USERGUIDE

Air Pollution Impact Model for Electricity Supply **AIRPOLIM-ES**

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Introducing the AIRPOLIM-ES

The AIRPOLIM-ES is an accessible, Excel-based tool that estimates the health impacts of air pollution from different sources of electricity generation and other fuel combustion. The first version of the model focuses on air pollution caused by electricity generation from coal- and gas-fired power plants. It calculates the impacts on mortality (premature deaths and years of life lost) from four adulthood diseases: lung cancer, chronic obstructive pulmonary disease, ischemic heart disease and stroke, all of whose prevalence is increased with the intake of pollution. The tool can be used to compare the magnitude of health impacts under different scenarios across both existing and planned plants.

The analysis is based on:

- Plant specific data including location, capacity, lifetime, heat rate, emission factors
- Population exposure estimates and population characteristics (age-shares, population growth rate etc.)
- Health metrics including country- and age-specific mortality rates for lung cancer, chronic obstructive pulmonary disease, ischemic heart disease and stroke

RESULTS

Results can be aggregated on the plant-, country- or scenario level. Health impact results include the estimated years of life lost (YLL) and number of premature deaths, by cause, pollutant or year. Emissions of pollutants are displayed on an annual basis or considering the whole lifetime of each included plant.

This document provides a step-by-step guide to setting up and using the model.







OVERVIEW

Model overview

Purpose and features of the main sections of the model



IMPORTANT NOTE: Yellow cells throughout the file are input cells where the user needs to include either text or data. Non-yellow shaded cells typically denote where formulas are used to perform calculations or link to other cells.



Opening the Excel file



The file opens on the cover sheet with a notice about calculations: read, click OK and start set up

	Overview			
INPUTS > >	File Name: Version: Location:	NewClimate Air Pollution Impact Model for Electricity Supply (AIRPOLIM-ES) v1.0 The model is made available for download online at ambitiontoaction net/outputs		
CALC > >	Description:	Spreadsheet-based model to estimate the health impacts of air pollution from electricity generation of coal- and gas- <u>A full description of the model is available online at ambitiontoaction.net/outputs</u>		
	Instructions:	A user quide for the model is available online at ambitiontoaction net/outputs		
RESULTS > >	Info and useage rights:		Climate Initiative (IKI) Microsoft Excel	× acy or appropriate
	Contact:		A word about the calculations	
		www.ambitiontoaction.net	AutoSave is turned off and Calculations are set to manual in this Workbook.	
			This speeds up navigation, data entry and reviewing results.	
	Sheets		To manually calculate the sheet you are on press < Shift + F9>.	
			To manually calculate the whole Workbook press <f9>.</f9>	
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RESULTS > >	MortalityRates	
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	PopShareOver25	

- List all power plants and add their specific characteristics
- Corresponding information required includes start date, lifetime, capacity, capacity factor, heat rate, type of emissions control (insert "Average" if unknown) and emission factor (enter "default" if unknown)
- **Population exposure estimates** have to be estimated in a separate geographic information system (GIS) analysis (*open source population data sets and GIS software is available*)
- The start date has to be equal or later than the year of population data set
- Press F9 (calculate model) once complete to update changes across all sheets

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INPUTS > >		
CALC > >	EmissionFactors	-
	MortalityRates	
APPENDIX > >	LifeExpectancy	-
APPENDIX > >	LifeExpectancy PopGrowthrate	-



- Enter age-specific mortality rates for COPD, lung cancer, ischemic heart disease and stroke from the Global Health Data Exchange for each country that is included in the analysis
- To obtain the age-weighted mortality rates add the percentage share per age group, e.g. using data from the World Development Indicators

