USERGUIDE

Air Pollution Impact Model for Electricity Supply

AIRPOLIM-ES

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NEW CLIMATE INSTITUTE

Ambition to Action

Introducing the AIRPOLIM-ES

Ambition to Action

OVERVIEW

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.

INPUTS

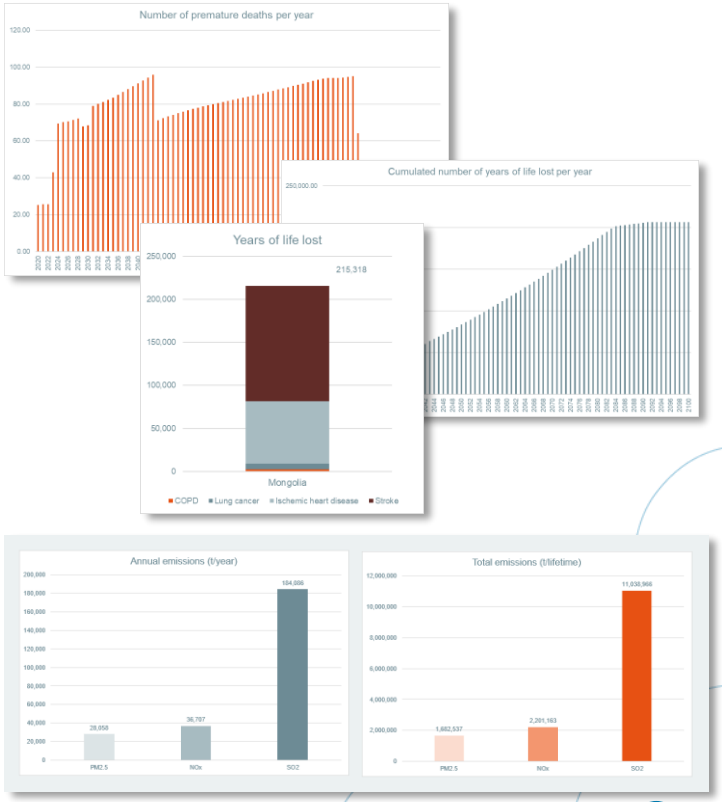
The analysis is based on:

- 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.



Model overview

Purpose and features of the main sections of the model

INPUTS > >	Setup scenarios, define power plant characteristics (capacity, lifetime, pollution control etc.) and input population exposure data
CALC > >	Calculation of population exposure, emissions, concentration change and health impacts
RESULTS > >	Results can be set-up and presented on plant-, country- or scenario-level.
APPENDIX > >	Fixed inputs (including concentration-response functions, intake fraction coefficients)

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

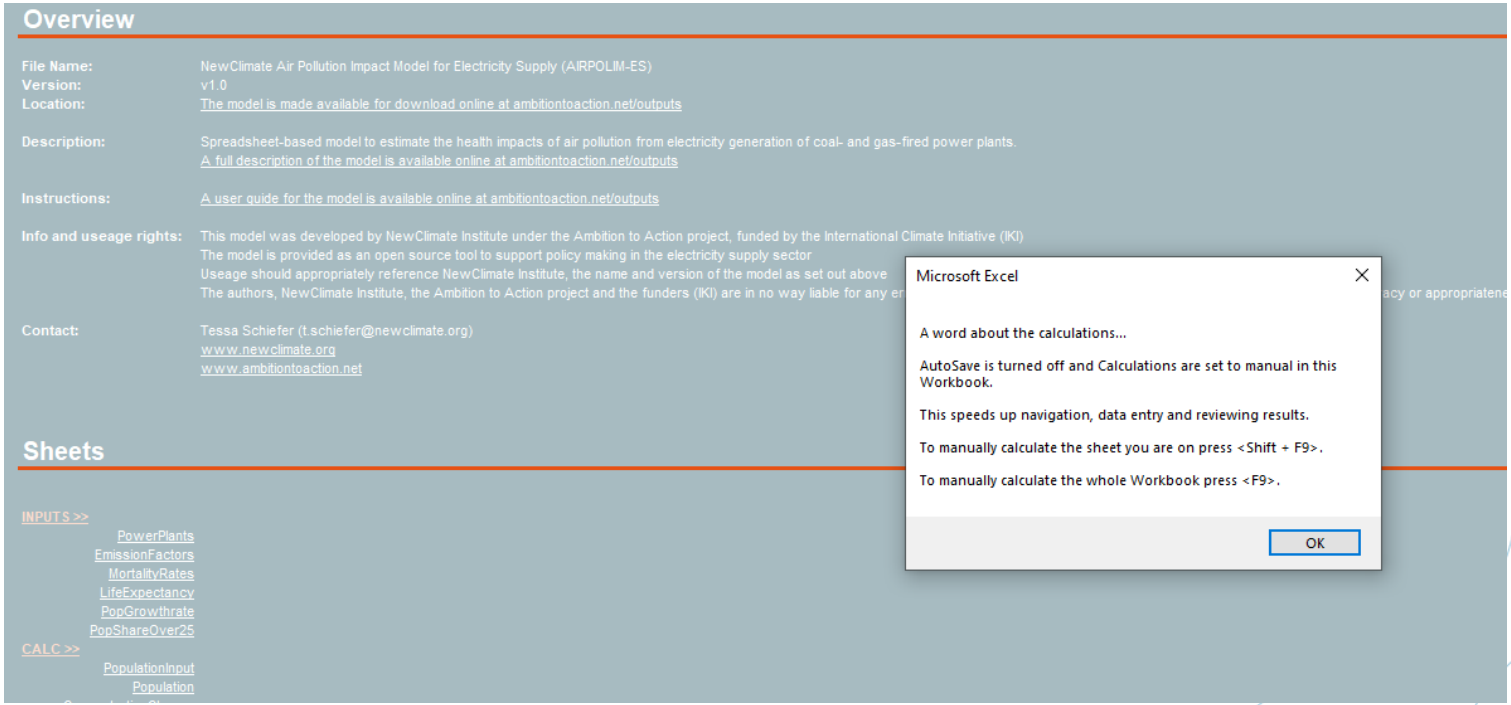
The file opens on the cover sheet with a notice about calculations: read, click OK and start set up

