

Supplementary Materials for

Increasing life expectancy in China by achieving its 2025 air quality target

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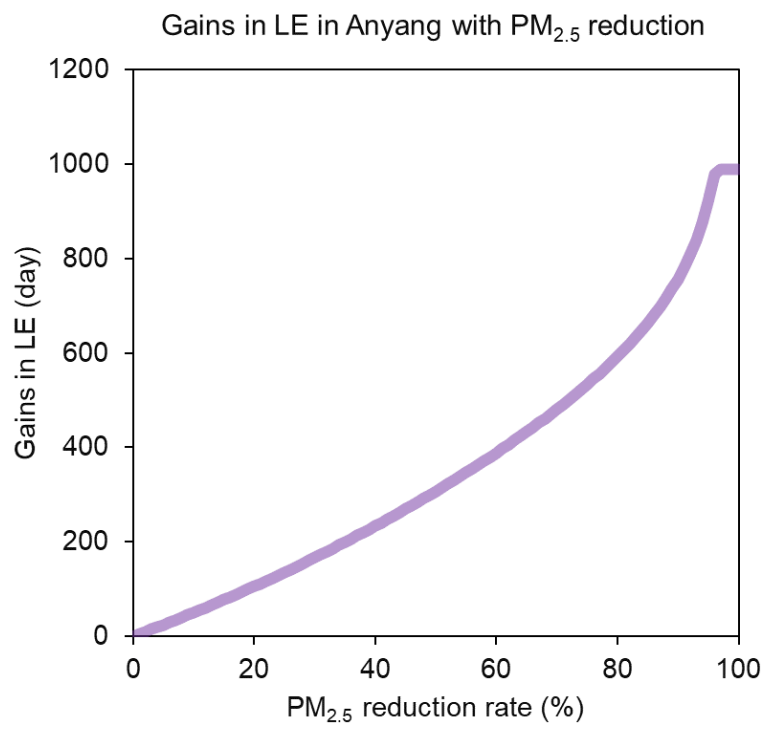
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Supplementary Materials Figures:



Supplementary Materials Figure S1 | Potential to increase life expectancy by reducing PM_{2.5} concentrations from 1% to 100%, with an interval of 1%, in Anyang, a city located in the BTHS region.

Supplementary Materials Tables:

Supplementary Materials Table S1 | City-level annual mean PM_{2.5} concentration in 2020 and the three prospective scenarios (unit: µg/m³).

City	Region	PM _{2.5} in 2020 (Base)*	PM _{2.5} in Policy scenario	PM _{2.5} in Average Reduction scenario	PM _{2.5} in Outperform scenario
Beijing	BTHS	38	32	34.2	29
Tianjin	BTHS	48	38.4	43.2	33.5
Shijiazhuang	BTHS	58	46.4	52.2	40.5
Tangshan	BTHS	49	39.2	44.1	34.2
Qinhuangdao	BTHS	34	27.2	30.6	23.8
Handan	BTHS	57	45.6	51.3	39.8
Xingtai	BTHS	53	42.4	47.7	37
Baoding	BTHS	50	40	45	34.9
Zhangjiakou	BTHS	23	18.4	20.7	16.1
Chengde	BTHS	27	21.6	24.3	18.9
Cang	BTHS	47	37.6	42.3	32.8
Langfang	BTHS	42	33.6	37.8	29.4
Hengshui	BTHS	52	41.6	46.8	36.3
Taiyuan	FWP	54	45.9	48.6	41.9
Datong	Other	31	29.2	27.9	28.4
Yangquan	FWP	46	39.1	41.4	35.7
Zhangzhi	FWP	44	37.4	39.6	34.1
Jincheng	FWP	46	39.1	41.4	35.7
Shuozhou	Other	37	34.9	33.3	33.9
Jinzhong	FWP	42	35.7	37.8	32.6
Yuncheng	FWP	57	48.5	51.3	44.2
Xinzhou	Other	44	41.5	39.6	40.3
Linfen	FWP	52	44.2	46.8	40.3
Lvliang	FWP	33	28.1	29.7	25.6
Hohhot	Other	40	37.7	36	36.6
Baotou	Other	44	41.5	39.6	40.3
Wuhai	Other	32	30.2	28.8	29.3
Chifeng	Other	25	23.6	22.5	22.9
Tongliao	Other	34	32.1	30.6	31.1
Ordos	Other	24	22.6	21.6	22
Hulunbuir	Other	18	17	16.2	16.5
Bayannur	Other	33	31.1	29.7	30.2
Ulanqab	Other	22	20.8	19.8	20.1
Hinggan	Other	25	23.6	22.5	22.9
Xilingol	Other	9	8.5	8.1	8.2