Age-w	eighted i	nortal	ty rate	es																						
Source: IHI	IE (2019), World	d Developn	nent Indica	tors (2019)																						
																									Mort	taityRate Thi
Analysis countries	Health impact type	Age category 25- 29	Age category 25- 29	Age category 30 - 34	Age category 30 - 34	Age category 35 - 39	Age category 35 - 39	Age category 40 - 44	Age category 40 - 44	Age category 45- 49	Age category 45- 49	Age category 50 - 54	Age category 50 - 54	Age category 55 - 59	Age category 55 - 59	Age category 60 - 64	Age category 60 - 64	Age category 65- 69	Age category 65- 69	Age category 70 - 74	Age category 70 - 74	Age category 75 - 79	Age category 75 - 79	Age category over 80	Age category over 80	Age- weighted mortality rate
		Mortality	Share in	Mortality	Share in	Mortality	Share in	Mortality	Share in	Mortality	Share in	Mortality	Share in	Mortality	Share in	Mortality	Share in	Mortality	Share in	Mortality	Share in	Mortality	Share in	Mortality	Share in	%
1	0000	rate	populatio	rate	populatio	rate	populatio	rate	populatio	rate	populatio	rate	populatio	rate	populatio	rate	populatio	rate	populatio	rate	populatio	rate	populatio	rate	populatio	0.00534
1 Argentina	LC	0.0000378	13.27	0.0033%	12.376	0.01449	41 0%	0.0241%	11.270	0.0404%	0.6%	0.020278	0.5%	0.032276	7.0%	0.04307	7.0%	0.049376	6.0%	0.0550%	4.070	0.0365%	3.4%	0.0337 %	4.470	0.023%
1 Argentina	IHD	0.0265%	13.2%	0.0440%	12.3%	0.0595%	11.9%	0.0820%	11.2%	0.1136%	9.5%	0.1337%	8.5%	0.1435%	7.8%	0.1547%	7.0%	0.1626%	6.0%	0.1688%	4.8%	0.1759%	3.4%	0 1970%	4.4%	0.102%
1 Argentina	ST	0.0235%	13.2%	0.0324%	12.3%	0.0436%	5 11.9%	0.0575%	11.2%	0.0651%	9.5%	0.0662%	8.5%	0.0658%	7.8%	0.0690%	7.0%	0.0724%	6.0%	0.0767%	4.8%	0.0831%	3.4%	0.0794%	4.4%	0.055%
2 Kenya	COPD	0.0022%	20.6%	0.0029%	19.0%	0.0037%	6 15.9%	0.0054%	12.4%	0.0092%	9.2%	0.0134%	6.7%	0.0236%	5.2%	0.0307%	4.0%	0.0331%	2.9%	0.0430%	1.8%	0.0434%	1.1%	0.0446%	1.1%	0.009%
2 Kenya	LC	0.0003%	20.6%	0.0006%	19.0%	0.0010%	6 15.9%	0.0020%	12.4%	0.0032%	9.2%	0.0052%	6.7%	0.0076%	5.2%	0.0102%	4.0%	0.0116%	2.9%	0.0113%	1.8%	0.0092%	1.1%	0.0047%	1.1%	0.003%
2 Kenya	IHD	0.0070%	20.6%	0.0120%	19.0%	0.0172%	6 15.9%	0.0254%	12.4%	0.0421%	9.2%	0.0573%	6.7%	0.0763%	5.2%	0.0910%	4.0%	0.1017%	2.9%	0.1146%	1.8%	0.1102%	1.1%	0.1229%	1.1%	0.033%
2 Kenya	ST	0.0077%	20.6%	0.0107%	19.0%	0.0137%	6 15.9%	0.0252%	12.4%	0.0347%	9.2%	0.0533%	6.7%	0.0674%	5.2%	0.0912%	4.0%	0.1045%	2.9%	0.1103%	1.8%	0.1218%	1.1%	0.1085%	1.1%	0.030%
3 Mongolia	COPD	0.0033%	16.8%	0.0046%	16.9%	0.0048%	6 13.7%	0.0049%	12.4%	0.0047%	10.9%	0.0060%	9.4%	0.0078%	7.6%	0.0115%	4.9%	0.0158%	3.0%	0.0160%	1.9%	0.0180%	1.3%	0.0181%	1.1%	0.006%
3 Mongolia	LC	0.0022%	16.8%	0.0037%	16.9%	0.0050%	6 13.7%	0.0094%	12.4%	0.0171%	10.9%	0.0255%	9.4%	0.0349%	7.6%	0.0424%	4.9%	0.0421%	3.0%	0.0386%	1.9%	0.0341%	1.3%	0.0224%	1.1%	0.015%
3 Mongolia	IHD	0.0451%	16.8%	0.0694%	16.9%	0.0920%	6 13.7%	0.1125%	12.4%	0.1401%	10.9%	0.1585%	9.4%	0.1715%	7.6%	0.1947%	4.9%	0.2433%	3.0%	0.2761%	1.9%	0.2964%	1.3%	0.3529%	1.1%	0.119%
3 Mongolia	ST	0.0341%	16.8%	0.0486%	16.9%	0.0757%	5 13.7%	0.1179%	12.4%	0.1632%	10.9%	0.1963%	9.4%	0.2082%	7.6%	0.2097%	4.9%	0.1900%	3.0%	0.1920%	1.9%	0.1904%	1.3%	0.2015%	1.1%	0.116%
4	0 COPD																									0.000%
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INPUTS > >		
	POWEIPIAIILS	,
CALC > >		
RESULTS > >	MortalityRates	
APPENDIX > >	LifeExpectancy	
	PopGrowthrate	
	PopShareOver25	



- Enter the **remaining life expectancy (years) at exact age and time** for each country that is included in the analysis
 - Data can be derived from the UN World Population Prospects

Remaining	life	expectancy	/ at	exact	ade	and	time

Source: UN World Population Prospects (2019)

