

## Supplementary material for Vahlsing/Smith

### A. Comparison of Survey Respondents and Non-Respondents

The geographical distribution and selected demographics of the survey respondents and non-respondents are summarized in Table 1 and 2.

Table 1: Number of respondents & Non – respondents in each Geographical Region

Region	Respondents	Non – Respondents	Total
Asia	10	22	32
Africa	6	43	49
Central Europe	3	13	16
South America	2	30	32
Middle East	1	16	17
North America	1	0	1
Western Europe	1	2	3
Scandinavia	0	3	3
Total	24	129	153

Asian countries represented the largest percent of the respondents (40 %), followed by African countries (25 %), Central European countries (12 %) and South American countries (8 %). The remaining 8 % of the respondents were from the Middle East, North America, and Western Europe. A statistical significant difference between medians was not observed between respondents and the non-respondents for any of the variables shown in Table 2.

Table 2: Selected Median of Demographics for Survey Respondents & Non – Respondents

Demographic	Median	
	Respondents (n = 24)	Non – Respondents (n = 129)
Population (2008)	1,000,000	6,200,000
Urban Population (% of Total, 2008)	53	49
GDP per capita (current \$US, 2008)	3,400	2,800
Health expenditure per capita (current US\$ 2007)	130	150
Energy Use (kg of oil equivalent per capita, 2007)	850	910
PM10 (population weighted ug/m3 2006)	51	37
SO2 Emissions (thousand metric tons 2000)	96	59
General Government Final Consumption Expenditure (% of GDP, 2008)	14	13
DALYS (attributed to urban air pollution, 2009)	1,000,000	930,000

\*statistical significance difference (p>0.05) between respondent and non – respondents

GDP(Gross Domestic Product), DALYs (Disability Adjusted Life Years)

Source – World Bank, World Development Indicators, 2010

## Ambient Air Quality Standards & Selected Demographics

Country Name (Source of AAQS <sup>1</sup> )	AAQS Pollutant (ug/m3)		Year <sup>2</sup> AAQS Set or Revised		Population <sup>3</sup> (2008)	Urban population <sup>4</sup> (% of total, 2008)	GDP/capita <sup>5</sup> (current US\$, 2008)	Health expenditure/capita <sup>6</sup> (current US\$, 2006)	Energy use <sup>7</sup> (kg of oil equivalent/capita, 2007)	PM10 <sup>8</sup> (ug/m3, 2007)	General government final consumption expenditure <sup>9</sup> (% of GDP, 2008)	Type of AAQS**
	PM10	SO2	PM10	SO2								
Algeria (Kerbachi, 2006)	0	0	2007	2007	34,373,426	65	4,845	173	1,089	71	13	
Antigua & Barbuda <sup>10</sup> (Blacklane, 2011)	0	0	2007	2007	86,634	30	14,048	627		12	18	
Argentina (Maggioria, 2006)	0	70	2006		39,882,980	92	8,236	663	1,850	73	13	

<sup>1</sup> Secondary sources are listed. If no source is provided the AAQS data came from the survey results discussed in this paper.

<sup>2</sup> The most recent year each AAQS was revised or the year the AAQS was set, if has not been revised. For example, the AAQS or limit values in the EU were last considered for revision in 2008, despite the fact that they did not change from 1999 limit values set in 1999. If the country does not have AAQS then this is the date the most recent document was published stating that there are no AAQS.

<sup>3</sup> Source: World Bank, World Development Indicators, 2010, [www.worldbank.org](http://www.worldbank.org)

<sup>4</sup> Source: World Bank, World Development Indicators, 2010, [www.worldbank.org](http://www.worldbank.org)

<sup>5</sup> Source: World Bank, World Development Indicators, 2010, [www.worldbank.org](http://www.worldbank.org)

<sup>6</sup> Source: World Bank, World Development Indicators, 2010, [www.worldbank.org](http://www.worldbank.org)

<sup>7</sup> Source: World Bank, World Development Indicators, 2010, [www.worldbank.org](http://www.worldbank.org)

<sup>8</sup> Particulate matter concentrations refer to fine suspended particulates less than 10 microns in diameter (PM10) that are capable of penetrating deep into the respiratory tract and causing significant health damage. Data for countries and aggregates for regions and income groups are urban-population weighted PM10 levels in residential areas of cities with more than 100,000 residents. The estimates represent the average annual exposure level of the average urban resident to outdoor particulate matter. The state of a country's technology and pollution controls is an important determinant of particulate matter concentrations (Source: World Bank, World Development Indicators, 2010, [www.worldbank.org](http://www.worldbank.org)).