City	Region	PM_{2.5} in 2020 (Base)*	PM_{2.5} in Policy scenario	PM_{2.5} in Average Reduction scenario	PM_{2.5} in Outperform scenario
Alxa	Other	23	21.7	20.7	21.1
Shenyang	Other	42	39.6	37.8	38.4
Dalian	Other	30	28.3	27	27.5
Anshan	Other	44	41.5	39.6	40.3
Fushun	Other	43	40.6	38.7	39.4
Benxi	Other	35	33	31.5	32
Dandong	Other	29	27.4	26.1	26.5
Jinzhou	Other	47	44.3	42.3	43
Yingkou	Other	41	38.7	36.9	37.5
Fuxin	Other	36	34	32.4	33
Liaoyang	Other	41	38.7	36.9	37.5
Panjin	Other	35	33	31.5	32
Tieling	Other	39	36.8	35.1	35.7
Chaoyang	Other	35	33	31.5	32
Huludao	Other	42	39.6	37.8	38.4
Changchun	Other	42	39.6	37.8	38.4
Jilin	Other	41	38.7	36.9	37.5
Siping	Other	33	31.1	29.7	30.2
Liaoyuan	Other	39	36.8	35.1	35.7
Tonghua	Other	27	25.5	24.3	24.7
Baishan	Other	28	26.4	25.2	25.6
Songyuan	Other	27	25.5	24.3	24.7
Baicheng	Other	25	23.6	22.5	22.9
Yanbian	Other	21	19.8	18.9	19.2
Harbin	Other	47	44.3	42.3	43
Qiqihar	Other	31	29.2	27.9	28.4
Jixi	Other	28	26.4	25.2	25.6
Hegang	Other	24	22.6	21.6	22
Shuangyashan	Other	26	24.5	23.4	23.8
Daqing	Other	28	26.4	25.2	25.6
Yichun	Other	21	19.8	18.9	19.2
Jiamusi	Other	28	26.4	25.2	25.6
Qitaihe	Other	33	31.1	29.7	30.2
Mudanjiang	Other	31	29.2	27.9	28.4
Heihe	Other	17	16	15.3	15.6
Suihua	Other	41	38.7	36.9	37.5
Da Hinggan Ling	Other	14	13.2	12.6	12.8
Shanghai	YRD	32	27.2	28.8	24.8