		LifeExpectar	тсу															
Analysis countries	Age category	2015	2020	2025	2030	2035	2040	2045	2050	2055	2060	2065	2070	2075	2080	2085	2090	2095
		years	years	years	years	years	years	years	years	years	years	years	years	years	years	years	years	years
1 Argentina	25	53.01	53.59	54.19	54.81	55.44	56.09	56.74	57.40	58.06	58.69	59.28	59.85	60.39	60.92	61.44	61.95	62.45
1 Argentina	30	48.27	48.83	49.42	50.03	50.64	51.27	51.91	52.56	53.20	53.82	54.40	54.96	55.48	56.01	56.52	57.03	57.52
1 Argentina	35	43.54	44.09	44.67	45.25	45.85	46.46	47.09	47.72	48.35	48.96	49.52	50.07	50.59	51.11	51.61	52.11	52.60
1 Argentina	40	38.83	39.37	39.93	40.50	41.09	41.68	42.29	42.91	43.52	44.12	44.67	45.21	45.72	46.23	46.72	47.21	47.70
1 Argentina	45	34.19	34.72	35.26	35.82	36.38	36.96	37.55	38.15	38.74	39.32	39.86	40.39	40.89	41.39	41.87	42.35	42.82
1 Argentina	50	29.70	30.21	30.73	31.26	31.80	32.35	32.91	33.49	34.06	34.62	35.14	35.65	36.13	36.61	37.08	37.55	38.01
1 Argentina	55	25.40	25.89	26.37	26.87	27.38	27.89	28.42	28.97	29.51	30.04	30.54	31.02	31.48	31.94	32.39	32.83	33.27
1 Argentina	60	21.39	21.84	22.28	22.73	23.19	23.67	24.15	24.65	25.15	25.63	26.09	26.54	26.97	27.40	27.82	28.23	28.65
1 Argentina	65	17.64	18.04	18.43	18.82	19.23	19.65	20.07	20.51	20.96	21.39	21.81	22.22	22.60	22.99	23.37	23.75	24.14
1 Argentina	70	14.21	14.55	14.87	15.19	15.54	15.89	16.25	16.63	17.02	17.39	17.75	18.10	18.44	18.78	19.13	19.46	19.81
1 Argentina	75	11.07	11.34	11.59	11.85	12.13	12.42	12.71	13.02	13.34	13.65	13.95	14.26	14.54	14.84	15.14	15.43	15.74
1 Argentina	80	4.77	4.87	4.97	5.07	5.18	5.29	5.41	5.55	5.68	5.82	5.95	6.10	6.23	6.38	6.53	6.68	6.85
2 Kenya	25	45.74	46.39	47.04	47.64	48.22	48.81	49.40	49.99	50.60	51.22	51.87	52.52	53.18	53.86	54.55	55.26	55.98
2 Kenya	30	41.35	41.93	42.52	43.08	43.63	44.19	44.75	45.33	45.92	46.53	47.16	47.80	48.45	49.12	49.79	50.49	51.19
2 Kenya	35	37.06	37.57	38.10	38.61	39.12	39.65	40.18	40.73	41.31	41.90	42.51	43.14	43.77	44.42	45.08	45.75	46.44
2 Kenya	40	32.91	33.35	33.82	34.26	34.73	35.21	35.72	36.24	36.79	37.35	37.94	38.55	39.16	39.78	40.41	41.07	41.73

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INPUTS > > CALC > > RESULTS > >	PowerPlants EmissionFactors MortalityRates	 Enter the population growth rate and percentage share of population over 25 years of age for each year and country that is included in the analysis Data can be derived from the UN World Population Prospects Press F9 (calculate model) once complete
APPENDIX > >	LifeExpectancy	Population Growth Rate Source: UN World Projustion Projects (2017) Bodiewan Bate
	PopGrowthrate	Pepulation growth rate Analysis countries 2415 2416 2417 2416 247 2416 247 2416 247 2416 247 2416 2447 2416 244 244 244 244 244 244 244 244 244 24
	PopShareOver25	Population Share over 25 years Some UN World Population Prosects (2011) PopUnc25, Sume PopUnc25, Year Share of population allower 25 years Analysis countries 25 tot 2012 2013 2012 2013 2012 2013 2012 2013 2013