<sup>9</sup> General government final consumption expenditure (formerly general government consumption) includes all government current expenditures for purchases of goods and services (including compensation of employees). It also includes most expenditure on national defense and security, but excludes government military expenditures that are part of government capital formation. Source: World Bank, World Development Indicators, 2010, [www.worldbank.org](http://www.worldbank.org)

<sup>10</sup> Although Antigua and Barbuda have no AAQS they use the WHO AQG when necessary

Country Name (Source of AAQS <sup>1</sup> )	AAQS Pollutant (ug/m3)		Year <sup>2</sup> AAQS Set or Revised		Population <sup>3</sup> (2008)	Urban population <sup>4</sup> (% of total, 2008)	GDP/capita <sup>5</sup> (current US\$, 2008)	Health expenditure/capita <sup>6</sup> (current US\$, 2006)	Energy use <sup>7</sup> (kg of oil equivalent/capita, 2007)	PM10 <sup>8</sup> (ug/m3, 2007)	General government final consumption expenditure <sup>9</sup> (% of GDP, 2008)	Type of AAQS**
	PM10	SO2	PM10	SO2								
Armenia (survey respondent)	0	yes <sup>11</sup>	2007	2004	3,077,087	64	3,873	133	926	59	12	
Australia (Aus. Gov., 1998)	50	209 (0.08 ppm)	1998	1998	21,431,800	89	47,370	3,986	5,888	15	1	
Austria (Council of EU, 2008)	50	125	2008	2008	8,336,926	67	49,599	4,523	3,997	33	18	D
The Bahamas <sup>12</sup> (Min. of Environment, 2006))	0	0	2008	2008	337,668	84		1,535				
Bangladesh (Govt. Bangladesh, 2005)	150	365	2005	2005	160,000,128	27	497	15	163	135	5	S
Barbados (EPD, 2004)	150		2004		255,203	40	14,426	932		40		S
Belarus (WHO, 2003)	0	200			9,680,850	73	6,230	302	2,891	6	17	M
Belgium (Council of EU, 2008)	50	125	2008	2008	10,708,433	97	47,085	4,056	5,366	22	23	D
Belize <sup>13</sup> (Law Rev. Com. 2003)	0	80	2003	2003	322,100	52	4,218	174		15	16	S
Benin (Min de l'Habitat, 2003)	0	0	2003	2003	8,662,086	41	771	32	343	46		

<sup>11</sup> If the survey respondent indicated that their country had AAQS for pollutant, but did not specify what the AAQS it was assumed that the country had the least stringent AAQS on the map, but the country was not included in average AAQA calculation.

<sup>12</sup> The Bahamas has drafted AAQS (The Environmental Planning and Protection Act of 2005. Pollution Control and Waste Management Regulations (preliminary draft May 18, 2005), but they have not been adopted.

<sup>13</sup> Residential and rural SO<sub>2</sub> AAQS. The industrial and mixed use SO<sub>2</sub> AAQS is 120 ug/m<sup>3</sup> and the sensitive AAQS is 30 ug/m<sup>3</sup>.

Country Name (Source of AAQS <sup>1</sup> )	AAQS Pollutant (ug/m3)		Year <sup>2</sup> AAQS Set or Revised		Population <sup>3</sup> (2008)	Urban population <sup>4</sup> (% of total, 2008)	GDP/capita <sup>5</sup> (current US\$, 2008)	Health expenditure/capita <sup>6</sup> (current US\$, 2006)	Energy use <sup>7</sup> (kg of oil equivalent/capita, 2007)	PM10 <sup>8</sup> (ug/m3, 2007)	General government final consumption expenditure <sup>9</sup> (% of GDP, 2008)	Type of AAQS**
	PM10	SO2	PM10	SO2								
Bolivia (Maggioria, 2006)	150	365	1992	1992	9,694,113	66	1,720	69	571	94	13	S
Botswana (survey respondent)	0	300	2008	2001	1,921,122	60	6,982	372	1,068	67	20	S
Brazil* (Maggioria, 2006)	150	365	1990	1990	191,971,506	86	8,205	606	1,239	23	20	S
Brunei Darussalam* (survey respondent)	Yes	0	2007	2007	392,280	75		753	7,190	54		S
Bulgaria (Council of EU, 2008)	50	125	2008	2008	7,623,395	71	6,546	384	2,641	57	16	D
Cameroon (survey respondent)	260	125	2007	2007	19,088,385	57	1,226	54	391	62		S
Canada <sup>14</sup> (Health Canada, 2006)	0	301 (115 ppb)	2008	1998	33,311,400	80	45,070	4,409	8,169	17		
Chile (survey respondent)	150	250	2001		16,803,952	88	10,084	615	1,851	48	12	S
China (personal communication)	50	50	2000	2000	1,324,655,000	43	3,267	108	1,484	73	14	S
Colombia (Maggioria, 2006)	150	250	2006	2006	45,012,096	75	5,416	284	655	22	16	S
Costa Rica (Maggioria, 2006)	150	365	2002	2002	4,519,126	63	6,564	488	1,070	36	14	
Croatia (survey respondent)	50	125	2004	2004	4,434,000	57	15,637	1,009	2,101	30	19	S
Cyprus (Council of EU, 2008)	50	125	2008	2008	862,434	70	31,410	1,778	2,854	44	19	D