City	Region	PM_{2.5} in 2020 (Base)*	PM_{2.5} in Policy scenario	PM_{2.5} in Average Reduction scenario	PM_{2.5} in Outperform scenario
Nanjing	YRD	31	26.4	27.9	24
Wuxi	YRD	33	28.1	29.7	25.6
Xuzhou	YRD	50	42.5	45	38.8
Changzhou	YRD	40	34	36	31
Suzhou	YRD	33	28.1	29.7	25.6
Nantong	YRD	34	28.9	30.6	26.4
Lianyungang	YRD	37	31.5	33.3	28.7
Huaian	YRD	42	35.7	37.8	32.6
Yancheng	YRD	33	28.1	29.7	25.6
Yangzhou	YRD	36	30.6	32.4	27.9
Zhenjiang	YRD	38	32.3	34.2	29.5
Taizhou	YRD	37	31.5	33.3	28.7
Suqian	YRD	45	38.3	40.5	34.9
Hangzhou	Other	30	28.3	27	27.5
Ningbo	Other	23	21.7	20.7	21.1
Wenzhou	Other	25	23.6	22.5	22.9
Jiaxing	Other	28	26.4	25.2	25.6
Huzhou	Other	26	24.5	23.4	23.8
Shaoxing	Other	28	26.4	25.2	25.6
Jinhua	Other	28	26.4	25.2	25.6
Quzhou	Other	26	24.5	23.4	23.8
Zhoushan	Other	17	16	15.3	15.6
Taizhou	Other	25	23.6	22.5	22.9
Lishui	Other	21	19.8	18.9	19.2
Hefei	YRD	36	30.6	32.4	27.9
Wuhu	YRD	35	29.8	31.5	27.1
Bengbu	YRD	43	36.6	38.7	33.3
Huainan	YRD	48	40.8	43.2	37.2
Maanshan	YRD	36	30.6	32.4	27.9
Huaibei	YRD	48	40.8	43.2	37.2
Tongling	YRD	35	29.8	31.5	27.1
Anqing	YRD	36	30.6	32.4	27.9
Huangshan	YRD	20	17	18	15.5
Chuzhou	YRD	39	33.2	35.1	30.2
Fuyang	YRD	49	41.7	44.1	38
Suzhou	YRD	46	39.1	41.4	35.7
Luan	YRD	37	31.5	33.3	28.7
Bozhou	YRD	47	40	42.3	36.4

City	Region	PM_{2.5} in 2020 (Base)*	PM_{2.5} in Policy scenario	PM_{2.5} in Average Reduction scenario	PM_{2.5} in Outperform scenario
Chizhou	YRD	34	28.9	30.6	26.4
Xuancheng	YRD	33	28.1	29.7	25.6
Fuzhou	Other	21	19.8	18.9	19.2
Xiamen	Other	18	17	16.2	16.5
Putian	Other	22	20.8	19.8	20.1
Sanming	Other	22	20.8	19.8	20.1
Quanzhou	Other	21	19.8	18.9	19.2
Zhangzhou	Other	20	18.9	18	18.3
Nanping	Other	19	17.9	17.1	17.4
Longyan	Other	18	17	16.2	16.5
Ningde	Other	22	20.8	19.8	20.1
Nanchang	Other	33	31.1	29.7	30.2
Jingdezhen	Other	25	23.6	22.5	22.9
Pingxiang	Other	33	31.1	29.7	30.2
Jiujiang	Other	38	35.9	34.2	34.8
Xinyu	Other	30	28.3	27	27.5
Yingtian	Other	32	30.2	28.8	29.3
Ganzhou	Other	26	24.5	23.4	23.8
Jian	Other	28	26.4	25.2	25.6
Yichun	Other	31	29.2	27.9	28.4
Fuzhou	Other	27	25.5	24.3	24.7
Shangrao	Other	29	27.4	26.1	26.5
Jinan	BTHS	50	40	45	34.9
Qingdao	BTHS	32	25.6	28.8	22.4
Zibo	BTHS	54	43.2	48.6	37.7
Zaozhuang	BTHS	55	44	49.5	38.4
Dongying	BTHS	46	36.8	41.4	32.1
Yantai	Other	32	30.2	28.8	29.3
Weifang	BTHS	50	40	45	34.9
Jining	BTHS	53	42.4	47.7	37
Taian	BTHS	50	40	45	34.9
Weihai	Other	26	24.5	23.4	23.8
Rizhao	BTHS	37	29.6	33.3	25.9
Linyi	BTHS	48	38.4	43.2	33.5
Dezhou	BTHS	49	39.2	44.1	34.2
Liaocheng	BTHS	53	42.4	47.7	37
Binzhou	BTHS	49	39.2	44.1	34.2
Heze	BTHS	53	42.4	47.7	37

