventions to mothers and children by improving key family practices to better prevent illness in the home, manage illness when it occurs, and seek preventive and curative services when necessary. UNICEF rolled out an international approach to training and empowering community-based health workers in Mongolia. More than 500 community members were trained to provide primary healthcare services at the hyper-local level. The community health workers were able to provide support to thousands of pregnant women and children living in remote villages and districts.

The success of community health workers has largely been the result of how they were selected. Each health worker was chosen from within their communities and then trained and employed on a voluntary basis. This approach ensured that the community health workers would understand their local context and be familiar faces that families could trust. This approach not only aligned with the national healthcare system's efforts but also helped to make soum health centres more accessible and addressed the human resources shortage in the health sector in hard-to-reach communities.

Specifically, community health workers were trained to:

- Educate their communities on how to reduce exposure to indoor air pollution;
- Build habits for parents to seek medical help;
- Monitor and advise pregnant women;
- Prevent diseases prevalent in infants and young children through vaccine education;
- Identify early signs of malnutrition and other harmful diseases; and
- Direct families to primary care physicians when/where needed.

The community health workers' interventions have been critical in preventing diseases that commonly occur in infants and young children and providing medical care in a timely manner.

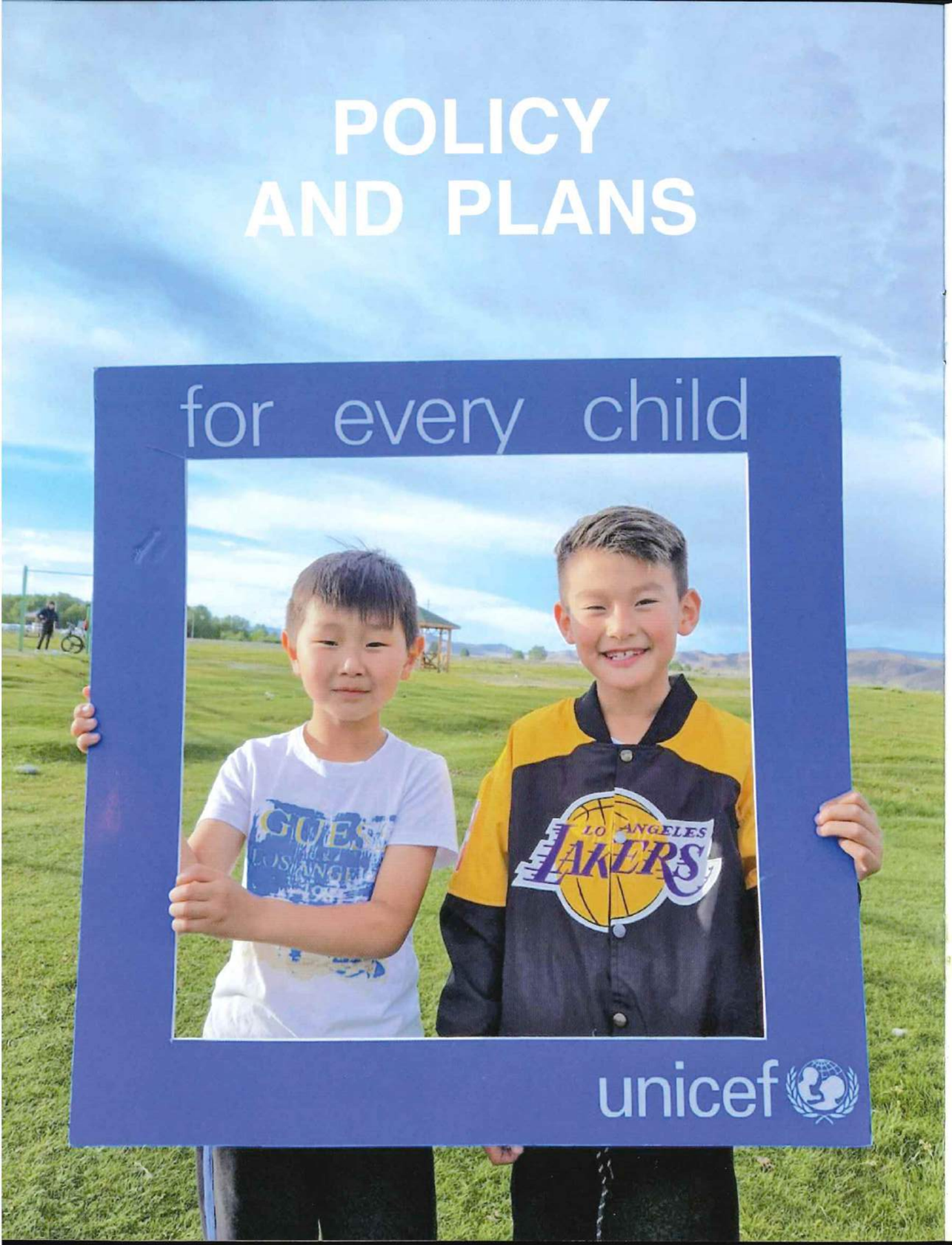
Codifying the community health workers approach, the Ministry of Health and UNICEF held a conference titled "Encouraging Public Participation in Strengthening Human Resources in the Health Sector and Sustainable Development Goals". The participants, including the district governors of all provinces and representatives from the Citizens' Representative Khural (Parliament), agreed to localize this approach across Mongolia.

"Primary healthcare is the main tool to achieve the Sustainable Development Goals and universal health coverage," said Ms. Ayako Kaino, Deputy Representative for UNICEF in Mongolia, during her speech at the opening of the conference.

"Universal health coverage means moving from a disease- and hospital-centered model to one that focuses on the citizens, and incorporating health issues within the entire life cycle of a person—not just limited to the health sector, to ensure equality."

Today, the Ministry of Health is integrating community-based maternal and child healthcare into its broader healthcare system. Thanks to UNICEF and the SDC's investments in this pilot, the ministry now believes that instead of providing healthcare only within the confines of traditional brick and mortar facilities, healthcare can, in fact, be provided via a community-to-community approach. At its core, this approach empowers citizens, local governors, district committees and other stakeholders to ensure that 'no one is left behind' and guarantees that healthcare is accessible for all.■

# POLICY AND PLANS




# MUCH-NEEDED CHANGES IN NATIONAL AND LOCAL POLICIES


*Photo: Air pollution in the time of the COVID-19 Pandemic: Rights to a clean, safe, healthy and sustainable environment 14 December 2022, Ulaanbaatar, Mongolia*

To protect the future from the effects of air pollution and reduce the economic burden to come, protecting the health of children and adolescents from air pollution should be a national policy priority.

UNICEF, in close cooperation with the Ministry of Environment and Tourism, the Ministry of Health, and local governments, with financing from the SDC and other donors, made the necessary changes in national, provincial, and local policies.