		/													
			Make sure to drag	Population I	nput										
			down formulas until	Source: WorldPop, Gl	S mapping results, 2	Zhou et al. (2006)									
			down formulas until	Population coverage	PopCoverage_Switch										
			results for each entered	WorldPop	p year: 2020 Plant Com	In-country	In-country	In-country	In-country	All countries	All countries	All countries	All countries		
			power plant are			In-country population	In-country population	In-country population	In-country population	All country population	All country population	All country population	All country population		Exposed
CALC > >	PopulationInput		displayed	Plant		100 km	100 - 500 km	500 - 1000 km	1000 - 3300 km	100 km	100 - 500 km	500 - 1000 km	1000 - 3300 km	Population over 25	25
				Río Turbio power station	1 Unit 2 Argentina	0.03	0.35	0.50	million 43.67	0.05	0.52	million 0.72	88.26	share 60%	26.730
		•	Add the base year of	Lamu power station	Kenya Kenya	0.27	22.28	23.71	0.06	0.37	25.15 35.06 61.52	111.35 161.43	612.06	41%	18.760
	Develoption		the population data set	Kitui power station Unit : Kitui power station Unit :	2 Kenya 3 Kenya	1.68	42.04	2.60	-	2.27	61.52 61.52	161.43 161.43	636.29 636.29	41%	18.760
	Population		used	Baganuur Pauer LLC Capacity expansion of C	Mongolia Choibals Mongolia	0.22 0.04	2.27 0.20	0.43 2.42	0.22 0.50	0.34 0.04	3.42 2.77	30.10 138.33	2,208.19 1,643.80	55% 55%	1.740 1.748
				Choibalsan CHP CHP 3	Mongolia Mongolia	0.04 1.76	0.20 0.77	2.42 0.44	0.50 0.19	0.04 1.78	2.77 3.49	138.33 20.66	1,643.80 2,378.79	55% 55%	1.748 1.748
				Population Expo	sure										
		•	Drag down formulas in	Source: WorldPop, GIS mapp	oing results, Zhou et al. (2)	006)									
			rows D – R until the last	Population coverage In-cc PopCoverage_Switch WorldPop year:	Drag down form	nulas until the last year of	operations of the last pow	er plant in the list is displa	syed, not further.						
			vear of operations of		PlantList	Years Years	In-countr In-countr	y In-country ry In-country	In-country In- In-country In	n-country All country All country	untries All countries untry All country	All countries All country	All countries All country		
			the last new or plant in	Plant Rep	eat Row Plant	Year Countr	y too km	in population ius within radius	population p within radius wit	opulation popul thin radius within 1 0 = 3300 km 400	ation population radius within radius km 100 - 500 km	population within radius	population within radius Popu	Expos Ilation over populatio 25 25	ed Total exposed i over population
			the last power plant in	text Rio Turbio power station U	31 0 Rio Turbio pow	text er statio 2020 Argentir	million	million 0.35 0.50	million 43.67	million milli 0.05	ion million 0.52 0.7	million 12 88.26	million 0.60	share millio 60%	27 45
			the list is displayed, <u>not</u>	Lamu power station Kitui power station Unit 1	35 62 Rio Turbio powe 45 97 Rio Turbio powe	er statio 2021 Argentir er statio 2022 Argentir er statio 2023 Argentir	na ha ha	0.36 0.51 0.36 0.51	44.42 44.79	0.05	0.53 0.7	3 89.77 14 90.51	0.61 0.62	61% 61%	27 45 27 45 28 48
			further 🥼	Kitui power station Unit 2 Kitui power station Unit 3 Banatuur Pauer LLC	46 142 Rio Turbio powe 47 188 Rio Turbio powe 64 235 Rio Turbio powe	er statio 2024 Argentin er statio 2025 Argentin er statio 2026 Argentin	na na	0.36 0.52 0.36 0.52 0.37 0.53	45.15 45.51 45.86	0.05	0.54 0.7	14 91.25 15 91.97 16 92.69	0.62 0.63	61% 61%	28 46 28 46 29 47
				Capacity expansion of Cho Choibalsan CHP	63 299 Rio Turbio powi 58 382 Rio Turbio powi	er statio 2027 Argentin er statio 2028 Argentin	na na	0.37 0.53 0.37 0.53	48.21 48.55	0.05	0.55 0.7	6 93.40 7 94.09	0.63	62% 62%	29 47 29 48
		•	Based on the entered	CHP 3 CHP 3 Extention CHP 3 Extention 2	9 420 Rio Turbio powe 64 429 Rio Turbio powe 64 493 Rio Turbio powe	er statio 2029 Argentin er statio 2030 Argentin er statio 2031 Argentin	na na	0.38 0.54 0.38 0.54 0.38 0.54	46.89 47.22 47.54	0.05	0.56 0.7 0.56 0.7 0.57 0.7	7 94.77 8 95.43 8 96.08	0.65	62% 63%	20 45 30 48 30 49
			lifetime and start of	CHP 4 CHP-2	24 557 Rio Turbio powe 2 581 Rio Turbio powe	er statio 2032 Argentin er statio 2033 Argentin	na	0.38 0.55 0.39 0.55	47.85 48.16	0.05	0.57 0.7	9 96.72 9 97.34	0.66	63% 63%	31 49 31 49
				Darkhan CHP Darkhan thermal power sta	6 624 Rio Turbio powe	er statio 2035 Argentir er statio 2038 Argentir	na na	0.39 0.56 0.39 0.56	48.77 49.06	0.06	0.58 0.6	10 98.56 31 99.15	0.67	64% 64%	32 50 32 50
			operations the years	Erdenet CHP Erdenet CHP - extention Erdenet factory CHP	6 690 Rio Turbio powe 61 696 Rio Turbio powe 59 757 Rio Turbio powe	er statio 2037 Argentir er statio 2038 Argentir er statio 2039 Argentir	na na	0.40 0.56 0.40 0.57 0.40 0.57	49.35 49.63 49.90	0.06	0.59 0.0	1 99.73 12 100.30 12 100.85	0.68	64% 65% 65%	32 50 33 51 33 51
			are set up	Mogul Pauer LLC New Asia Group LLC	72 816 Rio Turbio powr 67 888 Rio Turbio powr	er statio 2040 Argentin er statio 2041 Argentin 2042 Argentin	ha	0.40 0.57 0.40 0.58	50.17 50.43	0.06	0.60 0.8	13 101.39 13 101.92	0.69	65% 65%	33 51 34 51
			automatically	- revantopor power station	The Contract of the second				* Downl	-			and in the		
			2						Popul	ation ex	posure e	estimate	cu in this ith octin	<u>s</u>	
		•	Press F9 to calculate						sneet in	rciuaes p	populatio	on grow	th estin	tates	10