City	Region	PM_{2.5} in 2020 (Base)*	PM_{2.5} in Policy scenario	PM_{2.5} in Average Reduction scenario	PM_{2.5} in Outperform scenario
Zhengzhou	BTHS	51	40.8	45.9	35.6
Kaifeng	BTHS	55	44	49.5	38.4
Luoyang	BTHS	51	40.8	45.9	35.6
Pingdingshan	BTHS	51	40.8	45.9	35.6
Anyang	BTHS	62	49.6	55.8	43.3
Hebi	BTHS	57	45.6	51.3	39.8
Xinxiang	BTHS	52	41.6	46.8	36.3
Jiaozuo	BTHS	56	44.8	50.4	39.1
Puyang	BTHS	59	47.2	53.1	41.2
Xuchang	BTHS	53	42.4	47.7	37
Tahe	BTHS	55	44	49.5	38.4
Sanmenxia	BTHS	48	38.4	43.2	33.5
Nanyang	BTHS	51	40.8	45.9	35.6
Shangqiu	BTHS	52	41.6	46.8	36.3
Xinyang	BTHS	40	32	36	28
Zhoukou	BTHS	50	40	45	34.9
Zhumadian	BTHS	45	36	40.5	31.5
Wuhan	Other	37	34.9	33.3	33.9
Huangshi	Other	35	33	31.5	32
Shiyan	Other	33	31.1	29.7	30.2
Yichang	Other	41	38.7	36.9	37.5
Xiangyang	Other	52	49.1	46.8	47.6
Ezhou	Other	38	35.9	34.2	34.8
Jingmen	Other	45	42.5	40.5	41.2
Xiaogan	Other	35	33	31.5	32
Jingzhou	Other	37	34.9	33.3	33.9
Huanggang	Other	36	34	32.4	33
Xianning	Other	30	28.3	27	27.5
Suizhou	Other	37	34.9	33.3	33.9
Enshi	Other	27	25.5	24.3	24.7
Changsha	Other	41	38.7	36.9	37.5
Zhuzhou	Other	38	35.9	34.2	34.8
Xiangtan	Other	39	36.8	35.1	35.7
Hengyang	Other	35	33	31.5	32
Shaoyang	Other	38	35.9	34.2	34.8
Yueyang	Other	37	34.9	33.3	33.9
Changde	Other	41	38.7	36.9	37.5
Zhangjiajie	Other	25	23.6	22.5	22.9

City	Region	PM_{2.5} in 2020 (Base)*	PM_{2.5} in Policy scenario	PM_{2.5} in Average Reduction scenario	PM_{2.5} in Outperform scenario
Yiyang	Other	43	40.6	38.7	39.4
Chenzhou	Other	28	26.4	25.2	25.6
Yongzhou	Other	33	31.1	29.7	30.2
Huaihua	Other	29	27.4	26.1	26.5
Loudi	Other	33	31.1	29.7	30.2
Xiangxi	Other	25	23.6	22.5	22.9
Guangzhou	Other	23	21.7	20.7	21.1
Shaoguan	Other	24	22.6	21.6	22
Shenzhen	Other	19	17.9	17.1	17.4
Zhuhai	Other	19	17.9	17.1	17.4
Shantou	Other	19	17.9	17.1	17.4
Foshan	Other	22	20.8	19.8	20.1
Jiangmen	Other	21	19.8	18.9	19.2
Zhanjiang	Other	21	19.8	18.9	19.2
Maoming	Other	21	19.8	18.9	19.2
Zhaoqing	Other	23	21.7	20.7	21.1
Huizhou	Other	20	18.9	18	18.3
Meizhou	Other	22	20.8	19.8	20.1
Shanwei	Other	18	17	16.2	16.5
Heyuan	Other	22	20.8	19.8	20.1
Yangjiang	Other	21	19.8	18.9	19.2
Qingyuan	Other	28	26.4	25.2	25.6
Dongguan	Other	24	22.6	21.6	22
Zhongshan	Other	20	18.9	18	18.3
Chaozhou	Other	24	22.6	21.6	22
Jieyang	Other	28	26.4	25.2	25.6
Yunfu	Other	22	20.8	19.8	20.1
Nanning	Other	26	24.5	23.4	23.8
Liuzhou	Other	29	27.4	26.1	26.5
Guilin	Other	29	27.4	26.1	26.5
Wuzhou	Other	26	24.5	23.4	23.8
Beihai	Other	23	21.7	20.7	21.1
Fangchenggang	Other	22	20.8	19.8	20.1
Qinzhou	Other	24	22.6	21.6	22
Guigang	Other	29	27.4	26.1	26.5
Yulin	Other	28	26.4	25.2	25.6
Baise	Other	27	25.5	24.3	24.7
Hezhou	Other	27	25.5	24.3	24.7