## NATIONAL LEVEL POLICIES AND PLANS

- Action plan for implementation of the National Programme on Environmental Health (2021-2025);
- Action plan for implementation of Nationally Determined Contributions to the Paris Agreement 2021-2025;
- National code on hospital building, planning and design (Jan. 2021); National code on school building design (2022); National code on kindergarten building design (2022);
- State green loan for CHIP in 2020 (eight per cent interest rate loan released by three commercial banks) and in 2022 (the interest rate was lowered from eight per cent to three per cent);
- The priority research themes and the action plan for the implementation of air pollution-related priority research, 2022-2025; and
- Mid-term environmental policy through 2030 (submitted to Parliament).

## SUBNATIONAL LEVEL POLICIES AND PLANS

Cooperation with provincial and local governments has been instrumental to the success of this work. For instance, the Clean Air Action Plan, which was developed and implemented with technical assistance from UNICEF and the Bayankhongor Provincial Government in 2019, became the basis for implementing similar programmes in Umnugovi and Govi-Altai provinces. Notably, the Bayankhongor, Govi-Altai and Umnugovi province administrations budgeted 1.25 billion MNT for implementation. For the Bayanzurkh and Songinokhairkhan districts for air pollution reduction activities, air quality monitoring, and CHIP project rollout, 370 million MNT was budgeted.

- Bayankhongor Province Clean Air Action Plan 2019-2022
- Umnugovi Province Clean Air Action Plan 2021-2024
- Gobi-Altai Province Clean Air Action Plan 2021-2024

Approval of these national and subnational-level policy and planning documents has led to increased state and local budgets to reduce air pollution and its impacts on maternal and child health.

## FEASIBILITY OF LOW CARBON TECHNOLOGY FOR PUBLIC BUILDINGS

The technical and economic feasibility study on transforming coal-fired heat-only boilers to ground source heat pumps for kindergarten, family health center and bag administrative buildings is ongoing in Bayankhongor Province. When realized, this solution will significantly reduce greenhouse gas emissions, improve air quality and reduce waste from coal burning.

## COOKING, HEATING AND INSULATION PRODUCTS – CHIP PACKAGE

The government's policy to introduce improved/refined coal to households and increase the use of electricity for heating was relatively challenging for urban households using traditional heating technologies, including 91,249 ger households in Ulaanbaatar. Although various air pollution reduction technologies have been introduced internationally, they are rarely suitable for Mongolia's climate, where winters are as cold as -45 degrees Celsius.

However, the introduction of CHIP, an innovative system for Mongolian ger insulation, heating, and ventilation, in cooperation with the School of Civil Engineering and Architecture of the Mongolian University of Science and Technology, local governments and People in Need INGO, became a very suitable, energy-efficient, affordable and practical solution for Mongolia's situation. An external evaluation by the Swiss Tropical and Public Health Institute (TPH) praised the results and implementation of the project and concluded that it contributes greatly to social and gender equality. This is because CHIP users not only save money but also save more than 40 minutes a day.

In addition, this reduced the amount of indoor PM2.5 and PM10 created by burning raw coal, which releases toxins such as sulfur dioxide, carbon dioxide and carbon monoxide. These toxic chemicals harm the health of children already growing up in an environment with high nutritional and drinking water risks.

At present, 1,676 households in six provinces and Ulaanbaatar, 11 kindergartens have solved their heating and air quality challenges by using CHIP. This not only helped them to live comfortably during the cold season but also helped reduce the risk of children being exposed to household burns. This transformation to clean technology has benefited the entire population of the provincial centres and Ulaanbaatar, totalling 1,718,380, or 72.6 per cent of the households living in Mongolia's urban areas.

*CHIP package: Air filters placed in the door.*

**CHIP users by population groups**

***Number of household member***

*3088*
*2832*

***Children under 5 years old***

*443*
*422*

***Number of children 6-18 ages***

*733*
*731*

***People with disability***

*68*
*95*

***Pregnant women***

*36*

***Elders***

*456*
*286*

***Single parents***

*236*
*121*




*T. Rys with grandchildren, CHIP package user family of Bayanzurkh district*
*Photo credit: People in Need Mongolia NGO*

## INCLUSIVE CHIP FINANCING SCHEME

**CHIP** is financed through a blended financing scheme: a subsidy from local government and project funding, green loans subsidized either by the government (the Ministry of Environment and Tourism) or non-banking financial institutions, and personal investment. Taking the results of the CHIP project into account, the Government of Mongolia agreed to provide green loans with a below-market interest rate of three per cent per annum to households interested in the package. This was an important decision to protect the health of 2,367,364 (2021, NSO) people living in Ulaanbaatar and other urban areas from air pollution.

The subsidies cover 50-70 per cent of the total CHIP price. The government's green loans are released nationwide through Khan Bank, Xas Bank, and State Bank of Mongolia. In addition, the private sector has contributed its own resources: Ulaanbaatar Investment and Management invested 80 million MNT in non-banking financial institutions (NBFIs) to provide loans for CHIP and Numur, Transcapital, GSB Capital and NET Capital NBFI's provided green loans for families This approach ensures CHIP's long-term sustainability. To date, 198 families have received green loans for CHIP packages.

The implementation of the project was delayed due to unavoidable external challenges, such as the closure of the Chinese border and the bans and restrictions caused by the COVID-19 pandemic. However, these challenges did not prevent the implementation of this project, which has become a centerpiece of national and local efforts to combat air pollution.■

**DATA**

**3%**[15]

Commercial banks in Mongolia offer loans to citizens with a 15 per cent interest rate, but for CHIP, thanks to green loan programs, they have been reduced to a three per cent annual interest rate.

**Twice lower interest rate:**[16]

Loans from NBFIs have an average interest rate of around 38 per cent . The MSFA has worked closely with NBFIs to provide green loans at 18-21.6 per cent interest.

**30 months**

Green loans are issued by commercial banks and NBFIs for a period of up to 30 months.

# INNOVATION DRIVE FOR CLEAN AIR

Stay warm, safe and healthy through the winter

I have five children. The little ones were at high risk of being burned because of the stove. I made a wooden gate to protect my kids from the stove, but it was too difficult for me as a visually impaired person; I would've fallen over it. Therefore, I was looking for electric heaters. I first learned about the CHIP packages for the Mongolian ger from my khoroo office and I have been using it since November 2021.

> "I AM BUYING THE CHIP PACKAGE FOR MY PARENTS THIS WINTER WITH A GREEN LOAN."

It helped me a lot that the CHIP package was three times cheaper than the same type of products, and it was possible to get a loan. Now, we are not making a fire to heat our ger, but it's really warm. In September 2022, when the weather got cold, we turned the heaters on for a long time, but the cost of electricity was only 78,000 MNT. It shows that the expenditure of using the CHIP package is cheaper than burning coal.

The CHIP heating package has a thermostat that automatically adjusts the temperature. It turns off when the ger's indoor air temperature reaches 30 degrees Celsius and turns back on when it approaches 20 degrees Celsius.