<sup>14</sup> The maximum acceptable level was used in this research. The maximum tolerable level is 306 ppb.

Country Name (Source of AAQS <sup>1</sup> )	AAQS Pollutant (ug/m3)		Year <sup>2</sup> AAQS Set or Revised		Population <sup>3</sup> (2008)	Urban population <sup>4</sup> (% of total, 2008)	GDP/capita <sup>5</sup> (current US\$, 2008)	Health expenditure/capita <sup>6</sup> (current US\$, 2006)	Energy use <sup>7</sup> (kg of oil equivalent/capita, 2007)	PM10 <sup>8</sup> (ug/m3, 2007)	General government final consumption expenditure <sup>9</sup> (% of GDP, 2008)	Type of AAQS**
	PM10	SO2	PM10	SO2								
Czech Republic (Council of EU, 2008)	50	125	2008	2008	10,424,336	74	20,673	1,141	4,428	21	20	D
Denmark (Council of EU, 2008)	50	125	2008	2008	5,493,621	87	62,118	5,551	3,598	19	27	D
Dominican Republic (Maggioria, 2006)	150	150	2002	2002	9,952,711	69	4,576	224	804	20	8	S
Ecuador (Maggioria, 2006)	150	350	2003	2003	13,481,424	66	4,056	200	885	25	11	
Egypt (survey respondent)	150	150	2005		81,527,172	43	1,991	101	840	119	11	S
El Salvador (Maggioria, 2006)	150	365	2003	2003	6,133,910	61	3,605	206	800	33	9	S
Estonia (Council of EU, 2008)	50	125	2008	2008	1,340,675	69	17,454	837	4,198	13	19	D
Ethiopia (Etyemezian V, 2005)	150	365 (0.14 ppm)	2003	2003	80,713,434	17	317	9	290	68	10	G
Finland (Council of EU, 2008)	50	125	2008	2008	5,313,399	63	51,323	3,809	6,895	18	22	D
France (Council of EU, 2008)	50	125	2008	2008	62,277,432	77	44,508	4,627	4,258	13	23	D
The Gambia (Sarr, 2008)	50	125	1999	1999	1,660,200	56	489	22		86	16	
Georgia (survey respondent)	0	yes	2007	2003	4,307,011	53	2,970	191	767	47	14	S
Germany (Council of EU, 2008)	50	125	2008	2008	82,110,097	74	44,446	4,209	4,027	19	18	D
Ghana (survey respondent)	70	100	2000	2000	23,350,927	50	713	54	415	34	20	G

Country Name (Source of AAQS <sup>1</sup> )	AAQS Pollutant (ug/m3)		Year <sup>2</sup> AAQS Set or Revised		Population <sup>3</sup> (2008)	Urban population <sup>4</sup> (% of total, 2008)	GDP/capita <sup>5</sup> (current US\$, 2008)	Health expenditure/capita <sup>6</sup> (current US\$, 2006)	Energy use <sup>7</sup> (kg of oil equivalent/capita, 2007)	PM10 <sup>8</sup> (ug/m3, 2007)	General government final consumption expenditure <sup>9</sup> (% of GDP, 2008)	Type of AAQS**
	PM10	SO2	PM10	SO2								
Greece (Council of EU, 2008)	50	125	2008	2008	11,237,094	61	31,670	2,679	2,875	36	17	D
Grenada (survey respondent)	0	0	2007	2007	103,538	31	6,162	416		20	16	
Guatemala (Maggiora, 2006)	0	0	2006	2006	13,686,128	49	2,848	186	620	62	9	
Honduras (Maggiora, 2006)	0	0	2006	2006	7,318,789	48	1,823	107	661	43	16	
Hungary (Council of EU, 2008)	50	125	2008	2008	10,038,188	68	15,408	1,019	2,658	19	9	D
India (Govt. of India, 2009)	100	80	2009	2009	1,139,964,932	30	1,017	40	529	65	12	S
Indonesia (Govt. of Indonesia, 1999)	150	365	1999	1999	227,345,082	51	2,246	42	849	83	8	S
Ireland (Council of EU, 2008)	50	125	2008	2008	4,425,675	61	60,460	4,556	3,457	16		D
Israel <sup>15</sup> (Govt. of Israel, 1992)	150	280	1992	1992	7,308,800	92	27,652	1,893	3,059	31	25	
Italy (Council of EU, 2008)	50	125	2008	2008	59,832,179	68	38,492	3,136	3,001	27	20	D

<sup>15</sup> PM<sub>10</sub> is defined as respirable particulate matter.