City	Region	PM_{2.5} in 2020 (Base)*	PM_{2.5} in Policy scenario	PM_{2.5} in Average Reduction scenario	PM_{2.5} in Outperform scenario
Hechi	Other	25	23.6	22.5	22.9
Laibin	Other	30	28.3	27	27.5
Chongzuo	Other	26	24.5	23.4	23.8
Haikou	Other	14	13.2	12.6	12.8
Sanya	Other	11	10.4	9.9	10.1
Chongqing	Other	33	31.1	29.7	30.2
Chengdu	Other	41	38.7	36.9	37.5
Zigong	Other	43	40.6	38.7	39.4
Panzhuhua	Other	29	27.4	26.1	26.5
Luzhou	Other	38	35.9	34.2	34.8
Deyang	Other	37	34.9	33.3	33.9
Mianyang	Other	34	32.1	30.6	31.1
Guangyuan	Other	25	23.6	22.5	22.9
Suining	Other	29	27.4	26.1	26.5
Neijiang	Other	34	32.1	30.6	31.1
Leshan	Other	35	33	31.5	32
Nanchong	Other	37	34.9	33.3	33.9
Meishan	Other	32	30.2	28.8	29.3
Yibin	Other	40	37.7	36	36.6
Guangan	Other	32	30.2	28.8	29.3
Dazhou	Other	39	36.8	35.1	35.7
Yaan	Other	27	25.5	24.3	24.7
Bazhong	Other	28	26.4	25.2	25.6
Ziyang	Other	30	28.3	27	27.5
Aba	Other	16	15.1	14.4	14.6
Ganzi	Other	9	8.5	8.1	8.2
Liangshan	Other	22	20.8	19.8	20.1
Guiyang	Other	23	21.7	20.7	21.1
Liupanshui	Other	22	20.8	19.8	20.1
Zunyi	Other	18	17	16.2	16.5
Anshun	Other	23	21.7	20.7	21.1
Bijie	Other	24	22.6	21.6	22
Tongren	Other	25	23.6	22.5	22.9
Qianxinan	Other	19	17.9	17.1	17.4
Qiandongnan	Other	24	22.6	21.6	22
Qiannan	Other	17	16	15.3	15.6
Kunming	Other	24	22.6	21.6	22
Qujing	Other	20	18.9	18	18.3

City	Region	PM_{2.5} in 2020 (Base)*	PM_{2.5} in Policy scenario	PM_{2.5} in Average Reduction scenario	PM_{2.5} in Outperform scenario
Yuxi	Other	20	18.9	18	18.3
Baoshan	Other	19	17.9	17.1	17.4
Zhaotong	Other	20	18.9	18	18.3
Lijiang	Other	12	11.3	10.8	11
Puer	Other	22	20.8	19.8	20.1
Lincang	Other	26	24.5	23.4	23.8
Chuxiong	Other	18	17	16.2	16.5
Honghe	Other	26	24.5	23.4	23.8
Wenshan	Other	23	21.7	20.7	21.1
Xishuangbanna	Other	29	27.4	26.1	26.5
Dali	Other	16	15.1	14.4	14.6
Dehong	Other	22	20.8	19.8	20.1
Nujiang	Other	22	20.8	19.8	20.1
Diqing	Other	13	12.3	11.7	11.9
Lhasa	Other	12	11.3	10.8	11
Xigazê	Other	9	8.5	8.1	8.2
Qamdo	Other	10	9.4	9	9.2
Nyingchi	Other	7	6.6	6.3	6.4
Shannan	Other	9	8.5	8.1	8.2
Nagqu	Other	18	17	16.2	16.5
Ngari	Other	7	6.6	6.3	6.4
Xian	FWP	51	43.4	45.9	39.5
Tongchuan	FWP	43	36.6	38.7	33.3
Baoji	FWP	47	40	42.3	36.4
Xianyang	FWP	54	45.9	48.6	41.9
Weinan	FWP	53	45.1	47.7	41.1
Yanan	Other	32	30.2	28.8	29.3
Hanzhong	Other	40	37.7	36	36.6
Yulin	Other	33	31.1	29.7	30.2
Ankang	Other	32	30.2	28.8	29.3
Shangluo	Other	30	28.3	27	27.5
Lanzhou	Other	34	32.1	30.6	31.1
Jiayuguan	Other	22	20.8	19.8	20.1
Jinchang	Other	20	18.9	18	18.3
Baiyin	Other	27	25.5	24.3	24.7
Tianshui	Other	27	25.5	24.3	24.7
Wuwei	Other	35	33	31.5	32
Zhangye	Other	31	29.2	27.9	28.4