INPUTS > >

CALC > >

RESULTS > >

APPENDIX > >



Setting up the tool

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PowerPlants

EmissionFactors

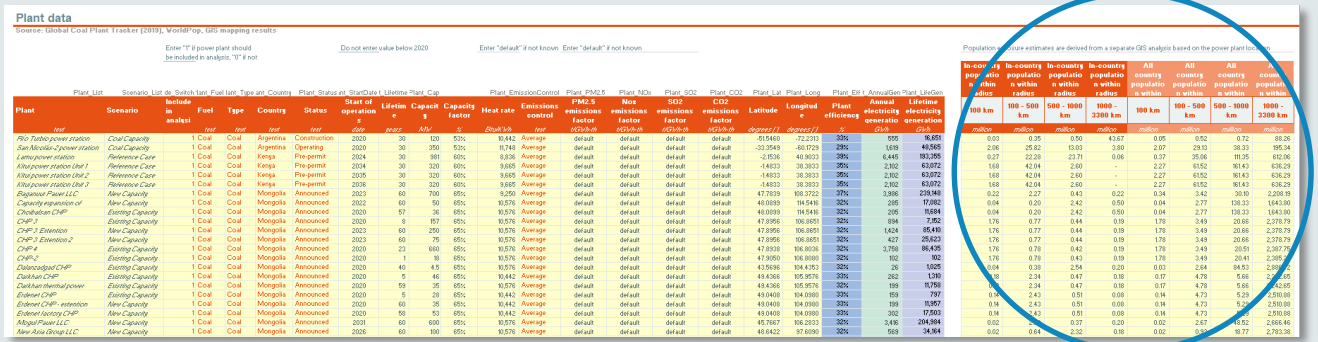
MortalityRates

LifeExpectancy

PopGrowthrate

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



Plant data

Source: Global Coal Plant Tracker (2018), WorldPop, GIS mapping results

Enter "1" if power plant should be included in analysis, "0" if not

Do not enter value below 2020

Enter "default" if not known

Enter "default" if not known

Population exposure estimates are derived from a separate GIS analysis based on the power plant location

Plant_List	Scenario_List	de_Switch	fuel_Fuel	ant_Type	ant_Country	Plant_Status	ext_StartDate	t_Lifetime	Plant_Cap		Plant_EmissionControl	Plant_PM2.5	Plant_NOx	Plant_SO2	Plant_CO2	Plant_Lat	Plant_Long	Plant_Eff	t_AnnualGen	Plant_LifeGen

Plant	Scenario	Include in analysi	Fuel	Type	Country	Status	Start of operation s	Lifetim e	Capacit y	Capacity factor	Heat rate	Emissions control	PM2.5 emissions factor	Nox emissions factor	SO2 emissions factor	CO2 emissions factor	Latitude	Longitud e	Plant efficiency	Annual electricity generatio n	Lifetime electricity generation
text		text	text	text	text	text	date	years	MW	%	Btu/kWh	text	t/GWh-th	t/GWh-th	t/GWh-th	t/GWh-th	degrees (-)	degrees (-)	%	GWh	GWh
Rio Turbio power station	Coal Capacity	1	Coal	Coal	Argentina	Construction	2020	30	120	53%	10,442	Average	default	default	default	default	-515460	-722203	33%	555	16,653
San Nicolás-2 power station	Coal Capacity	1	Coal	Coal	Argentina	Operating	2020	30	350	53%	11,749	Average	default	default	default	default	-33.3549	-60.0729	29%	1,699	46,845
Lamu power station	Reference Case	1	Coal	Coal	Kenya	Pre-permit	2024	30	981	60%	8,836	Average	default	default	default	default	-2.1536	40.9033	39%	6,445	193,355
Kitui power station Unit 1	Reference Case	1	Coal	Coal	Kenya	Pre-permit	2024	30	320	60%	9,665	Average	default	default	default	default	-1.4833	38.3833	35%	2,162	63,072
Kitui power station Unit 2	Reference Case	1	Coal	Coal	Kenya	Pre-permit	2025	30	320	60%	9,665	Average	default	default	default	default	-1.4833	38.3833	35%	2,162	63,072
Kitui power station Unit 3	Reference Case	1	Coal	Coal	Kenya	Pre-permit	2026	30	320	60%	9,665	Average	default	default	default	default	-1.4833	38.3833	35%	2,162	63,072
Baganuur Power LLC	New Capacity	1	Coal	Coal	Mongolia	Announced	2023	60	700	65%	9,250	Average	default	default	default	default	47.7839	108.3722	37%	3,866	239,940
Capacity expansion of	New Capacity	1	Coal	Coal	Mongolia	Announced	2022	60	50	65%	10,576	Average	default	default	default	default	48.0899	114.5416	32%	285	17,082
Choibalsan CHP	New Capacity	1	Coal	Coal	Mongolia	Announced	2020	57	26	65%	10,576	Average	default	default	default	default	48.0899	114.5416	32%	285	16,684
CHP-3	Existing Capacity	1	Coal	Coal	Mongolia	Announced	2020	8	157	65%	10,576	Average	default	default	default	default	47.8956	106.8651	32%	894	7,852
CHP-3 Extention	New Capacity	1	Coal	Coal	Mongolia	Announced	2023	60	250	65%	10,576	Average	default	default	default	default	47.8956	106.8651	32%	1,424	85,410
CHP-3 Extention 2	New Capacity	1	Coal	Coal	Mongolia	Announced	2023	60	75	65%	10,576	Average	default	default	default	default	47.8956	106.8651	32%	427	25,623
CHP-4	Existing Capacity	1	Coal	Coal	Mongolia	Announced	2020	23	660	65%	10,576	Average	default	default	default	default	47.8939	106.8036	32%	3,750	86,435
CHP-2	Existing Capacity	1	Coal	Coal	Mongolia	Announced	2020	1	18	65%	10,576	Average	default	default	default	default	47.9050	106.8080	32%	102	102
Dalanzadgad CHP	Existing Capacity	1	Coal	Coal	Mongolia	Announced	2020	40	4.5	65%	10,576	Average	default	default	default	default	43.5636	104.4353	32%	26	1,025
Darkhan CHP	Existing Capacity	1	Coal	Coal	Mongolia	Announced	2020	5	46	65%	10,442	Average	default	default	default	default	49.4366	105.9576	33%	262	1,310
Darkhan thermal power	Existing Capacity	1	Coal	Coal	Mongolia	Announced	2020	59	35	65%	10,576	Average	default	default	default	default	49.4366	105.9576	32%	199	11,758
Erdenet CHP	Existing Capacity	1	Coal	Coal	Mongolia	Announced	2020	5	28	65%	10,442	Average	default	default	default	default	49.0408	104.0980	33%	159	797
Erdenet CHP - extention	New Capacity	1	Coal	Coal	Mongolia	Announced	2020	60	25	65%	10,442	Average	default	default	default	default	49.0408	104.0980	33%	199	11,957
Erdenet factory CHP	New Capacity	1	Coal	Coal	Mongolia	Announced	2020	58	53	65%	10,442	Average	default	default	default	default	49.0408	104.0980	33%	302	17,503
Mogul Power LLC	New Capacity	1	Coal	Coal	Mongolia	Announced	2031	60	600	65%	10,576	Average	default	default	default	default	45.7667	106.2833	32%	3,416	204,984
New Asia Group LLC	New Capacity	1	Coal	Coal	Mongolia	Announced	2026	60	100	65%	10,576	Average	default	default	default	default	48.8422	97.6090	32%	569	34,164