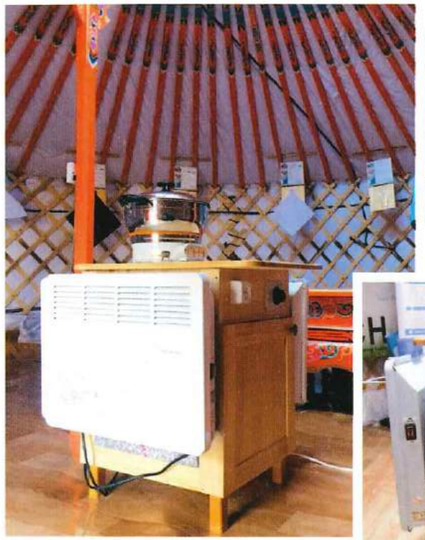
The CHIP heating package is installed on a cabinet and has an outlet for electric appliances. Most electric heaters make the indoor air too dry and it dries out a person's throat, but this heater does not. The ventilation system is perfect. Heat loss is low because the door and top opening insulation are designed precisely according to the size of the Mongolian ger.

Although there was much rain in summer and autumn, it was not uncomfortable thanks to the CHIP package. The bottom of the wall has insulation that is 20 cm high, so rain or dirt doesn't get inside. I am buying the CHIP package for my parents this winter with a green loan.

## B.MUNKHJARGAL

A CHIP user in 16th khoroo, Bayanzurkh District

## WHAT'S DIFFERENT ABOUT CHIP ?



*Thermostat to control electric heater*

*Electric heating package*

The Mongolian ger is a round, tent-like structure with one large room with a heating area of 28.5 m2. A stove is located in the centre, fired by solid fuels such as raw coal, firewood and briquettes.

The incomplete combustion of coal in low-efficiency stoves is one of the major causes of air pollution and per capita GHG emissions. On average, a household living in a ger uses approximately 3-4.5 tons of coal and 1.0-2.5 m3 of wood during the heating season. The heat loss is enormous in a ger.

> WITHOUT CHANGING THE GER'S STRUCTURE AND SHAPE, CHIP OFFERS THREE PACKAGES WITH SOLUTIONS: AN INSULATION PACKAGE, AN ELECTRIC HEATING SYSTEM WITH A THERMOSTAT, AND A VENTILATION SYSTEM.

**Extra layers of insulation:**

A CHIP ger demonstrates improved insulation by utilizing synthetic textiles—a thick tarp-like, durable, and dense material with a middle layer of recycled insulation—to better hold in heat and block external wind. Heat loss through a joining point between the floor and wall is reduced as it is covered with this synthetic insulation, eliminating energy losses. The material used for this measure is recycled felt that can be found in the local market.

**Electric heating:**

Three electric heaters with a capacity of 0.8 kW are attached to a wooden box and face each side of the ger, located in the center of the ger to transmit heat equally to all parts of the home. The electric heaters are monitored with an automatic thermostat. Accordingly, the heat spreads evenly throughout the ger while reducing the heat loss between the floor and walls.

**Air filter and ventilation:**

The air filter is placed on the door, and the exhaust air opening is attached to the top opening of the ger. As a result, the system constantly circulates air.



### DATA

**1,676 households and 11 ger kindergartens:**

CHIP packages have already been installed in 1,676 households and 11 kindergartens and 12 schools across Bayankhongor, Govi-Altai, and Umnugovi, Orkhon and Dundgobi provinces, and Bayanzurkh and Songinokhairkan districts in Ulaanbaatar.

**Automatic setting:**

When the temperature inside the ger drops and reaches a certain level, the electric heater automatically turns on and off, thanks to the introduction of a thermostat.

**3 - 4.5 tons of coal removed**

CHIP-user households no longer burn 3-4.5 tons of coal or a large amount of wood during the heating season.

**Burns:**

The risk of burns caused by firing a stove was nearly eliminated.

**90%**

Ninety per cent of CHIP users agreed that CHIP improved their gers' indoor air quality, and 89 per cent of respondents said that air intake fans are safe for their health and comfort.

**56,000**

A CHIP-using household spends 56,000 MNT less than a household that heats their ger with a traditional stove in the winter.

**40-90 minute**

On average, CHIP-using households save approximately 40-90 minutes per day. An external evaluation found this was very beneficial, especially for women.


# WHAT CANNOT BE MEASURED CANNOT BE MANAGED

**Real time measurement of air quality**

Since 2011, I have been working on different projects aimed at measuring air quality in Mongolia and studying how air pollution affects the human body. Air pollution measurement in Bayanzurkh District and Bayankhongor Province, in cooperation with UNICEF, is the third project I've participated in. We completed

> *"IT IS IMPORTANT FOR CITIZENS TO RECOGNIZE AND USE THE RESOURCES OF ALL LOW-COST MEASURING DEVICES."*

air measurements in a total of 29 kindergartens and six health centres with low-cost air quality monitoring sensors. However, PM10, PM2.5, and carbon dioxide levels were higher than expected.

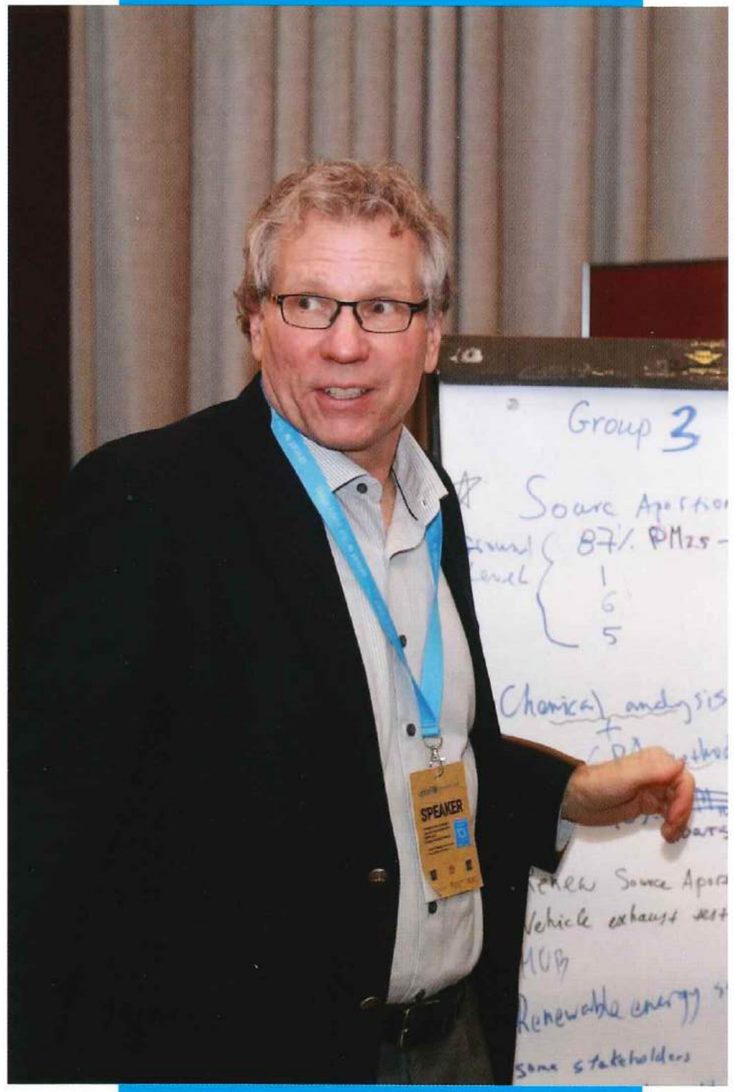
For example, the city center gardens are located close to each other, but the indoor air quality is different. This is due to the different sources of air pollution.