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INPUTS >> PopulationInput CALC >> PopulationInput RESULTS >> Population APPENDIX >> ConcentrationChange RelativeRisk

Make sure to drag down formulas until results for every power plant and year are calculated

• Press F9 to calculate once done

Intake fraction and concentration change

Source: WorldPop, GIS mapping results, Zhou et al. (2006)

				intake fraction		Change in P	M _{2.5} conc
Plant	Year	Country	PM2.5	NOx	SO2	PM _{2.6}	NO
			g of PM2.5 inl	haled per tonne of e	missions		
Río Turbio power station Uni	1 2020	Argentina	0.25	0.10	0.15	7.53E-07	
Río Turbio power station Uni	1 2021	Argentina	0.25	0.10	0.15	7.53E-07	
Río Turbio power station Uni	1 2022	Argentina	0.25	0.10	0.15	7.53E-07	
Río Turbio power station Uni	1 2023	Argentina	0.25	0.10	0.15	7.53E-07	
Río Turbio power station Uni	2024	Argentina	0.25	0.11	0.15	7.53E-07	
Río Turbio power station Uni	2025	Argentina	0.26	0.11	0.15	7.53E-07	
Río Turbio power station Uni	2026	Argentina	0.26	0.11	0.16	7.53E-07	
Río Turbio power station Uni	2027	Argentina	0.26	0.11	0.16	7.53E-07	
Río Turbio power station Uni	2028	Argentina	0.26	0.11	0.16	7.53E-07	
Río Turbio power station Uni	2029	Argentina	0.26	0.11	0.16	7.53E-07	
Río Turbio power station Uni	2030	Argentina	0.26	0.11	0.16	7.53E-07	
Río Turbio power station Uni	2031	Argentina	0.27	0.11	0.16	7.53E-07	
Río Turbio power station Uni	2032	Argentina	0.27	0.11	0.16	7.53E-07	
Río Turbio power station Uni	2033	Argentina	0.27	0.11	0.16	7.53E-07	
Río Turbio power station Uni	2034	Argentina	0.27	0.11	0.16	7.53E-07	
Río Turbio power station Uni	2035	Argentina	0.27	0.11	0.17	7.53E-07	
Río Turbio power station Uni	2036	Argentina	0.28	0.11	0.17	7.53E-07	
Río Turbio power station Uni	2037	Argentina	0.28	0.12	0.17	7.53E-07	
Río Turbio power station Uni	2038	Argentina	0.28	0.12	0.17	7.53E-07	
Río Turbio power station Uni	2039	Argentina	0.28	0.12	0.17	7.53E-07	
Río Turbio power station Uni	2040	Argentina	0.28	0.12	0.17	7.53E-07	
Río Turbio power station Uni	2041	Argentina	0.28	0.12	0.17	7.53E-07	
Río Turbio power station Uni	2042	Argentina	0.28	0.12	0.17	7.53E-07	
Río Turbio power station Uni	2043	Argentina	0.29	0.12	0.17	7.53E-07	
Río Turbio power station Uni	2044	Argentina	0.29	0.12	0.17	7.53E-07	
Río Turbio power station Uni	2045	Argentina	0.29	0.12	0.17	7.53E-07	
Río Turbio power station Uni	2046	Argentina	0.29	0.12	0.18	7.53E-07	
Río Turbio power station Uni	2047	Argentina	0.29	0.12	0.18	7.53E-07	
Río Turbio power station Uni	2048	Argentina	0.29	0.12	0.18	7.53E-07	
Río Turbio power station Uni	2049	Argentina	0.29	0.12	0.18	7.53E-07	
Río Turbio power station Uni	2050	Argentina	0.29	0.12	0.18	7.53E-07	





- Make sure to **drag down formulas** until results for every power plant and year are calculated
- Press F9 to calculate once done