In-country population within radius	In-country population within radius	In-country population within radius	In-country population within radius	All country population within	All country population within	All country population within	All country population within
100 km	100 - 500 km	500 - 1000 km	1000 - 3300 km	100 km	100 - 500 km	500 - 1000 km	1000 - 3300 km
million	million	million	million	million	million	million	million
0.03	0.35	0.50	43.67	0.05	0.52	0.72	99.26
2.06	25.82	13.93	3.80	2.07	29.10	38.33	185.34
0.27	22.28	23.71	0.06	0.37	35.06	111.35	612.06
1.68	42.04	2.60	-	2.27	61.52	161.43	636.29
1.68	42.04	2.60	-	2.27	61.52	161.43	636.29
1.68	42.04	2.60	-	2.27	61.52	161.43	636.29
0.22	2.27	0.43	0.22	0.34	3.42	30.10	2,266.89
0.04	0.20	2.42	0.50	0.04	2.77	138.33	1,643.80
0.04	0.20	2.42	0.50	0.04	2.77	138.33	1,643.80
1.76	0.77	0.44	0.19	1.79	3.49	20.66	2,378.79
1.76	0.77	0.44	0.19	1.79	3.49	20.66	2,378.79
1.76	0.77	0.44	0.19	1.79	3.49	20.66	2,378.79
1.76	0.78	0.42	0.19	1.79	3.49	20.51	2,367.79
1.76	0.78	0.43	0.19	1.79	3.49	20.41	2,365.79
0.04	0.38	2.54	0.20	0.03	2.64	84.53	2,893.95
0.59	2.34	0.47	0.18	0.17	4.78	5.66	2,442.45
0.59	2.34	0.47	0.18	0.17	4.78	5.66	2,442.45
0.14	2.43	0.51	0.08	0.14	4.73	5.23	2,510.88
0.14	2.43	0.51	0.08	0.14	4.73	5.23	2,510.88
0.14	2.43	0.51	0.08	0.14	4.73	5.23	2,510.88
0.02	0.37	0.20	0.02	2.67	13.52	16.77	2,668.46
0.02	0.64	2.32	0.18	0.02	0.32	16.77	2,783.28

Setting up the tool

Ambition to Action

INPUTS > >

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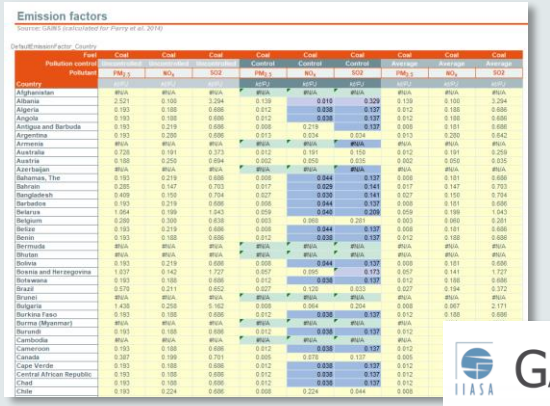
- PowerPlants
- EmissionFactors
- MortalityRates
- LifeExpectancy
- PopGrowthrate
- PopShareOver25



- If emission factors are unknown, **approximate emission factors** for each country and type of control technology calculated by the **GAINS model** can be used
- Entering plant-specific emission factors improves the accuracy of the estimates