City	Region	PM_{2.5} in 2020 (Base)*	PM_{2.5} in Policy scenario	PM_{2.5} in Average Reduction scenario	PM_{2.5} in Outperform scenario
Pingliang	Other	22	20.8	19.8	20.1
Jiuquan	Other	24	22.6	21.6	22
Qingyang	Other	28	26.4	25.2	25.6
Dingxi	Other	25	23.6	22.5	22.9
Longnan	Other	18	17	16.2	16.5
Linxia	Other	28	26.4	25.2	25.6
Gannan	Other	19	17.9	17.1	17.4
Xining	Other	35	33	31.5	32
Haidong	Other	38	35.9	34.2	34.8
Haibei	Other	19	17.9	17.1	17.4
Huangnan	Other	21	19.8	18.9	19.2
Hainan	Other	19	17.9	17.1	17.4
Golog	Other	16	15.1	14.4	14.6
Yushu	Other	8	7.5	7.2	7.3
Haixi	Other	12	11.3	10.8	11
Yinchuan	Other	36	34	32.4	33
Shizuishan	Other	40	37.7	36	36.6
Wuzhong	Other	34	32.1	30.6	31.1
Guyuan	Other	24	22.6	21.6	22
Zhongwei	Other	33	31.1	29.7	30.2
Urumqi	Other	47	44.3	42.3	43
Karamay	Other	26	24.5	23.4	23.8
Turpan	Other	42	39.6	37.8	38.4
Hami	Other	27	25.5	24.3	24.7
Changji	Other	53	50	47.7	48.5
Bortala	Other	24	22.6	21.6	22
Bayingol	Other	31	29.2	27.9	28.4
Aksu	Other	39	36.8	35.1	35.7
Kizilsu	Other	35	33	31.5	32
Kashgar	Other	54	51	48.6	49.4
Hotan	Other	58	54.7	52.2	53.1
Ili	Other	43	40.6	38.7	39.4
Tacheng	Other	12	11.3	10.8	11
Altay	Other	10	9.4	9	9.2
Shihezi	Other	56	52.8	50.4	51.3
Wujiaqu	Other	63	59.4	56.7	57.7

*Historical annual mean PM_{2.5} concentrations for each city published by the Chinese government are rounded to integers.

Supplementary Materials Table S2| Gains in national average life expectancy from 2020 to 2025 in different scenarios estimated based on demographic information and baseline mortality incidence rate in different years (unit: day).

	<i>Policy</i>	<i>Average Reduction</i>	<i>Outperform</i>
Demographic information and BMR* in 2014	42.1	38.1	64.8
Demographic information and BMR in 2015	42.2	38.2	64.9
Demographic information and BMR in 2016	42.2	38.2	64.9
Demographic information and BMR in 2017	42.4	38.3	65.1
Demographic information and BMR in 2018	42.5	38.4	65.3
Demographic information and BMR in 2019	42.5	38.4	65.4

*BMR refers to baseline mortality incidence rate.