Country Name (Source of AAQS <sup>1</sup> )	AAQS Pollutant (ug/m3)		Year <sup>2</sup> AAQS Set or Revised		Population <sup>3</sup> (2008)	Urban population <sup>4</sup> (% of total, 2008)	GDP/capita <sup>5</sup> (current US\$, 2008)	Health expenditure/capita <sup>6</sup> (current US\$, 2006)	Energy use <sup>7</sup> (kg of oil equivalent/capita, 2007)	PM10 <sup>8</sup> (ug/m3, 2007)	General government final consumption expenditure <sup>9</sup> (% of GDP, 2008)	Type of AAQS**
	PM10	SO2	PM10	SO2								
Jamaica (Claude Davis, 2006)	150	365	2006	2006	2,687,200	53	5,438	224	1,852	43		S
Japan (Schwela, 2006)	100	105			127,704,000	66	38,455	2,751	4,019	30		S
Kenya <sup>16</sup> (Govt. of Kenya, 2009)	0	0	2004	2004	38,765,312	22	783	34	485	36	17	
Korea, Rep. (Schwela, 2006)	150				48,607,000	81	19,115	1,362	4,586	35	15	S
Latvia (Council of EU, 2008)	50	125	2008	2008	2,266,094	68	14,908	784	2,052	16	20	D
Lesotho (survey respondent)	0	0	2007	2007	2,049,429	25	791	51		41	27	
Lithuania (Council of EU, 2008)	50	125	2008	2008	3,358,115	67	14,098	717	2,740	19	18	D
Luxembourg (Council of EU, 2008)	50	125	2008	2008	488,650	82	109,903	7,439	8,790	15	16	D
Malta (Council of EU, 2008)	50	125	2008	2008	411,950	94		1,362	2,120			D
Mauritius (survey respondent)	100	200	1997	1997	1,268,854	42	7,345	247		18	13	S
Mexico (SEMARNAT, 2005) (Min. of Health., 1993)	120	341	2005	1994	106,350,434	77	10,232	564	1,750	36	10	S
Moldova (Cojocaru, 2008)	0	50	2008		3,633,369	42	1,694	127	910	36	21	M

<sup>16</sup> Draft AAQS were promulgated. See reference.



Country Name (Source of AAQS <sup>1</sup> )	AAQS		Year <sup>2</sup> AAQS Set or Revised		Population <sup>3</sup> (2008)	Urban population <sup>4</sup> (% of total, 2008)	GDP/capita <sup>5</sup> (current US\$, 2008)	Health expenditure/capita <sup>6</sup> (current US\$, 2006)	Energy use <sup>7</sup> (kg of oil equivalent/capita, 2007)	PM10 <sup>8</sup> (ug/m3, 2007)	General government final consumption expenditure <sup>9</sup> (% of GDP, 2008)	Type of AAQS**
	PM10	SO2	PM10	SO2								
Myanmar (survey respondent)	0	0	2007	2007	49,563,019	33		7	319	58		
Nepal (survey respondent; Sah, 2003)	120	70	2003	2003	28,809,526	17	438	20	338	34	10	S
Netherlands (Council of EU, 2008)	50	125	2008	2008	16,445,593	82	52,963	4,243	4,909	34	25	D
New Zealand (Min. for the Envir, 2004)	50	0	2004	2004	4,268,900	87	30,439	2,790	3,966	14		
Nicaragua (Maggioria, 2006)	0	0	2006	2006	5,667,325	57	1,163	92	621	28		
Pakistan (survey respondent)	0	0	2007	2007	166,111,487	36	991	23	512	120	12	
Panama (Maggioria, 2006)	0	0	2006	2006	3,398,823	73	6,793	396	845	35	11	
Peru (Maggioria, 2006)	150	365	2001	2001	28,836,700	71	4,477	160	494	54	9	
Philippines (survey respondent)	150	180	1999	1999	90,348,437	65	1,847	63	451	23	10	G
Poland (Council of EU, 2008)	50	125	2008	2008	38,125,759	61	13,845	716	2,547	37	19	D
Portugal (Council of EU, 2008)	50	125	2008	2008	10,622,413	59	22,923	2,108	2,363	23	21	D
Romania (Council of EU, 2008)	50	125	2008	2008	21,513,622	54	9,300	369	1,806	14	16	D
Russian Federation (Sakhalin Energy, 2005)	0	50	2008		141,950,000	73	11,832	493	4,730	18	17	M
Senegal (Govt. of Senegal, 2003)	260	125	2003	2003	12,211,181	42	1,087	54	225	95	10	S