For example, the research showed that indoor air quality depends on many factors, such as the number of children exceeding capacity, the building's insulation, the building's structure, the materials used, whether the building is old or new, and so on.

Regarding outdoor air pollution, PM2.5 and carbon monoxide levels vary at different times of the day. By continuously measuring for 24 hours, we know how much air pollution there is at a certain time of the day and what the main sources of pollution are. By then making the hourly data available to the public, any of us can get air quality information at any time.

Currently, UNICEF has installed small air quality sensors in 67 locations across the country, and it is commendable that our air quality measurement network continues to expand.

This winter, working in collaboration with the National Agency of Meteorology and Environmental Monitoring, it is able to measure air pollution in more provinces. Above all, it is important for citizens to recognize and utilize the availability of low-cost measuring devices. ■




# JAY TURNER

Professor at
Washington University
in St. Louis, Missouri,
USA



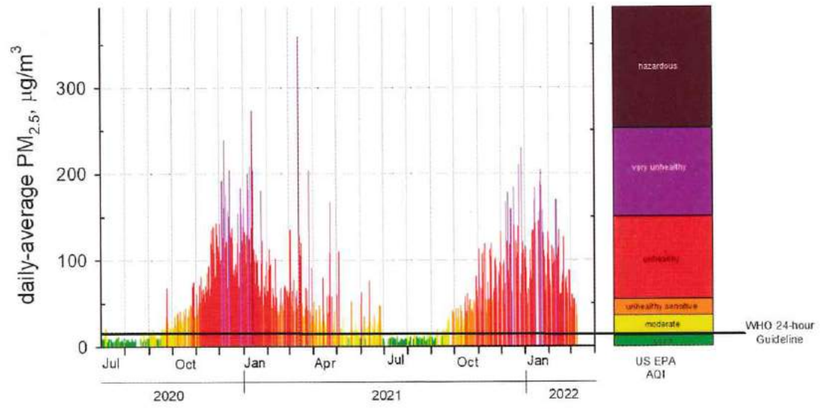
## REAL-TIME MEASUREMENT OF AIR QUALITY

One of the significant measures carried out within the framework of the Reducing the Impacts of Air Pollution on Maternal and Child Health programme is the creation of a system for the 24-hour, continuous measurement of indoor and outdoor air pollution, and the subsequent development of solutions for combatting air pollution based on actual research and statistics.

Air pollution measurements and research were also carried out in cooperation with UNICEF and the National Agency for Meteorology and the Environmental Monitoring, led by Professor Jay Turner of WUSTL and B. Munkhbayar, director of the Building Energy Efficiency Center of the Mongolian University of Science and Technology. They installed a BAM 1020 air quality monitoring reference station in the centre of Bayankhongor Province, which measures and reports PM2.5 particles every hour to measure outdoor air pollution. They also organized training for local experts on operating the air quality monitor. The monitor records the amount of fine PM2.5 particles, and the collected data is uploaded to the http://w.tsag-agaar.gov.mn/ website in a way the public can understand.

> *"The amount of fine particulate matter or PM 2.5 in Ulaanbaatar city air is 40 to 50 times higher than the tolerance limit set by the World Health Organization (WHO) in winter."*