Relative risk																
Source: Own calculations																
						Relat	ive risk of a on	e tonne increa	ase per perso	n (health impa	cts)					
Plant	Year	Country														
		oounuy		PM2	.5			NO	x		SO2					
text		text	COPD	LC		ST	COPD	LC		ST	COPD	LC		ST		
Río Turbio power station	2020	Argentina	1.00000004	1.000000005	1.00000006	1.000000011	1.00000002	1.00000002	1.000000003	1.000000005	1.00000002	1.00000003	1.000000004	1.00000007		
Río Turbio power station	2021	Argentina	1.00000004	1.00000005	1.00000006	1.000000011	1.00000002	1.00000002	1.00000003	1.000000005	1.00000002	1.00000003	1.000000004	1.00000007		
Río Turbio power station	2022	Argentina	1.00000004	1.000000005	1.000000006	1.000000011	1.00000002	1.00000002	1.00000003	1.000000005	1.00000002	1.00000003	1.000000004	1.00000007		
Río Turbio power station	2023	Argentina	1.00000004	1.000000005	1.00000006	1.000000011	1.00000002	1.00000002	1.00000003	1.000000005	1.00000002	1.00000003	1.000000004	1.00000007		
Río Turbio power station	2024	Argentina	1.00000004	1.00000005	1.00000006	1.000000011	1.00000002	1.00000002	1.00000003	1.000000005	1.00000002	1.00000003	1.000000004	1.00000007		
Río Turbio power station	2025	Argentina	1.00000004	1.00000005	1.00000006	1.000000011	1.00000002	1.00000002	1.00000003	1.000000005	1.00000002	1.00000003	1.00000004	1.00000007		
Río Turbio power station	2026	Argentina	1.00000004	1.00000005	1.00000006	1.000000011	1.00000002	1.00000002	1.00000003	1.000000005	1.00000002	1.00000003	1.00000004	1.00000007		
Rio Turbio power station	2027	Argentina	1.00000004	1.00000005	1.00000006	1.000000011	1.00000002	1.00000002	1.00000003	1.000000005	1.00000002	1.00000003	1.00000004	1.00000007		
Río Turbio power station	2028	Argentina	1.00000004	1.000000005	1.00000006	1.000000011	1.00000002	1.00000002	1.00000003	1.000000005	1.00000002	1.00000003	1.00000004	1.00000007		
Río Turbio power station	2029	Argentina	1.00000004	1.000000005	1.00000006	1.000000011	1.00000002	1.00000002	1.00000003	1.000000005	1.00000002	1.00000003	1.000000004	1.00000007		
Río Turbio power station	2030	Argentina	1.00000004	1.000000005	1.00000006	1.000000011	1.00000002	1.00000002	1.00000003	1.000000005	1.00000002	1.00000003	1.00000004	1.00000007		
Río Turbio power station	2031	Argentina	1.00000004	1.000000005	1.00000006	1.000000011	1.00000002	1.00000002	1.00000003	1.000000005	1.00000002	1.00000003	1.00000004	1.00000007		
Río Turbio power station	2032	Argentina	1.00000004	1.000000005	1.00000006	1.000000011	1.00000002	1.00000002	1.00000003	1.000000005	1.00000002	1.00000003	1.00000004	1.00000007		
Río Turbio power station	2033	Argentina	1.00000004	1.000000005	1.00000006	1.000000011	1.00000002	1.00000002	1.00000003	1.000000005	1.00000002	1.00000003	1.000000004	1.00000007		

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- Make sure to **drag down formulas** until results for every power plant are calculated
- Press F9 to calculate once done