Country Name (Source of AAQS <sup>1</sup> )	AAQS Pollutant (ug/m3)		Year <sup>2</sup> AAQS Set or Revised		Population <sup>3</sup> (2008)	Urban population <sup>4</sup> (% of total, 2008)	GDP/capita <sup>5</sup> (current US\$, 2008)	Health expenditure/capita <sup>6</sup> (current US\$, 2006)	Energy use <sup>7</sup> (kg of oil equivalent/capita, 2007)	PM10 <sup>8</sup> (ug/m3, 2007)	General government final consumption expenditure <sup>9</sup> (% of GDP, 2008)	Type of AAQS**
	PM10	SO2	PM10	SO2								
Seychelles (survey respondent)	0	0	2007	2007	86,956	54	9,580	564			15	
Singapore (Schwela, 2006)	150	365			4,839,400	100	37,597	1,148	5,831	41	11	
Slovak Republic (Council of EU, 2008)	50	125	2008	2008	5,406,626	57	18,212	1,077	3,307	15	17	D
Slovenia (Council of EU, 2008)	50	125	2008	2008	2,021,316	49	27,019	1,836	3,632	30		D
South Africa (Rep. of South Africa, 2006)	75	125	2007	2004	48,687,000	61	5,678	497	2,807	21	20	G
Spain (Council of EU, 2008)	50	125	2008	2008	45,555,716	77	35,215	2,712	3,208	32	19	D
Sri Lanka (survey respondent)	0	Yes	2007	2003	20,156,204	15	2,013	68	464	82	16	S
Sweden (Council of EU, 2008)	50	125	2008	2008	9,219,637	85	51,950	4,495	5,512	12	26	D
Switzerland (survey respondent)	50	80	2007		7,647,675	73	64,327	6,108	3,406	26		S
Thailand (survey respondent)	120	300	1995	2001	67,386,383	33	4,043	136	1,553	71	12	S
Trinidad & Tobago (Rep. of Trinidad and Tobago, 2005; email communication, 2008)	75	125	2008	2008	1,333,388	13	18,108	785	11,506	101	11	G
Turkey (Rep. of Turkey, 1986)	150	150	1986	1986	73,914,260	69	9,942	465	1,370	40	13	
Uganda (Personal comm., 2003)	0	0	2003	2003	31,656,865	13	453	28		12	12	
United Kingdom (Council of EU, 2008)	50	125	2008	2008	61,414,062	90	43,541	3,867	3,464	15	22	D

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	PM10	SO2	PM10	SO2								
United States (EPA, 2009)	150	365	2006	1996	304,060,000	82	46,350	7,285	7,766	21		S
Venezuela (Maggioria, 2006)	0	365	2006	1995	27,935,000	93	11,246	477	2,319	11	11	
Vietnam (Schwela, 2006)	150	125	2005	2005	86,210,781	28	1,051	58	655	55	6	
Serbia (survey respondent)	50	150	2000	2000	7,350,221	52	6,811	408	2,141		21	
Zambia (Govt. of Zambia, 1996)	70	125	1996	1996	12,620,219	35	1,134	57	604	40	9	G
Zimbabwe (Govt. of Zimbabwe, 2006)	0	0	2005	2005	12,462,879	37		79	759	27		
World (WHO, 2006)	50	20	2005	2005	6,697,254,041	50	9,042	809	1,819	50		G

\*Sub-national AQS

\*\* S = ambient air quality standard, G = ambient air quality guideline, M = maximum permissible concentration, D = EU air quality directive, blank values indicate the type of AAQS is unknown

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PARTICULADO PARA PARTICULAS SUSPENDIDAS TOTALES PST, PARTICULAS MENORES DE 10 MICROMETROS  $PM_{10}$  Y PARTICULAS MENORES DE 2.5 MICROMETROS  $PM_{2.5}$  EN EL AIRE AMBIENTE COMO MEDIDA DE PROTECCION A LA SALUD DE LA POBLACION, PARA QUEDAR COMO NORMA OFICIAL MEXICANA NOM-025-SSA1-1993, SALUD AMBIENTAL.