GAINS Online

Greenhouse Gas - Air Pollution Interactions and Synergies

Plant data

Source: Global Coal Plant Tracker (2019), WorldPop, GIS mapping results

Enter "1" if power plant should be included in analysis, "0" if not

Do not enter value below 2020

Enter "default" if not known

Enter "default" if not known

Plant_List	Scenario_List	de_Switch	lant_Fuel	lant_Type	ant_Country	Plant_Status	ant_StartDate	l_Lifetime	Plant_Cap		Plant_EmissionControl	Plant_PM2.5	Plant_NOx	Plant_SO2	Plant_CO2
Plant	Scenario	Include in analysis	Fuel	Type	Country	Status	Start of operations	Lifetime	Capacity	Capacity factor	Heat rate	Emissions control	PM2.5 emissions factor	Nox emissions factor	SO2 emissions factor	CO2 emissions factor
text		text		text	text	text	date	years	MW	%	Btu/KWh	text	t/GWh-th	t/GWh-th	t/GWh-th	t/GWh-th
Rio Turbio power station Unit	Coal Capacity	1	Coal	Coal	Argentina	Construction	2020	30	120	53%	10,442	Average	default	default	default	default
San Nicolás-2 power station	Coal Capacity	1	Coal	Coal	Argentina	Operating	2020	30	350	53%	11,748	Average	default	default	default	default
Lamu power station	Reference Case	1	Coal	Coal	Kenya	Pre-permit	2024	30	981	60%	8,836	Average	default	default	default	default
Kitui power station Unit 1	Reference Case	1	Coal	Coal	Kenya	Pre-permit	2034	30	320	60%	9,665	Average	default	default	default	default
Kitui power station Unit 2	Reference Case	1	Coal	Coal	Kenya	Pre-permit	2035	30	320	60%	9,665	Average	default	default	default	default
Kitui power station Unit 3	Reference Case	1	Coal	Coal	Kenya	Pre-permit	2036	30	320	60%	9,665	Average	default	default	default	default
Baganuur Pauer LLC	New Capacity	1	Coal	Coal	Mongolia	Announced	2023	60	700	65%	9,250	Average	default	default	default	default
Capacity expansion of	New Capacity	1	Coal	Coal	Mongolia	Announced	2022	60	50	65%	10,576	Average	default	default	default	default
Choibalsan CHP	Existing Capacity	1	Coal	Coal	Mongolia	Announced	2020	57	36	65%	10,576	Average	default	default	default	default

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IHME

Global Health Data Exchange | GHDx | Institute for Health Metrics and Evaluation

WDI DataFinder

- 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-weighted mortality rates

Source: IHME (2019), World Development Indicators (2019)

MortalityRate_Tbl

	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 rate	Share in populatio	Mortality rate	Share in populatio	Mortality rate	Share in populatio	Mortality rate	Share in populatio	Mortality rate	Share in populatio	Mortality rate	Share in populatio	Mortality rate	Share in populatio	Mortality rate	Share in populatio	Mortality rate	Share in populatio	Mortality rate	Share in populatio	Mortality rate	Share in populatio	Mortality rate	Share in populatio	Mortality rate	Share in populatio	Mortality rate	Share in populatio	Mortality rate	Share in populatio	Mortality rate	Share in populatio	Mortality rate	Share in populatio	Mortality rate	Share in populatio	Mortality rate	Share in populatio	Mortality rate	Share in populatio	Mortality rate	Share in populatio	%
1	Argentina	COPD	0.0085%	13.2%	0.0099%	12.3%	0.0111%	11.9%	0.0130%	11.2%	0.0188%	9.5%	0.0252%	8.5%	0.0322%	7.8%	0.0436%	7.0%	0.0493%	6.0%	0.0556%	4.8%	0.0563%	3.4%	0.0597%	4.4%	0.025%
1	Argentina	LC	0.0035%	13.2%	0.0073%	12.3%	0.0144%	11.9%	0.0241%	11.2%	0.0404%	9.5%	0.0596%	8.5%	0.0735%	7.8%	0.0700%	7.0%	0.0636%	6.0%	0.0509%	4.8%	0.0355%	3.4%	0.0145%	4.4%	0.033%
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%	11.9%	0.0575%	11.2%	0.0851%	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%	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%	0.0448%	1.1%	0.009%
2	Kenya	LC	0.0003%	20.6%	0.0006%	19.0%	0.0010%	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%	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%	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%	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%	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%	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%	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		COPD																																										0.000%
4		LC																																										0.000%
4		IHD																																										0.000%
4		ST																																										0.000%
5		COPD																																										0.000%
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UNITED NATIONS
DESA / POPULATION DIVISION
World Population Prospects

- 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 age and time

Source: UN World Population Prospects (2019)

LifeExpectancy

	Analysis countries	Age category	2015 years	2020 years	2025 years	2030 years	2035 years	2040 years	2045 years	2050 years	2055 years	2060 years	2065 years	2070 years	2075 years	2080 years	2085 years	2090 years	2095 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

Setting up the tool

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PowerPlants

EmissionFactors

MortalityRates

LifeExpectancy

PopGrowthrate

PopShareOver25

UNITED NATIONS
DESA / POPULATION DIVISION
World Population Prospects

- 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**

Population Growth Rate

Source: UN World Population Prospects (2019)

PopGrowth_Rate

Population growth rate

	Analysis countries	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050	2051
1	Argentina	0.96%	0.94%	0.92%	0.90%	0.88%	0.86%	0.84%	0.83%	0.81%	0.80%	0.78%	0.76%	0.74%	0.72%	0.70%	0.68%	0.66%	0.65%	0.63%	0.62%	0.60%	0.58%	0.57%	0.55%	0.54%	0.52%	0.50%	0.49%	0.47%	0.46%	0.44%	0.43%	0.41%	0.40%	0.38%	0.37%	0.35%
2	Kenya	2.32%	2.29%	2.27%	2.24%	2.22%	2.19%	2.16%	2.13%	2.11%	2.08%	2.05%	2.02%	1.99%	1.95%	1.92%	1.89%	1.85%	1.81%	1.77%	1.73%	1.69%	1.65%	1.61%	1.58%	1.54%	1.50%	1.47%	1.43%	1.40%	1.36%	1.33%	1.30%	1.27%	1.25%	1.22%	1.19%	1.16%
3	Mongolia	1.78%	1.70%	1.62%	1.55%	1.47%	1.39%	1.34%	1.28%	1.23%	1.17%	1.12%	1.09%	1.07%	1.04%	1.02%	0.99%	0.98%	0.97%	0.95%	0.94%	0.93%	0.92%	0.91%	0.90%	0.89%	0.88%	0.87%	0.85%	0.84%	0.82%	0.81%	0.79%	0.76%	0.74%	0.71%	0.69%	0.66%
4	0																																					
5																																						
6																																						

Population Share over 25 years

Source: UN World Population Prospects (2019)