Bayankhongor, July 2020-February 2022



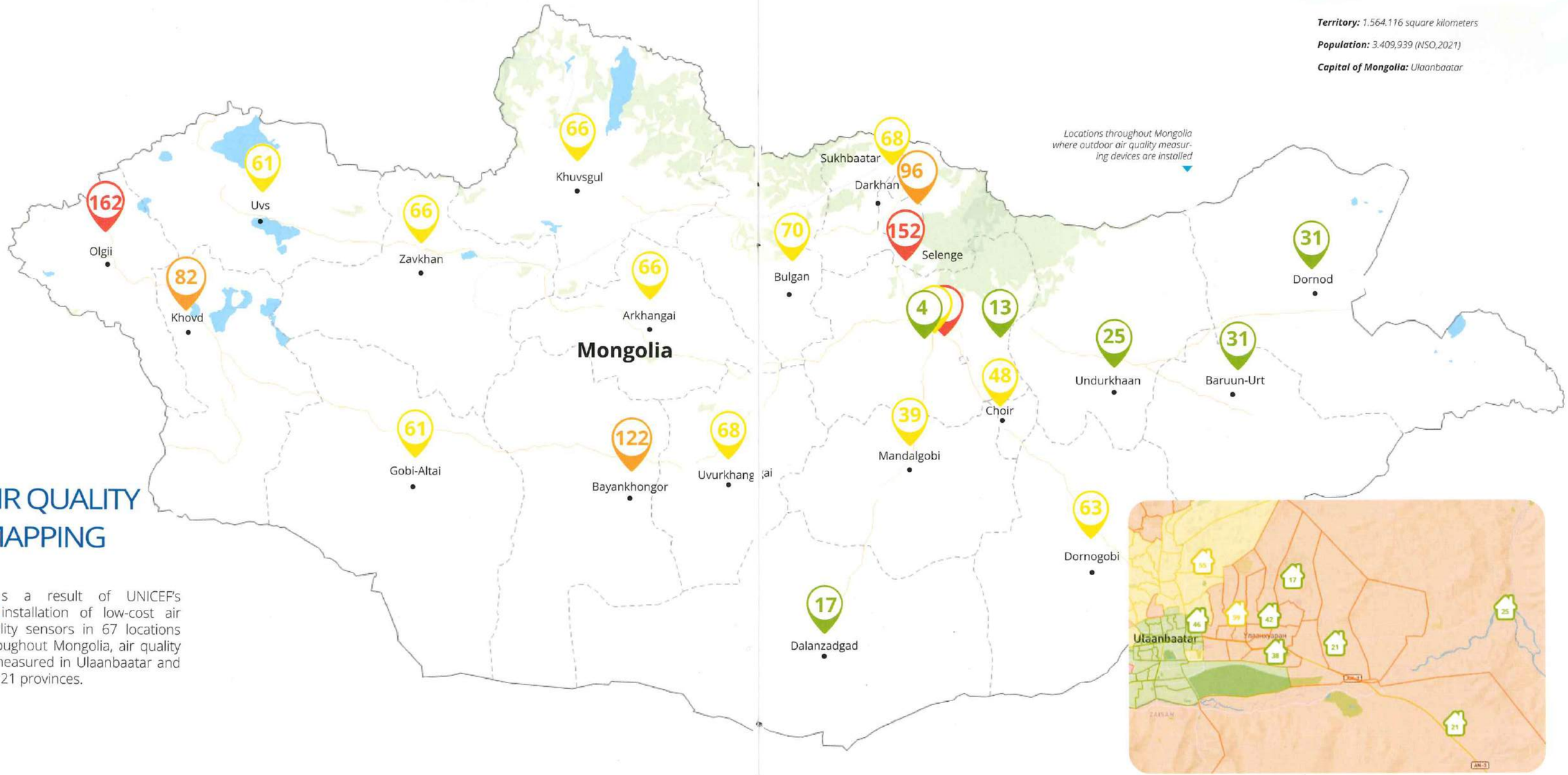

**Orange box: What is the importance of regularly measuring ambient air pollution?**

- *Recognizing the most polluted time of day*
- **PM2.5** — *Citizens monitor air quality and pay attention to reducing exposure to air pollution*
- *Planning air pollution abatement measures*
- *Developing air pollution prediction models*
- *Decision-makers will take effective measures for target groups*

GOOD 0-50
MODERATE 51-100
UNHEALTHY FOR SENSITIVE GROUPS 101-200
UNHEALTHY 201-300
VERY UNHEALTHY 301-400
HAZARDOUS 401-500

# AIR QUALITY MAPPING

As a result of UNICEF's installation of low-cost air quality sensors in 67 locations throughout Mongolia, air quality is measured in Ulaanbaatar and the 21 provinces.




**GRAPHIC /AIR QUALITY INDEX/**

| 0-50 | 51-100 | 101-200 | 201-300 | 301-400 | 401-500 |
|---|---|---|---|---|---|
| Good | Moderate | Unhealthy for sensitive groups | Unhealthy | Very unhealthy | Hazardous |

*Locations where outdoor air quality measuring devices are installed*

*Locations where Indoor air quality measuring devices are installed*

*Scan the QR code to find out today's air quality.*


# COMMUNITY-BASED HEALTHCARE SERVICE

Leaving No One Behind



G.Buyantsetseg has worked at a hospital her entire life. When she retired, she still loved every bit of her job. In fact, she really missed it.

"When UNICEF announced a project to train volunteers to provide health advice and services, I enrolled in training immediately. I started working here at the family healthcare center," Buyantsetseg recalled.

Although Buyantsetseg spent her life in the healthcare sector, she was still nervous, as it is often rightly assumed that to volunteer at a hospital, one must gain in-depth health education and what to consider when providing care.

To help get Buyantsetseg and the other community health workers up-to-speed, Dr. Sh. Oyukhuu provided training and shared invaluable knowledge and experience with the trainees.

After training with Dr. Oyukhuu, Buyantsetseg gained more confidence.

"We were mobilized to take care of pregnant women and newborns, and answer questions from local residents over the phone during the peak of the COVID-19 pandemic, during the lockdown and when the lockdown was relaxed. To this day, I enjoy doing this work," she said.

It's not only medical professionals and volunteers who have been involved directly in the programme but also local residents.

Many of the trained community health workers are ready and eager to lend a helping hand—day or night.

"The volunteer hotline can ring at any time of the day. Most of the registered calls are requests for assistance from people whose children have caught a cold or pneumonia," said Buyantsetseg.

The community health workers also provide information on preliminary test results for early detection that are covered by health insurance. ■

## G.BUYANTSETSEG

A volunteer at Eruul Orshikhui Family Healthcare Center in the 32nd khoroo, Bayanzurkh District

# REACHING THE UNREACHABLE

It is vital for everyone to receive quality healthcare services when they need them, regardless of where they live. In particular, the need to provide adequate health services to Mongolia's remote khoroos and soums continues to grow. Primary care services should focus on leaving no one behind by adopting strategies that target vulnerable and abandoned population groups.

When the Reducing the Impacts of Air Pollution on Maternal and Child Health programme started, human resources in Mongolia's health sector were under active discussion. Staff shortages, particularly in remote communities, were a growing concern. Many believed that community participation within primary care could have a profound impact on Mongolia's health system. But, 'how' to do it was a puzzle.

Since then, the introduction of the community health workers initiative has become a transformative approach to addressing the human resource challenges within the health sector, filling the gap with their support, enthusiasm, and active engagement. Many countries have been recruiting community health workers in accordance with their socio-economic conditions, and Mongolia has now joined this practice.

Community health workers that complete special training are able to provide basic health advice and services. These are essential roles that enable households to continue receiving basic health services, particularly those living in remote areas that are far from urban settings, difficult to reach, are not registered within their district, or are internal migrants.

In addition to supporting families in their khoroo or bagh communities by monitoring pregnant women, preventing diseases that commonly occur in infants and young children, and helping to ensure prompt access to hospital services, many community health workers are also helping to eliminate social discrimination.

> *IN 2020, A TOTAL OF 106 CITIZENS WERE SELECTED AND START-ED THE TRAINING TO WORK IN GROUPS OF 5-6 IN THE MOST REMOTE AREAS OF THE BAYANZURKH DISTRICT.*

The pilot phase of the community health worker training project, which began in 2019, started with training specialists in 18 khoroos in the ger areas of Bayanzurkh District. A training room for the district's community health workers was furnished and equipped.

Even during the COVID-19 lockdown period, community health workers participated in four comprehensive online training sessions. As a result of the programme's constant counseling and support, these community health workers helped immensely by filling in the gaps at primary healthcare centers during the pandemic, often giving advice to residents over the phone and contacting patients' family members during difficult times.

Through the project, 545 community health workers were trained, and primary health advice and services are provided regularly in Bayanzurkh District and in Bayankhongor, Govi-Altai and Umnugovi provinces.

United to support others, community health workers—outfitted in blue vests—are dedicated to helping people living in remote soums and districts access timely health services. They have been trained to help others, devoting their time and care to the betterment of their community's health.

Community health workers continue to be celebrated and praised by primary healthcare center doctors and nurses for their enormous support.■

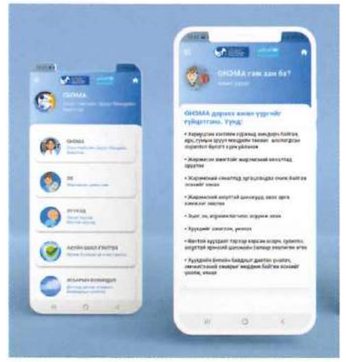
Photo by UNICEF, 2020



# "COMMUNITY HEALTH WORKER TEACHER" APPLICATION

The Community Health Worker Application, launched in 2022, is now widely used by community health workers in their daily work. It contains all types of information about what recommendations to give and how to provide basic healthcare to infants, young children, and pregnant women.

New recommendations have been added to the "Maternal and Child Health Book", which is the primary tool for child development assessment and early detection. In addition to providing recommendations on how to take measures at home if a child has symptoms of severe illness requiring calling an ambulance or going to the hospital, a special section has been added on diagnosis, treatment, recording of children's health, and the prevention of exposure to air pollution.