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AAQS Survey

UC Berkeley Survey on AQGs

September 2007 - 1

School of Public Health,  
University of California, Berkeley, USA  
September 2007  
Survey on Air Quality Guidelines and Standards

Professor Kirk R. Smith  
<krksmith@berkeley.edu>  
Candace Vahlsing  
<vahlsing@berkeley.edu>

Please complete the following questionnaire. The questions of the most importance to us are in bold, if you are not able to complete the entire questionnaire, any attempt to answer the questions in bold would be much appreciated.

Country   
Name of respondent   
Title and agency   
Postal address for receiving final report of survey results and a complimentary copy of the *WHO Air Quality Guidelines, Global Update 2005*

**Section 1: Background Information on Air Quality Standards**

1. Does your country have a law or act mandating the establishment of ambient air quality standards (AAQSs)?
  - yes
    - a. What year did your country implement the law or act?
    - b. Please check the pollutants that your country has ambient air quality standards (AAQSs) for  carbon monoxide  SO<sub>x</sub>  NO<sub>2</sub>  lead  ozone  Total PM  PM<sub>10</sub>  PM<sub>2.5</sub>  other \_\_\_\_\_
  - no
    - a. Does your country plan to establish AAQSs?  yes  no
2. Is your country part of any regional air quality agreement, regulation, or standard?
  - yes, please list \_\_\_\_\_
  - no
3. Is the establishment of your countries ambient air quality standards (AAQS) tied to an international loan agreement or debt package with, for example, the World Bank?
  - yes, please write the name of the development organization it is with \_\_\_\_\_
  - no
4. What type of AAQSs does your country have? (please check all that apply)
  - AAQSs for different land use practices, for example residential or industrial
  - national AAQS  state/municipal/local AAQS
5. Does your country use a Pollution Standards Index?
  - yes
    - a. Which standards are used to calculate the Pollution Standard Index? (check all that apply)
      - WHO Air Quality Guidelines
      - Standards from another country, Please specify the country \_\_\_\_\_
      - the national AAQS
      - other \_\_\_\_\_
  - no

**Section 2: WHO AQG**

6. Before reading this questionnaire, were you aware that the World Health Organization (WHO) publishes

- a. air quality guidelines for Europe?  yes  no
- b. air quality guidelines that are globally applicable?  yes  no

7. Does your country have ambient air quality standards (legally binding) or guidelines (voluntary) for Particulate Matter (PM)?

- yes, we have (please circle) standards guidelines
  - a. What year were they established? \_\_\_\_\_
  - b. When were they last updated? \_\_\_\_\_
- no (please go to question 11)

8. What indicator of PM does your country have standards for? (please check all that apply and write the concentration of the standard)

Pollutant	Standard (mass concentration)	
	Annual	Daily
<input type="checkbox"/> Total Suspended Particles (TSP)	_____ (ug/m <sup>3</sup> )	_____ (ug/m <sup>3</sup> )
<input type="checkbox"/> Thoracic particles	_____ (ug/m <sup>3</sup> )	_____ (ug/m <sup>3</sup> )
<input type="checkbox"/> PM <sub>10</sub>	_____ (ug/m <sup>3</sup> )	_____ (ug/m <sup>3</sup> )
<input type="checkbox"/> PM <sub>2.5</sub>	_____ (ug/m <sup>3</sup> )	_____ (ug/m <sup>3</sup> )
<input type="checkbox"/> other _____	_____ (ug/m <sup>3</sup> )	_____ (ug/m <sup>3</sup> )

9. Please check all of the following documents that have played a significant role in the deliberations for setting the AAQS for PM, and indicate how the evidence in the document was used.

Document	Evidence in document evaluated, and accepted	Evidence in document evaluated, but not used	Evidence in document evaluated, and modified for local conditions
<input type="checkbox"/> <i>Air Quality Guidelines for Europe</i> (published by the WHO in 1987)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/> <i>Air Quality Guidelines for Europe 2<sup>nd</sup> edition</i> (published by the WHO in 2000)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/> <i>Guidelines for Air Quality</i> (published by the WHO in 2000, with a global focus)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/> <i>Air Quality Guidelines: Global Update 2005</i> (published by the WHO in 2006)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

10. Have any of the documents checked in Question 9 been acknowledged in a legal act?  
 yes  no

11. The WHO has promulgated PM AQGs using different approaches that try to reflect in varying degree the growing scientific recognition that there are no clear thresholds, i.e., levels of pollution below which there is no effect. The figures below represent three of these methods.  
 (see the following page)