PopOver25_Share PopOver25_Year

Share of population above 25 years

	Analysis countries	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046
1	Argentina	58.50%	58.80%	59.10%	59.40%	59.70%	60.00%	60.26%	60.52%	60.78%	61.04%	61.30%	61.54%	61.78%	62.02%	62.26%	62.50%	62.76%	63.02%	63.28%	63.54%	63.80%	64.06%	64.32%	64.58%	64.84%	65.10%	65.38%	65.66%	65.94%	66.22%	66.50%	66.72%
2	Kenya	38.30%	38.74%	39.18%	39.62%	40.06%	40.50%	41.02%	41.54%	42.06%	42.58%	43.10%	43.66%	44.22%	44.78%	45.34%	45.90%	46.46%	47.02%	47.58%	48.14%	48.70%	49.18%	49.66%	50.14%	50.62%	51.10%	51.48%	51.86%	52.24%	52.62%	53.00%	53.38%
3	Mongolia	54.30%	54.50%	54.70%	54.90%	55.10%	55.30%	55.26%	55.22%	55.18%	55.14%	55.10%	55.06%	55.02%	54.98%	54.94%	54.90%	55.12%	55.34%	55.56%	55.78%	56.00%	56.52%	57.04%	57.56%	58.08%	58.60%	59.06%	59.52%	59.98%	60.44%	60.90%	61.14%
4	0																																
5																																	
6																																	

Setting up the tool

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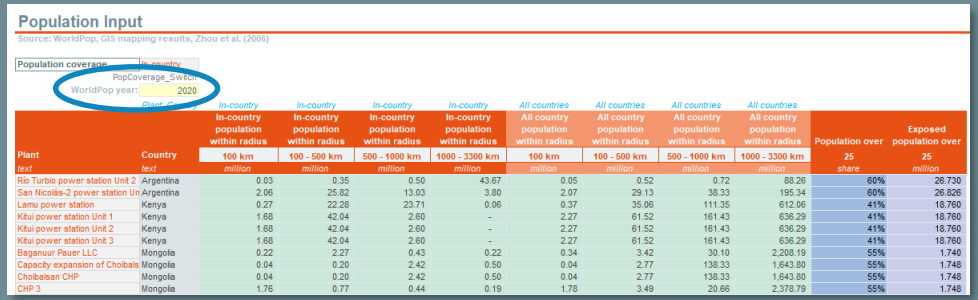
- Make sure to **drag down formulas** until results for each entered power plant are displayed
- Add the **base year** of the population data set used

- **Drag down formulas** in rows D – R until the last year of operations of the last power plant in the list is displayed, not further ⚠
- Based on the entered lifetime and start of operations the years are set up automatically
- **Press F9** to calculate



Plant	Country	In-country population within radius 100 km	In-country population within radius 100 - 500 km	In-country population within radius 500 - 1000 km	In-country population within radius 1000 - 3300 km	All country population within radius 100 km	All country population within radius 100 - 500 km	All country population within radius 500 - 1000 km	All country population within radius 1000 - 3300 km	Population over 25	Exposed population over 25
text	text	million	million	million	million	million	million	million	million	share	million
Rio Turbio power station Unit 2	Argentina	0.03	0.35	0.50	43.67	0.05	0.52	0.72	88.26	60%	26.730
San Nicolás-2 power station Un	Argentina	2.06	25.82	13.03	3.80	2.07	29.13	38.33	195.34	60%	26.826
Lamu power station	Kenya	0.27	22.28	23.71	0.06	0.37	35.06	111.35	612.06	41%	18.760
Kitui power station Unit 1	Kenya	1.68	42.04	2.60	-	2.27	61.52	161.43	636.29	41%	18.760
Kitui power station Unit 2	Kenya	1.68	42.04	2.60	-	2.27	61.52	161.43	636.29	41%	18.760
Kitui power station Unit 3	Kenya	1.68	42.04	2.60	-	2.27	61.52	161.43	636.29	41%	18.760
Baganuur Pauer LLC	Mongolia	0.22	2.27	0.43	0.22	0.34	3.42	30.10	2,208.19	55%	1.740
Capacity expansion of Choibals	Mongolia	0.04	0.20	2.42	0.50	0.04	2.77	138.33	1,643.80	55%	1.748
Choibalsan CHP	Mongolia	0.04	0.20	2.42	0.50	0.04	2.77	138.33	1,643.80	55%	1.748
CHP 3	Mongolia	1.76	0.77	0.44	0.19	1.78	3.49	20.66	2,378.79	55%	1.748