*CHW application – Cover page and corner of the function.*

Community health workers are teaching and advising parents on how to update this book correctly and know their child's health status early.

Photo by UNICEF, 2020, COMMUNITY HEALTH WORKERS TRAINING

> *When I look at our community health workers, they are truly altruistic angels who care for people like their own children, parents, and siblings. I am proud and grateful for their humanity and compassion. UNICEF's implementation of this project established a much-needed foundation in our country's health sector. It became a practical experience that can be supported and operated by our government. I would like to express my sincere gratitude to community health workers, project implementers, and all other stakeholders for making miracles happen.*

*Doctor Sh. Oyukhuu, consultant for preparing the "Community Health Worker" project of UNICEF.*

## DATA

### 2018.11.26

The World Health Organization issued guidelines for the operation of CHW (Community Health Workers)

### 128 health-care centers

Community health workers are currently providing information, advice, and care assistance in 128 family healthcare centers in Bayanzurkh district of Ulaanbaatar and 4 provinces.

### 5 locations

135 training facilitators from all soums of Bayankhongor, Govi-Altai, Umnogovi and Zavkhan provinces and Bayanzurkh district of Ulaanbaatar were equipped with the knowledge and skills to train CHWs.

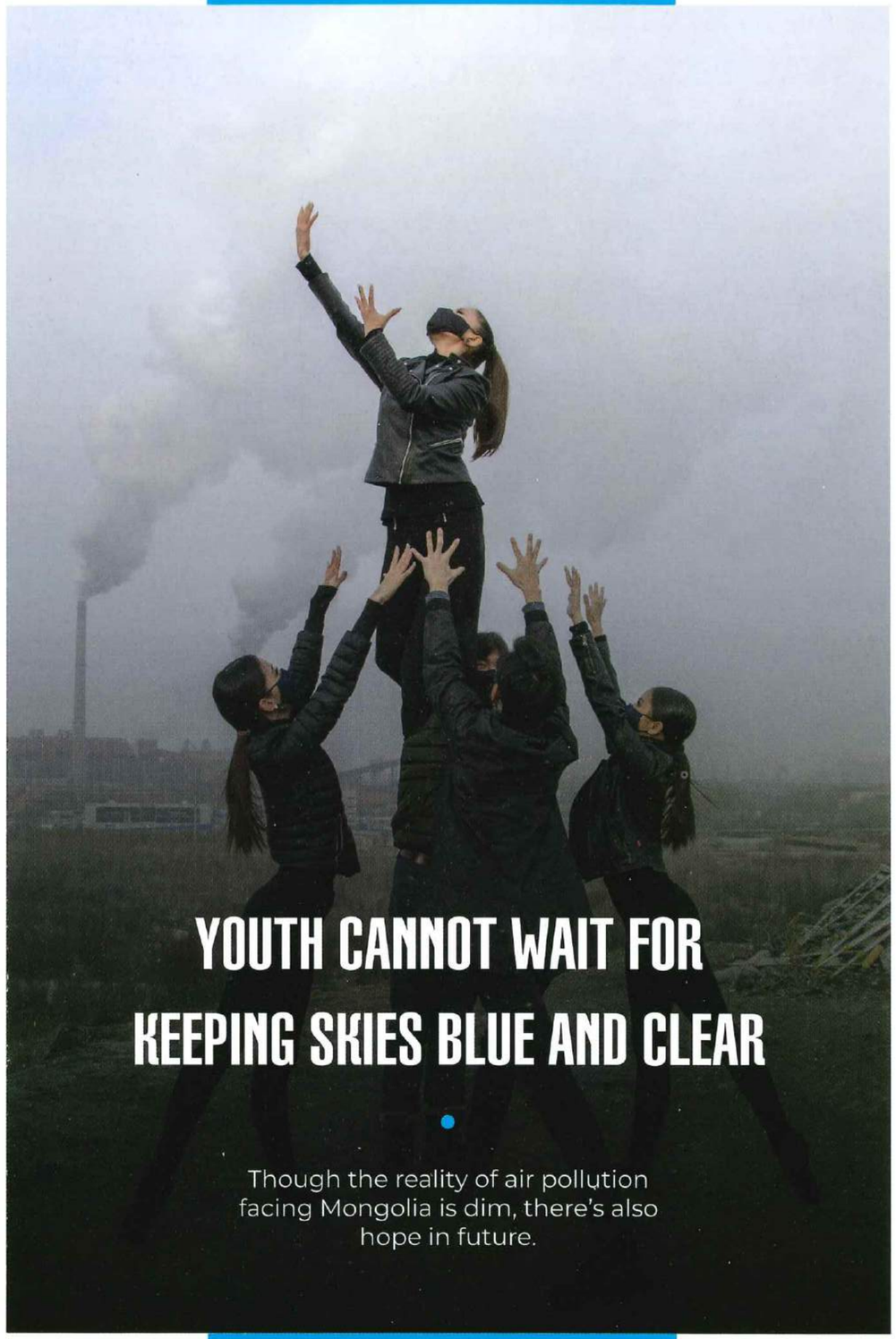
### 521 CHWs

The trained community health workers are currently providing service to local communities.

Community health workers are providing service to:

**87,650** *children aged between 0 to 5*

**12,531** *pregnant women*



# YOUTH CANNOT WAIT FOR KEEPING SKIES BLUE AND CLEAR

Though the reality of air pollution facing Mongolia is dim, there's also hope in future.

I am a 2021 graduate of the Teen Parliament project implemented by UNICEF in partnership with the Parliament of Mongolia.

Thanks to this valuable project, I became aware that our earth needs the care and support of children and youth. I've just arrived in vibrant New York City after traveling from Govisumber, the tiniest province in Mongolia.

I am representing my country, my peers, and the Teen Parliament programme at UNICEF's Generation Unlimited conference in New York. As with Legos, a set cannot be completed if one piece is missing. I would like to urge every single person at the conference to safeguard the environment.

I am the youngest among the young people at the conference from around the world. "You're only 16 years old? Aren't you brave for coming here by yourself?" The question is encouraging and reminds me that there are opportunities for all young Mongolians.

As soon as I got off the plane, I learned a phrase I had never heard before, 'jet lag', which refers to a time difference and changes in sleep schedule. I came to the realisation that you may learn new words and phrases without memorizing them right away or consulting a dictionary; instead, you can learn a word from its context in a sentence and use it in conversation.

The conference coincided with the UN General Assembly. I went to urge all countries to realise that we need each other.

The main reason I was chosen for this conference is that I act and advocate to reduce pollution in my neighborhood and schools, and I am passionate about a better environment. Also, my English is good enough to communicate with other young people and express myself. So, being a student in a remote area doesn't limit opportunities, and I believe children who put in the effort will have access to endless opportunities.