**Method A: Risk Coefficients with no specific recommended concentrations (WHO, 2000)**

Table 11. Summary of relative risk estimates for effects of long-term exposure to particulate matter on the morbidity and mortality associated with a 10 µg/m<sup>3</sup> increase in the concentration of PM10 or PM2.5

Endpoint (reference)	Relative risk for PM2.5 (95% confidence interval)	Relative risk for PM10 (95% confidence interval.)
Mortality (26)	1.14 (1.04–1.24)	1.10 (1.03–1.18)
Mortality (115)	1.07 (1.04–1.11)	n.a.
Bronchitis (154)	1.34 (0.94, 1.99)	1.29 (0.96–1.83)
% change in FEV <sub>1</sub> , children (155)	- 1.9% (- 3.1% to - 0.6%) <sup>a</sup>	- 1.2% (- 2.3% to - 0.1%)
% change in FEV <sub>1</sub> , adults (151)		- 1.0% (n.a.)

**Method B:  
Concentration Guidelines  
alone (WHO, 2006)**

Guidelines	
PM <sub>2.5</sub> :	10 µg/m <sup>3</sup> annual mean 25 µg/m <sup>3</sup> 24-hour mean
PM <sub>10</sub> :	20 µg/m <sup>3</sup> annual mean 50 µg/m <sup>3</sup> 24-hour mean

**Method C: Guidelines with Interim Targets and some risk information (WHO, 2006)**

WHO air quality guidelines and interim targets for particulate matter: annual mean concentrations <sup>a</sup>			
	PM <sub>10</sub> (µg/m <sup>3</sup> )	PM <sub>2.5</sub> (µg/m <sup>3</sup> )	Basis for the selected level
Interim target-1 (IT-1)	70	35	These levels are associated with about a 15% higher long-term mortality risk relative to the AQG level.
Interim target-2 (IT-2)	50	25	In addition to other health benefits, these levels lower the risk of premature mortality by approximately 6% [2–11%] relative to the IT-1 level.
Interim target-3 (IT-3)	30	15	In addition to other health benefits, these levels reduce the mortality risk by approximately 6% [2–11%] relative to the IT-2 level.
Air quality guideline (AQG)	20	10	These are the lowest levels at which total, cardiopulmonary and lung cancer mortality have been shown to increase with more than 95% confidence in response to long-term exposure to PM <sub>10</sub> .

Please indicate which approach provides the most useful information for setting the AAQs for your country. Here, we are not asking you to judge the specific PM levels in the above examples, but rather to judge the utility of the method used by WHO to present them

- Method A: Risk coefficients with no specific guidelines provided
- Method B: Guidelines with no risk coefficients provided
- Method C: Guidelines with Interim Targets (that provide a step-wise approach to air pollution management) with some risk information
- all three methods are necessary
- none of the three methods are useful
- another method, please explain \_\_\_\_\_

12. Please explain the reasons for your answer to the previous question. We urge you to take all the space you need as this is an important part of the survey. Please consider

- scientific issues, for example whether a method better reflects physical reality in your opinion;
- regulatory concerns, for example whether a method would be easier to implement in regulation;
- policy issues, for example whether a method is easier explain to policy makers and the public.

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13. Does your country have ambient air quality standards or guidelines for SO<sub>2</sub>?

- yes, we have standards
- yes, we have guidelines
  - a. What year were they established? \_\_\_\_\_
  - b. When were they last updated? \_\_\_\_\_
- no (please go to question 18)

14. What averaging time is used for each SO<sub>2</sub> AAQS? (please check all that apply and write the concentration of the standard)

- | Pollutant                                  | Standard (mass concentration) |
|--|-------------------------------|
| <input type="checkbox"/> 24 hour average   | _____ ug/m <sup>3</sup>       |
| <input type="checkbox"/> 8 hour average    | _____ ug/m <sup>3</sup>       |
| <input type="checkbox"/> 10 minute average | _____ ug/m <sup>3</sup>       |
| <input type="checkbox"/> annual average    | _____ ug/m <sup>3</sup>       |
| <input type="checkbox"/> other _____       | _____ ug/m <sup>3</sup>       |

15. Please check the following documents if they have played a significant role in the deliberations for setting the AAQS for SO<sub>2</sub> and indicate how the evidence in the document was used.