Plant	Repeat	Row	Plant	Year	Country	In-country population within radius 100 km	In-country population within radius 100 - 500 km	In-country population within radius 500 - 1000 km	In-country population within radius 1000 - 3300 km	All country population within radius 100 km	All country population within radius 100 - 500 km	All country population within radius 500 - 1000 km	All country population within radius 1000 - 3300 km	Population over 25	Exposed population over 25	Total exposed population
text					text	million	million	million	million	million	million	million	million	share	million	million
Rio Turbio power station Ur	31	0	Rio Turbio power statio	2020	Argentina	0.35	0.58	43.67	0.05	0.52	0.72	88.26	0.60	60%	27	45
San Nicolás-2 power static	31	31	Rio Turbio power statio	2021	Argentina	0.35	0.58	44.05	0.05	0.52	0.73	89.02	0.61	60%	27	45
Lamu power station	35	62	Rio Turbio power statio	2022	Argentina	0.36	0.51	44.42	0.05	0.53	0.73	89.77	0.61	61%	27	45
Kitui power station Unit 1	45	97	Rio Turbio power statio	2023	Argentina	0.36	0.51	44.79	0.05	0.53	0.74	90.51	0.62	61%	28	46
Kitui power station Unit 2	46	142	Rio Turbio power statio	2024	Argentina	0.36	0.52	45.15	0.05	0.54	0.74	91.25	0.62	61%	28	46
Kitui power station Unit 3	47	188	Rio Turbio power statio	2025	Argentina	0.36	0.52	45.51	0.05	0.54	0.75	91.97	0.63	61%	28	46
Baganuur Pauer LLC	64	235	Rio Turbio power statio	2026	Argentina	0.37	0.53	45.86	0.05	0.55	0.76	92.69	0.63	62%	29	47
Capacity expansion of Cho	63	299	Rio Turbio power statio	2027	Argentina	0.37	0.53	46.21	0.05	0.55	0.76	93.40	0.63	62%	29	47
Choibalsan CHP	58	362	Rio Turbio power statio	2028	Argentina	0.37	0.53	46.55	0.05	0.55	0.77	94.09	0.64	62%	29	48
CHP 3	9	420	Rio Turbio power statio	2029	Argentina	0.38	0.54	46.89	0.05	0.56	0.77	94.77	0.64	62%	30	48
CHP 3 Extention	64	429	Rio Turbio power statio	2030	Argentina	0.38	0.54	47.22	0.05	0.56	0.78	95.43	0.65	63%	30	48
CHP 3 Extention 2	64	493	Rio Turbio power statio	2031	Argentina	0.38	0.54	47.54	0.05	0.57	0.78	96.08	0.65	63%	30	49
CHP 4	24	557	Rio Turbio power statio	2032	Argentina	0.38	0.55	47.85	0.05	0.57	0.79	96.72	0.66	63%	31	49
CHP-2	2	581	Rio Turbio power statio	2033	Argentina	0.39	0.55	48.16	0.06	0.57	0.79	97.34	0.66	63%	31	49
Dalanzadgad CHP	41	583	Rio Turbio power statio	2034	Argentina	0.39	0.55	48.47	0.06	0.58	0.80	97.96	0.67	64%	31	49
Darkhan CHP	6	624	Rio Turbio power statio	2035	Argentina	0.39	0.56	48.77	0.06	0.58	0.80	98.56	0.67	64%	32	50
Darkhan thermal power sta	60	630	Rio Turbio power statio	2036	Argentina	0.39	0.56	49.06	0.06	0.58	0.81	99.15	0.67	64%	32	50
Erdenet CHP	6	690	Rio Turbio power statio	2037	Argentina	0.40	0.56	49.35	0.06	0.59	0.81	99.73	0.68	64%	32	50
Erdenet CHP - extention	61	696	Rio Turbio power statio	2038	Argentina	0.40	0.57	49.63	0.06	0.59	0.82	100.30	0.68	65%	33	51
Erdenet factory CHP	59	757	Rio Turbio power statio	2039	Argentina	0.40	0.57	49.90	0.06	0.59	0.82	100.85	0.69	65%	33	51
Mogul Pauer LLC	72	816	Rio Turbio power statio	2040	Argentina	0.40	0.57	50.17	0.06	0.60	0.83	101.39	0.69	65%	33	51
New Asia Group LLC	67	888	Rio Turbio power statio	2041	Argentina	0.40	0.58	50.43	0.06	0.60	0.83	101.92	0.69	65%	34	51
Tavantolgoi Power Station	64	955	Rio Turbio power statio	2042	Argentina	0.41	0.58	50.69	0.06	0.60	0.84	102.43	0.70	66%	34	52

** Population exposure estimated in this sheet includes population growth estimates*

Setting up the tool

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...

- 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)

Plant	Year	Country	Intake fraction			Change in $PM_{2.5}$ concentration per tonne		
			PM2.5	NOx	SO2	$PM_{2.5}$	NO_x	SO2
		text	g of PM2.5 inhaled per tonne of emissions			unit		
Rio Turbio power station Unit	2020	Argentina	0.25	0.10	0.15	7.53E-07	3.15E-07	4.56E-07
Rio Turbio power station Unit	2021	Argentina	0.25	0.10	0.15	7.53E-07	3.15E-07	4.56E-07
Rio Turbio power station Unit	2022	Argentina	0.25	0.10	0.15	7.53E-07	3.15E-07	4.56E-07
Rio Turbio power station Unit	2023	Argentina	0.25	0.10	0.15	7.53E-07	3.15E-07	4.56E-07
Rio Turbio power station Unit	2024	Argentina	0.25	0.11	0.15	7.53E-07	3.15E-07	4.56E-07
Rio Turbio power station Unit	2025	Argentina	0.26	0.11	0.15	7.53E-07	3.15E-07	4.56E-07
Rio Turbio power station Unit	2026	Argentina	0.26	0.11	0.16	7.53E-07	3.15E-07	4.56E-07
Rio Turbio power station Unit	2027	Argentina	0.26	0.11	0.16	7.53E-07	3.15E-07	4.56E-07
Rio Turbio power station Unit	2028	Argentina	0.26	0.11	0.16	7.53E-07	3.15E-07	4.56E-07
Rio Turbio power station Unit	2029	Argentina	0.26	0.11	0.16	7.53E-07	3.15E-07	4.56E-07
Rio Turbio power station Unit	2030	Argentina	0.26	0.11	0.16	7.53E-07	3.15E-07	4.56E-07
Rio Turbio power station Unit	2031	Argentina	0.27	0.11	0.16	7.53E-07	3.15E-07	4.56E-07
Rio Turbio power station Unit	2032	Argentina	0.27	0.11	0.16	7.53E-07	3.15E-07	4.56E-07
Rio Turbio power station Unit	2033	Argentina	0.27	0.11	0.16	7.53E-07	3.15E-07	4.56E-07
Rio Turbio power station Unit	2034	Argentina	0.27	0.11	0.16	7.53E-07	3.15E-07	4.56E-07
Rio Turbio power station Unit	2035	Argentina	0.27	0.11	0.17	7.53E-07	3.15E-07	4.56E-07
Rio Turbio power station Unit	2036	Argentina	0.28	0.11	0.17	7.53E-07	3.15E-07	4.56E-07
Rio Turbio power station Unit	2037	Argentina	0.28	0.12	0.17	7.53E-07	3.15E-07	4.56E-07
Rio Turbio power station Unit	2038	Argentina	0.28	0.12	0.17	7.53E-07	3.15E-07	4.56E-07
Rio Turbio power station Unit	2039	Argentina	0.28	0.12	0.17	7.53E-07	3.15E-07	4.56E-07
Rio Turbio power station Unit	2040	Argentina	0.28	0.12	0.17	7.53E-07	3.15E-07	4.56E-07
Rio Turbio power station Unit	2041	Argentina	0.28	0.12	0.17	7.53E-07	3.15E-07	4.56E-07
Rio Turbio power station Unit	2042	Argentina	0.28	0.12	0.17	7.53E-07	3.15E-07	4.56E-07
Rio Turbio power station Unit	2043	Argentina	0.29	0.12	0.17	7.53E-07	3.15E-07	4.56E-07
Rio Turbio power station Unit	2044	Argentina	0.29	0.12	0.17	7.53E-07	3.15E-07	4.56E-07
Rio Turbio power station Unit	2045	Argentina	0.29	0.12	0.17	7.53E-07	3.15E-07	4.56E-07
Rio Turbio power station Unit	2046	Argentina	0.29	0.12	0.18	7.53E-07	3.15E-07	4.56E-07
Rio Turbio power station Unit	2047	Argentina	0.29	0.12	0.18	7.53E-07	3.15E-07	4.56E-07
Rio Turbio power station Unit	2048	Argentina	0.29	0.12	0.18	7.53E-07	3.15E-07	4.56E-07
Rio Turbio power station Unit	2049	Argentina	0.29	0.12	0.18	7.53E-07	3.15E-07	4.56E-07
Rio Turbio power station Unit	2050	Argentina	0.29	0.12	0.18	7.53E-07	3.15E-07	4.56E-07