This year's Generation Unlimited conference included a wide range of topics, but the ones that caught my interest included those related to the environmental rights of children, children's right to an education, and mental health. Due to the COVID lockdowns, people are experiencing psychological issues and feelings of loneliness. Mental health education is crucial for everyone's recovery.■



## O.MUNGUNZUL

11th grade student from the Govisumber province of Mongolia

# EMPOWER YOUTH ADVOCACY FOR CLEAN AIR AND CLIMATE CHANGE.

## DATA

**1,015,250** people

20 Days of Activism content on air pollution and climate change was developed and delivered to 1,015,250 people across Mongolia.

**11,600** KM

The "20 days of activism" was organized to encourage children and young people in their communities across Mongolia to learn, share, and directly engage with local leaders on issues concerning them on the environment and climate change.

**60,000**

children and youth

More than 60,000 children and youth were directly engaged and informed about air pollution and climate change.

**158,641** people

In 2021, a three-day youth summit on "Climate Change Through the Eyes of Children and Youth" was organized online, reaching 158,641 people.

**90** days

Approximately 4,000 air pollution measurements were taken over a 90-day period.

**8,894** particpants

In order to increase the membership of the "YOUCCAN" network and expand the scope of activities, an online mobilization drive was organized. In total, 8,894 children and young people directly participated.

*Source: The "Children and Youth Advocate for Climate Change and Clean Air" Project Report, 2021.*

There are 1.2 billion young people aged 15-24 worldwide, making up 16 per cent of the global population. As climate change becomes an urgent issue for everyone in the world, children and young people are increasing their activism. The children and youth of Mongolia are also united for a future that is sustainable and free from toxic air pollution. In Mongolia, with support from UNICEF and the SDC, tens of thousands of children and young people have engaged with the Youth for Climate Change and Clean Air Network (YOUCCAN), Teen Parliament, and Serser.mn, a platform for children and youth to evaluate the implementation of climate policies. These youth networks continue to unite young people by expanding their social circles and meaningfully engaging them in productive activities.

## YOUCCAN

*YOUCCAN - Youth for Climate Change and Clean Air Network*

In 2019, UNICEF and the Scout Association of Mongolia established the Youth for Climate Change and Clean Air Network (YOUCCAN). Subsequently, in 2019, as a part of the 30th anniversary of the Convention on the Rights of the Child, the 6th National Jamboree of the Scout Association of Mongolia was organized. With more than 1,000 participants in attendance, YOUCCAN members and UNICEF delivered lessons and information on how climate change and air pollution impact our lives. To this day, UNICEF and the Scout Association of Mongolia continue working collectively to advocate for children and young people's rights to participate in decisions that will affect their future. About 9,000 children and young people from all over Mongolia have joined YOUCCAN.

*For tens of thousands of Mongolian households affected by air pollution, drought, desertification, forest fires, and other climate-related issues, this film highlights the fact that climate change is not distant news but a reality today. The film was shared with an international audience during COP 26 in Glasgow, Scotland, and even shared on social media by world-renowned journalist and author Naomi Klein.*


*Scan the QR code*





## TEEN PARLIAMENT INITIATIVE

*platform for youth engagement*

Teen Parliament was initiated by UNICEF and the Parliamentary Subcommittee on the SDGs. The initiative is a gathering of Mongolian adolescents and young people empowered to advocate for climate action and the achievement of the Sustainable Development Goals.

"On the issue of climate change and air pollution, I first implemented a micro-project as part of Teen Parliament, but now I am happy to contribute to solving this problem on behalf of the children and youth of Mongolia," said M. Garid, president of the National Children's Council of Mongolia, member of Teen Parliament 2021, and youth delegate from Mongolia at the 27th Conference of Parties (COP) on Climate Change held in Sharm El-Sheikh, Egypt. Heads of state, politicians, diplomats, civil society representatives, activists, thought leaders, and members of the media and the public—including children—from the 198 signatory countries of the United Nations Framework Convention on Climate Change (UNFCCC) joined COP 27 to work out policy measures, constructive agendas, and collective efforts in battling climate change and various climate-related problems.

Young people like Garid who join Teen Parliament gain knowledge about the SDGs, the universal rights of children, climate change and air pollution, democracy, human rights, and lawmaking and the decision-making process.

"Participating States shall ensure that children who are capable of forming their own opinions have the right to freely express their opinions on all matters concerning them, and shall give due weight to their opinions, taking into account the child's age and maturity."

Teen Parliament also provides opportunities for children and young people to raise their voices and increase their participation in the process of initiating, developing, and implementing laws. Garid was one Teen Parliament member that was never shy to express his frustration about growing up in the polluted city of Ulaanbaatar.

The Teen Parliament initiative continues shaping and supporting young people like Garid to hold the Government of Mongolia accountable to their global climate commitments and empower a new generation of climate-sensitive young leaders.■


*"I spent my childhood in the winter of Ulaanbaatar, full of smoke and soot, and it was difficult to even see the road ahead. As a result, not only me, but the health of every child and person is affected by years of toxic air pollution,"* **said Garid.**

## SERSER.MN

*A platform for children and youth to evaluate policy implementation*

By using this online platform, children and young people can find information about the environment and climate change, expand their knowledge, and evaluate the progress of key policy commitments.

### CHRONICLE

**2021 Aug 26 – 2021 Sep 25**

The Teen Parliament selection process was held online across Mongolia, with 907 applications received.

**2021 Oct 02**

The programme's opening ceremony was organized.

**2021 Oct 02 – 2022 May 15**

For 12 weeks, the participants attended classes on the topics of parliamentary education, climate change, the SDGs, healthy food and a proper diet, and personal development, and also engaged in advocacy work.

**2021 Nov 08 and 2022 May 05**

The members conducted advocacy work on two topics, 'Climate Change' and 'Healthy Food and Healthy Future', with participants from the 21 provinces and the districts of Ulaanbaatar.

**2021 Aug 26 – 2022 May 15**

Teen Parliament content reached 274,101 people.

**2022 May 11–14**

The closing ceremony for Teen Parliament 2021 was held in Ulaanbaatar.

**2022 Sep-Oct**

Teen Parliament 2022 was announced, focusing on sustainable energy, and parliamentarians were selected.