Emissions																		
Source: Own calculations																		
							Flanc FM2'5	FRANC MEN	Flant SLP	HanLLLE	PM2.5_Annual	NUX_Annual	SU2_Annual	CU2_Annual	PM2.5_Lifetime	NUx_Lifetime	SU2_Lifetime	CU2_Lifetime
Plant Lin							Emissions	Emissions	Emissions	Emissions	Annual	Annual	Annual	Annual	Lifetime	Lifetime	Lifetime	Lifetime
Mancus					Ammont	Lifetime	Factor	ractor	ractor	ractor	emissions	emissions	emissions	emissions	emissions	emissions	emissions	emissions
Plant	Country	Evel	Control tune	Efficiency	electricity	electricity	PM	NOv		CO2	PMax	NDv		CD2	PM	NOv		CO2
					generation	generation					1 102.3				1112.5			
hest										パランリッ・ウ	Bear			Sea	Hiletime			Hiletime
Río Turbio power station Unit 2	Argentina	Coal	Average	33%	555	16,651	0.0471	10065	2.3097	339.4800	80	1,710	3,923	576,644	2,401	51,291	117,698	17,299,334
San Nicolás-2 power station Unit 11	Argentina	Coal	Average	29%	1,619	48,565	0.0471	10065	2.3097	339.4800	263	5,610	12,874	1.892.235	7,880	168.309	386.221	56,767,064
Lamu power station	Kenva	Coal	Average	39%	6,445	193.355	0.0443	0.6750	2.4693	339.4800	739	11,266	41.214	5.666.019	22,171	337.978	1,236,406	169.980.580
Kitui power station Unit 1	Kensa	Coal	Average	35%	2,102	63.072	0.0443	0.6750	2.4693	339.4800	264	4.020	14,705	2.021.664	7,911	120.592	441,156	60.649.909
Kitui power station Unit 2	Kenva	Coal	Average	35%	2,102	63.072	0.0443	0.6750	2.4693	339.4800	264	4.020	14,705	2.021.664	7.911	120,592	441.156	60.649.909
Kitui power station Unit 3	Kenva	Coal	Average	35%	2,102	63.072	0.0443	0.6750	2.4693	339.4800	264	4.020	14,705	2.021.664	7.911	120,592	441.156	60.649.909
Baganuur Pauer LLC	Mongolia	Coal	Average	37%	3,986	239,148	0.5098	0.6669	3.3447	358.2000	5,509	7,207	36,142	3,870,560	330,519	432,398	2,168,502	232,233,595
Capacity expansion of Choibalsan CH	Mongolia	Coal	Average	32%	285	17.082	0.5098	0.6669	3.3447	358.2000	450	589	2,952	316,096	26,992	35,312	177,094	18,965,736
Choibalsan CHP	Mongolia	Coal	Average	32%	205	11,684	0.5098	0.6669	3.3447	358.2000	324	424	2,125	227,589	18,463	24,154	121,132	12,972,564
CHP 3	Mongolia	Coal	Average	32%	894	7,152	0.5098	0.6669	3.3447	358.2000	1,413	1,848	9,268	992,540	11,301	14,784	74,143	7,940,322
CHP 3 Extention	Mongolia	Coal	Average	32%	1,424	85,410	0.5098	0.6669	3.3447	358.2000	2,249	2,943	14,758	1,580,478	134,962	176,562	885,471	94,828,681
CHP 3 Extention 2	Mongolia	Coal	Average	32%	427	25,623	0.5098	0.6669	3.3447	358.2000	675	883	4,427	474,143	40,489	52,969	265,641	28,448,604
CHP 4	Mongolia	Coal	Average	32%	3,758	86,430	0.5098	0.6669	3.3447	358.2000	0.338	7,769	38,361	4,1/2,462	136,581	1/8,681	896,097	30,366,626
Delagradiand CUP	Mongolia	Coal	Average	32/4	202	102	0.5036	0.6669	3.3447	358.2000	40	212	266	29.449	162	212	10.63	113,734
Darkhan CMP	Mongolia	Coal	Average	32%	20	1.210	0.5099	63333.0	2 3447	358,2000	409	535	2 691	20,443	2.042	2,110	12,405	1435.640
Darkhan thermal nower station State F	Mangolia	Coal	áverage.	30%	199	11 258	0.5098	63333.0	3 3447	358,2000	315	412	2.066	221.267	18 580	24 307	121,900	13 054 748
Erdenet CHP	Mongolia	Coal	Average	33%	159	797	0.5098	0.6669	3.3447	358,2000	249	325	1.632	174,774	1.244	1,627	8,160	873,868
Erdenet CHP - extention	Mongolia	Coal	Average	33%	199	11,957	0.5098	0.6669	3.3447	358.2000	311	407	2,040	218,467	18,656	24,406	122,397	13,108,017
Erdenet factory CHP	Mongolia	Coal	Average	33%	302	17,503	0.5098	0.6669	3.3447	358.2000	471	616	3,089	330,821	27,308	35,726	179,166	19,187,641
Mogul Pauer LLC	Mongolia	Coal	Average	32%	3,416	204,984	0.5098	0.6669	3.3447	358.2000	5,398	7,062	35,419	3,793,147	323,908	423,750	2,125,131	227,588,835
New Asia Group LLC	Mongolia	Coal	Average	32%	569	34,164	0.5098	0.6669	3.3447	358.2000	900	1,177	5,903	632,191	53,985	70,625	354,188	37,931,473
Tavantolooi Power Station LLC	Mongolia	Coal	Average	33%	1,708	102,492	0.5098	0.6669	3.3447	358.2000	2.665	3.487	17.485	1.872.574	159,905	209.194	1.049.119	112.354.434