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...

- 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

Plant	Year	Country	Relative risk of a one tonne increase per person (health impacts)											
			PM2.5				NOx				SO2			
text		text	COPD	LC	IHD	ST	COPD	LC	IHD	ST	COPD	LC	IHD	ST
Rio Turbio power station I	2020	Argentina	1.000000004	1.000000005	1.000000006	1.000000011	1.000000002	1.000000002	1.000000003	1.000000005	1.000000002	1.000000003	1.000000004	1.000000007
Rio Turbio power station I	2021	Argentina	1.000000004	1.000000005	1.000000006	1.000000011	1.000000002	1.000000002	1.000000003	1.000000005	1.000000002	1.000000003	1.000000004	1.000000007
Rio Turbio power station I	2022	Argentina	1.000000004	1.000000005	1.000000006	1.000000011	1.000000002	1.000000002	1.000000003	1.000000005	1.000000002	1.000000003	1.000000004	1.000000007
Rio Turbio power station I	2023	Argentina	1.000000004	1.000000005	1.000000006	1.000000011	1.000000002	1.000000002	1.000000003	1.000000005	1.000000002	1.000000003	1.000000004	1.000000007
Rio Turbio power station I	2024	Argentina	1.000000004	1.000000005	1.000000006	1.000000011	1.000000002	1.000000002	1.000000003	1.000000005	1.000000002	1.000000003	1.000000004	1.000000007
Rio Turbio power station I	2025	Argentina	1.000000004	1.000000005	1.000000006	1.000000011	1.000000002	1.000000002	1.000000003	1.000000005	1.000000002	1.000000003	1.000000004	1.000000007
Rio Turbio power station I	2026	Argentina	1.000000004	1.000000005	1.000000006	1.000000011	1.000000002	1.000000002	1.000000003	1.000000005	1.000000002	1.000000003	1.000000004	1.000000007
Rio Turbio power station I	2027	Argentina	1.000000004	1.000000005	1.000000006	1.000000011	1.000000002	1.000000002	1.000000003	1.000000005	1.000000002	1.000000003	1.000000004	1.000000007
Rio Turbio power station I	2028	Argentina	1.000000004	1.000000005	1.000000006	1.000000011	1.000000002	1.000000002	1.000000003	1.000000005	1.000000002	1.000000003	1.000000004	1.000000007
Rio Turbio power station I	2029	Argentina	1.000000004	1.000000005	1.000000006	1.000000011	1.000000002	1.000000002	1.000000003	1.000000005	1.000000002	1.000000003	1.000000004	1.000000007
Rio Turbio power station I	2030	Argentina	1.000000004	1.000000005	1.000000006	1.000000011	1.000000002	1.000000002	1.000000003	1.000000005	1.000000002	1.000000003	1.000000004	1.000000007
Rio Turbio power station I	2031	Argentina	1.000000004	1.000000005	1.000000006	1.000000011	1.000000002	1.000000002	1.000000003	1.000000005	1.000000002	1.000000003	1.000000004	1.000000007
Rio Turbio power station I	2032	Argentina	1.000000004	1.000000005	1.000000006	1.000000011	1.000000002	1.000000002	1.000000003	1.000000005	1.000000002	1.000000003	1.000000004	1.000000007
Rio Turbio power station I	2033	Argentina	1.000000004	1.000000005	1.000000006	1.000000011	1.000000002	1.000000002	1.000000003	1.000000005	1.000000002	1.000000003	1.000000004	1.000000007

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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