**2022 Nov 05**

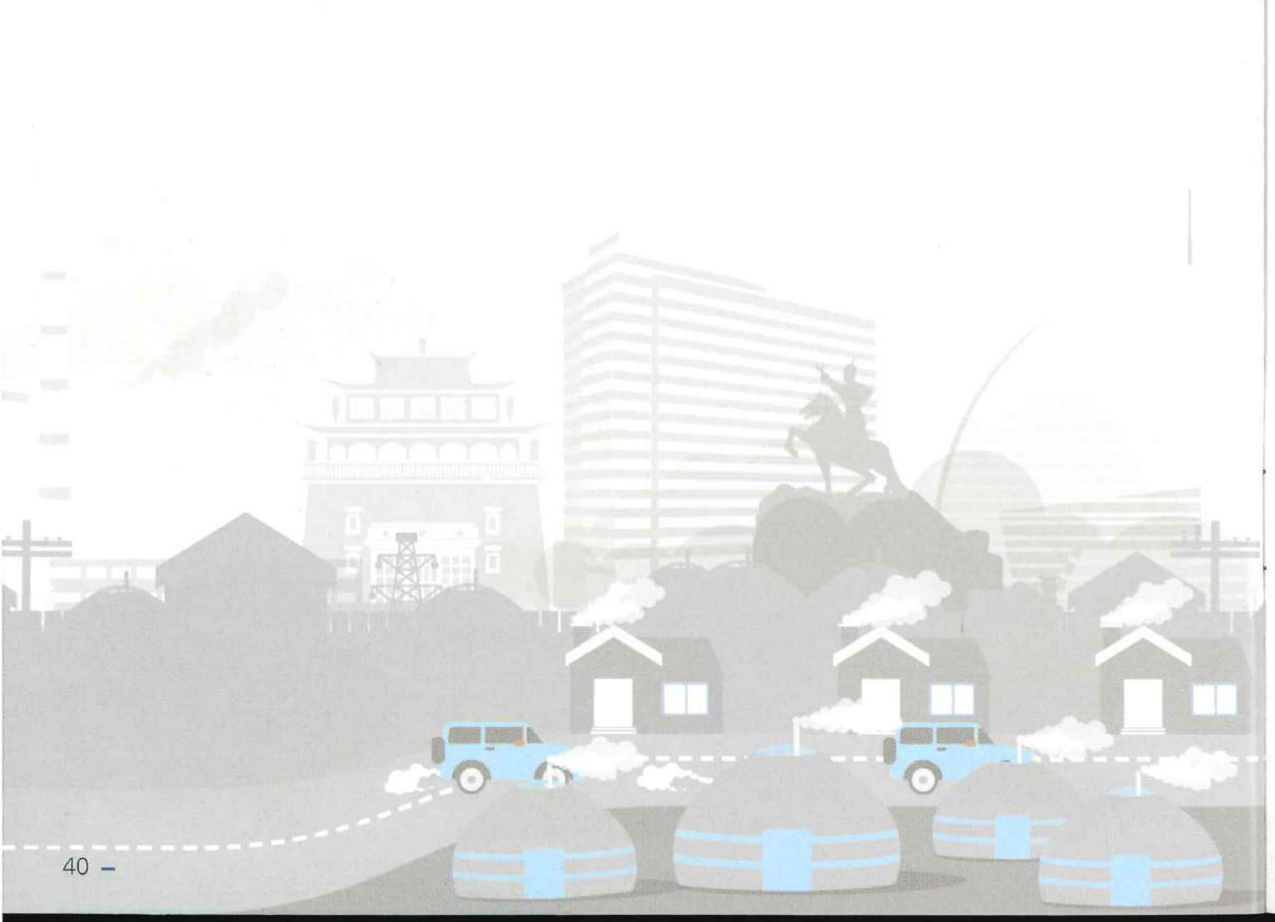
Teen Parliament 2022 launch event was organised.

*Source: Activity report on Youth Parliament program, UNICEF*

# FACTS ABOUT AIR POLLUTION

Air pollution has long been a headache for Mongolians. The fact that Ulaanbaatar is the coldest capital in the world, more than half of the population lives in the capital city, and coal and briquettes are the main source of heat for residents living in the ger districts makes Ulaanbaatar one of the cities in the world with the most air pollution. Let's take a look at the numbers to prove how much secondhand smoke affects our health:

# LEADERSHIP FOR TRANSFORMATIONAL CHANGE



When I returned to Bayankhongor Province after graduating from university in 2011, air and soil pollution had already become a problem. At that time, I didn't know what to do to stop or prevent it, but with time I gained a lot of experience working in the private sector and for state organizations to develop the community.

In 2019, I was elected to the Bayankhongor's Citizens Representative Khural (Assembly), and appointed Bayankhongor's Deputy Governor. That's when I started to work on the UNICEF-SDC financed clean air initiative. For the last three years, we have been working to reduce the impact of air pollution on the health of mothers and children, and I am the secretary of the working group.

I want to reflect on energy-efficient and affordable CHIP. Bayankhongor had 9,679 households when we started implementation in 2019. Of these households, 68.6 per cent (6,639) lived in a traditional Mongolian ger. The provincial government saw the potential in CHIP and made it their goal to transition 20 per cent of all ger households CHIP users within the next four years.

As of today, the provincial government is halfway there, reaching 10 per cent. But it wasn't easy at first, there were even some doubts. When it came to replacing the traditional coal-burning fireplace with a CHIP package, people rejected it due to its purchase price and increased electricity costs for the heater.

Families who started using CHIP told me that it took some time to get used to. But, from the second year of having CHIP technology, they were able to live comfortably and got used to it. In the past, our children used to wait for an hour until the coal burned hot enough to warm the home. They used to sit with their coats on after coming home from school and kindergarten. After solving this issue by using [CHIP], this problem was easily solved.

We are already seeing improved children's health in their community and finding that cases of respiratory diseases have reduced significantly. More than a decade ago, a PM2.5 measuring device was placed outside the U.S. Embassy in Ulaanbaatar. Today, there is one in our province, with the help of the SDC, UNICEF and Professor Jay Turner from WUSTL. Since then, we've been able to accurately calculate air pollution in real time. With this, our provincial meteorology staff have learnt a lot through online and in-person training. Surprisingly, our meteorologists have found a way to communicate with Prof. Turner and his team on a daily basis using Google Translate and a Facebook group. Global communication tools have let our people overcome language barriers and work closely on a daily basis despite the distance."■

## B.NARANBAYAR

Director of Social Policy at the Bayankhongor Governor's Office

GOVERNMENT OF MONGOLIA

Schweizerische Eidgenossenschaft
Confédération suisse
Confederazione Svizzera
Confederaziun svizra

Swiss Agency for Development and Cooperation SDC

unicef
for every child

Grateful for the support and commitment to implement "Impact of Air Pollution on Maternal and Child Health" project 2018-2023 funded by the Swiss Agency for Development and Cooperation (SDC).

GOVERNMENT OF MONGOLIA
PARLIAMENT OF MONGOLIA
GOVERNMENT OF MONGOLIA
NATIONAL COMMITTEE ON REDUCING ENVIRONMENTAL POLLUTION

NAMEM

National center for maternal and child health

MUNICIPALITY OF ULAANBAATAR

BAYANKHONGOR
GOVI-ALTAI
UMNUGOVI

MNUMS
MUST
NATIONAL UNIVERSITY OF MONGOLIA 1942
MONGOLIAN NATIONAL UNIVERSITY OF EDUCATION 1951

Washington University in St.Louis
Penn University of Pennsylvania
UNIVERSITY OF WATERLOO
UNIVERSITY OF BIRMINGHAM

People in Need
ToC MONGOLIAN SUSTAINABLE FINANCE ASSOCIATION
THE SCOUT ASSOCIATION OF MONGOLIA