Document	Evidence in document evaluated, and accepted	Evidence in document evaluated, but not used	Evidence in document evaluated, and modified for local conditions
<input type="checkbox"/> <i>Air Quality Guidelines for Europe</i> (published by the WHO in 1987)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/> <i>Air Quality Guidelines for Europe 2<sup>nd</sup> edition</i> (published by the WHO in 2000)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/> <i>Guidelines for Air Quality</i> (published by the WHO in 2000, with a global focus)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/> <i>Air Quality Guidelines: Global Update 2005</i> (published by the WHO in 2006)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

16. Have any of the documents checked in Question 15 been acknowledged in a legal act?

- yes  no

17. Did you consider the secondary formation of particles when setting the AAQS for SO<sub>2</sub>?

- yes  no

18. Does your country plan to use the WHO AQG to set or update your AAQSs?

- yes
  - a. We plan to use them to set AAQSs  
For which pollutants? (please check)  PM  SO<sub>2</sub>  NO<sub>2</sub>  O<sub>3</sub>
  - b. We plan to use them to update AAQSs  
For which pollutants? (please check)  PM  SO<sub>2</sub>  NO<sub>2</sub>  O<sub>3</sub>
- no

19. What additional information do you want from the WHO in order to help set your AAQSs?

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**Section 3: The Evidence-base used to Determine AAQs and the Standard Setting Process**

(If you answered “yes” to either question 7 or 13 please continue. If you answered “no” to question 7 and 13 and have begun planning your AAQs, please answer the following questions. If setting AAQs is not a current priority, please skip to the comments section – Question 31 - at the end of the questionnaire.)

20. What types of studies are used to set the AAQs in your country? (please check all that apply)

- toxicology studies (animal studies conducted in a lab)
- epidemiology studies in natural settings (studies examining the causation between exposure to air pollution and health effects)
- epidemiology studies in occupational settings
- controlled human exposure studies (studies in which humans are exposed to air pollutants in a controlled lab environment)
- monitoring data on current pollution concentrations in your country
- reports from nongovernmental organizations (NGOs)
- other \_\_\_\_\_

21. Please rate the importance of the studies you selected in the previous question when determining your AAQs.

Type of Study	Important	Partially Important	Not important
toxicology studies	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
epidemiology studies	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
controlled human exposure studies	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Reports from NGOs	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
other	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

22. Do you require the epidemiology studies used to set your AAQs to be conducted in your own country?

- yes  no

23. Do epidemiology, toxicology and controlled human exposure studies have to be peer reviewed to be used to set the AAQs in your country?

- yes  no

24. Which of the following standards, if any, are your AAQs based on (please check)

- European Union air quality directives
- the United States air quality standards
- California’s air quality standards
- the standards of another country in the region  
If so, which country \_\_\_\_\_
- International Agency for Research on Cancer (IARC) designation

25. Who are the participants involved in setting the AAQs? (please check all that apply)

- government/parliament officials  consultants  development organizations
- academic scientists  government/parliament scientists  lawyers
- economists  businesses  environment or health NGOs
- community based organizations (CBOs)
- other \_\_\_\_\_



26. Which of the following factors, if any, are considered when setting an AAQS? (please check all that apply)

- health effects
- cost
- concentration of air pollutant
- concentration of other pollutants that might affect the pollutant of interest
- the effect of the pollutant of interest on climate change
- other \_\_\_\_\_
- other \_\_\_\_\_
- exposure duration
- feasibility
- non-health environmental effects
- susceptible populations
- number of people exposed

27. Do you require a risk assessment to be conducted in your country on the pollutant of interest, before an AAQS is set?

- yes
- no

28. Which official or agency makes the final decision about each AAQS?

\_\_\_\_\_

29. Is an economic analysis done before or after the AAQSs are set?

- before
- after
- neither

30. Do you plan to include an evaluation of the how PM or SO<sub>2</sub> interact with gases that affect the climate in your next revision of the AAQSs?

- yes
- no

31. Comments/ Issues related to air quality standards (for example: Is there a source of information you find valuable that has not been mentioned above? What other information would be valuable, when setting your AAQS? What type of international assistance would you prefer? What other sources do you need? Any other suggestions that you want to share are welcome.)

Please make sure your contact information is noted at the beginning of the questionnaire so that you receive a copy of the final report and WHO publication.

If not using the addressed envelope please return to:

Candace Vahlsing  
 Division of Environmental Health Sciences  
 UC Berkeley School of Public Health  
 50 University Hall, # 7360  
 Berkeley, CA 94720- 7360

Thank you very much for taking the time to complete this questionnaire. We appreciate your participation.

**References**

*Air Quality Guidelines for Europe*, 2<sup>nd</sup> Edition. Copenhagen, WHO Regional Office for Europe, 2000 (WHO Regional Publications, European Series, No 91).

*Air Quality Guidelines for Europe: Global Update 2005*. Copenhagen, WHO Regional Office for Europe, 2006.

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