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Total deaths from PM_{2.5}

heart

0.01

0.01

0.01

0.01

0.01

0.01

0.01

0.01

0.01

0.01 0.01

0.01

0.01

0.02

stroke

0.01

0.01

0.01

0.01

0.01

0.01

0.01

0.01

0.01

0.02

0.02

0.02

Total

0.03

0.03

0.03

0.03

0.03

0.03

0.03

0.04

0.04

0.04

0.04

0.04

0.04

lung ischemic

		Premature Deaths														
		Source: Own calculations														
		000	Total IC Total ND	Total ST Total				DM2.5 Total				NOx Total				502 Tel
		Plant	Total deaths p	er plant/lifetime		Total dea	ths from PM _{2.}	Phi2.5_Total		Total deaths f	rom NO _x	NOX_TOTAL	т	otal deaths from	n SO ₂	302_10
CALCAN	PromatureDeaths	text CC	OPD lung isch	emic stroke Total	COPD	lung is cancer	chemic stro	ke Total	COPD I	ung ischem ncer beart	ic stroke	Total C	COPD lun	g ischemic er heart	stroke	Total
CALC > >	riematureDeatiis	Río Turbio power station Unit 2 San Nicolás-2 power station Unit 14	2.88 5.33 46.88 271.23 9	19.06 19.49 47 70.35 992.69 2.381	0.07	0.13	0.48 (.49 1.18	0.65	1.20 4.2 34.00 121.6	9 4.39 2 124.42	10.53 298.46	2.16 3 125.27 23	.99 14.28 .32 827.55	14.61 846.60	35.05
		Lamu power station 15 Kitui power station Unit 1	55.06 62.78 84 13.67 46.03 64	83.76 1,570.30 2,672	3.08	1.25	17.54 31	.17 53.04	13.75	5.57 78.4	0 139.30	237.02	138.23 55	97 787.82	1,399.83	2,381.8
		Kitui power station Unit 2 11	15.86 46.91 66	60.31 1,173.27 1,996	2.32	0.96	13.49 23	.97 40.79	8.86	3.59 50.4	7 89.68	152.58	104.63 42	.37 596.35	1,059.63	1,802.98
		Ritul power station onit 3	16.05 47.79 6	72.66 1,195.26 2,034	2.41	10.55	13.74 24	42 41.55	9.02	3.65 51.4	91.36	100.04	10 70 61	16 607.55	070.47	1,836.76
		A	AnnualCountry_List A	AnnualScenario AnnualInclude	COPD	LC	IHD	ST								
		Plant Year	r Country S	Scenario Include in	Age-we	eighted mo	ortality rate by	r plant		В	ise cases					
	_			ext text	COPD	lung cancer	ischemic heart	stroke	COPD	lung i cancer	schemic heart	stroke	Total			
		Río Turbio power station Unit 2 20 Río Turbio power station Unit 2 20	020 Argentina C	Coal Capacity 1	0.025%	0.033%	0.102%	0.055%	6,620	8,942	27,232	14,662	57,456 58 202			
		Río Turbio power station Unit 2 20	022 Argentina C	Coal Capacity 1	0.025%	0.033%	0.102%	0.055%	6,792	9,173	27,938	15,042	58,946			
		Río Turbio power station Unit 2 20 Río Turbio power station Unit 2 20	023 Argentina C 024 Argentina C	Coal Capacity 1	0.025%	0.033%	0.102%	0.055%	6,878	9,289						
		Río Turbio power station Unit 2 20 Río Turbio power station Unit 2 20	025 Argentina C 026 Argentina C	Coal Capacity 1 Coal Capacity 1	0.025%	0.033%	0.102%	0.055%	7,049	9,520 9,632	_	Death	s per tonne o	of PM _{2.5}		4
	VII PerTonne	Río Turbio power station Unit 2 20	027 Argentina C	Coal Capacity 1	0.025%	0.033%	0.102%	0.055%	7,214	9,743	COPD	cancer	heart	stroke	Total	
		Río Turbio power station Unit 2 20	029 Argentina C	Coal Capacity 1	0.025%	0.033%	0.102%	0.055%	7,376	9,962	0.000	0 0.000	0 0.0002	0.0002	0.0004	
		Río Turbio power station Unit 2 20	030 Argentina C	Coal Capacity 1	0.025%	0.033%	0.102%	0.055%	7,456	10,071	0.000	0 0.000	0 0.0002		Tota	al deaths
											0.000	0 0.000	0 0.0002	COPD	lung cancer	ische hea
		 Again ma 	ake sure t	to drag dow	n forı	nula	s until				0.000	0 0.000	0 0.0002	0.00	0.0	0
		results fo	n everv r	nower nlant	and v	ear a	re				0.000	0 0.000 0 0.000	0 0.0002 1 0.0002	0.00	0.0	0
			, cvcry p		und y	curu	IC .				0.000	0 0.000	1 0.0002	0.00	0.0	0
		calculate	a											0.00	0.0	0
														0.00	0.0	0
		Press F9	to calcul	ate once do	ne									0.00	0.0	0
														0.00	0.0	0
														0.00	0.0	







INPUTS > >		•
CALC > >	Premature Deaths	•
RESULTS > >	ValuationPD	۰
APPENDIX > >		Valua Source: 0
	YLL_PerTonne	Ana Cou 1 Arg 2 Ken 3 Mor 4
	YLL_TotalDeaths	6 7 8 9 10
	YLL_TotalYears	Source:
	ValuationYLL	1 Ar 2 Ke 3 Me 5 6 7

Optional valuation of health impacts

- Based on existing studies or methodologies (e.g. willingness to pay approaches) the user can input a value of a statistical life or life year respectively
- Include a source for reference
- Press F9 to calculate



15.48

50 154 53

2.493.08 26.769.99 49.262.52

79.381

119.071.952.42



INPUTS > >	
CALC > >	
RESULTS > >	Scenario
APPENDIX > >	Country

In the result set-up choose the scenario and population coverage

.

- "In-country" calculates the results only for the population in the country where the power plant is located, "All countries" for all populations affected by the emissions of the power plant
- Press F9 (calculate model) when making changes to the result setup
- Graphs and result tables will automatically update





INPUTS > >	
CALC > >	
RESULTS > >	Scenario
	Country
	PowerPlant

- In the result set-up choose the country or power plant of interest
- Population coverage can only be changed in the Scenario results sheet
- Press F9 (calculate model) when making changes to the result setup
- Graphs and result tables will automatically update



QUESTIONS / COMMENTS / FEEDBACK

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