Plant_List							Plant_PM2.5 Emissions Factor	Plant_NOx Emissions Factor	Plant_SO2 Emissions Factor	Plant_CO2 Emissions Factor	PM2.5_Annual Annual emissions	NOx_Annual Annual emissions	SO2_Annual Annual emissions	CO2_Annual Annual emissions	PM2.5_Lifetime Lifetime emissions	NOx_Lifetime Lifetime emissions	SO2_Lifetime Lifetime emissions	CO2_Lifetime Lifetime emissions
Plant	Country	Fuel	Control type	Efficiency	Annual electricity generation	Lifetime electricity generation	$PM_{2.5}$	NOx	SO2	CO2	$PM_{2.5}$	NOx	SO2	CO2	$PM_{2.5}$	NOx	SO2	CO2
text	*text*	*text*	*text*	%	GWh	GWh	kG/wh-th	kG/wh-th	kG/wh-th	kG/wh-th	*t/year*	*t/year*	*t/year*	*t/year*	*Mt/lifetime*	*Mt/lifetime*	*Mt/lifetime*	*Mt/lifetime*
Río Turbio power station Unit 2	Argentina	Coal	Average	33%	555	16,651	0.0471	1.0065	2.3097	339.4800	80	1,710	3,923	576,644	2,401	51,291	117,638	17,299,334
San Nicolás-2 power station Unit 11	Argentina	Coal	Average	29%	1,619	48,565	0.0471	1.0065	2.3097	339.4800	263	5,610	12,874	1,892,235	7,880	168,309	386,221	56,767,064
Lamu power station	Kenya	Coal	Average	35%	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	Kenya	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	Kenya	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	Kenya	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	26,932	35,392	177,094	18,965,736
Choibalsan CHP	Mongolia	Coal	Average	32%	205	11,884	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	1,580,479	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	86,435	0.5098	0.6669	3.3447	358.2000	5,938	7,769	38,961	4,172,462	136,581	178,681	896,097	95,966,626
CHP-2	Mongolia	Coal	Average	32%	102	102	0.5098	0.6669	3.3447	358.2000	162	212	1,063	113,794	162	212	1,063	113,794
Dalanzadgad CHP	Mongolia	Coal	Average	32%	26	1,025	0.5098	0.6669	3.3447	358.2000	40	53	266	28,449	1,620	2,119	10,626	1,137,944
Darkhan CHP	Mongolia	Coal	Average	33%	262	5,110	0.5098	0.6669	3.3447	358.2000	409	535	2,681	287,128	2,043	2,673	13,405	1,435,640
Darkhan thermal power station State P	Mongolia	Coal	Average	32%	199	11,758	0.5098	0.6669	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	13,108,097
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
Tavantolgoy Power Station LLC	Mongolia	Coal	Average	33%	1,708	102,492	0.5098	0.6669	3.3447	358.2000	2,685	3,497	17,495	1,872,574	159,905	209,194	1,049,119	112,354,434

Setting up the tool

Ambition to Action

INPUTS > >

CALC > >

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PrematureDeaths

ValuationPD

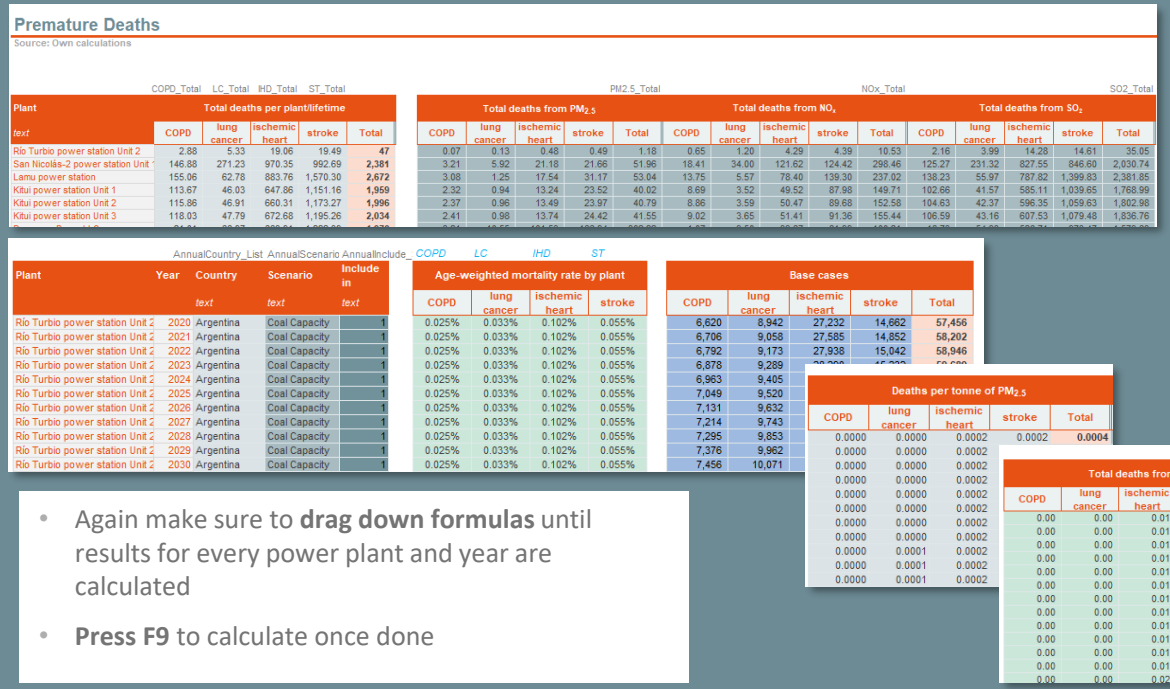
YLL_BaseCases

YLL_PerTonne

YLL_TotalDeaths

YLL_TotalYears

ValuationYLL



Premature Deaths

Source: Own calculations

Plant	Total deaths per plant/lifetime					Total deaths from $PM_{2.5}$					Total deaths from NO_x					Total deaths from SO_2				
	COPD_Total	LC_Total	IHD_Total	ST_Total		PM2.5_Total					NOx_Total					SO2_Total				
text	COPD	lung cancer	ischemic heart	stroke	Total	COPD	lung cancer	ischemic heart	stroke	Total	COPD	lung cancer	ischemic heart	stroke	Total	COPD	lung cancer	ischemic heart	stroke	Total
Río Turbio power station Unit 2	2.88	5.33	19.06	19.49	47	0.07	0.13	0.48	0.49	1.18	0.65	1.20	4.29	4.39	10.53	2.16	3.99	14.28	14.61	35.05
San Nicolás-2 power station Unit 1	146.88	271.23	970.35	992.69	2,381	3.21	5.92	21.18	21.66	51.96	18.41	34.00	121.62	124.42	298.46	125.27	231.32	827.55	846.60	2,030.74
Lamu power station	155.06	62.78	883.76	1,570.30	2,672	3.08	1.25	17.54	31.17	53.04	13.75	5.57	78.40	139.30	237.02	136.23	55.97	787.82	1,399.83	2,381.85
Kitui power station Unit 1	113.67	46.03	647.86	1,151.16	1,959	2.32	0.94	13.24	23.52	40.02	8.69	3.52	49.52	87.98	149.71	102.66	41.57	585.11	1,039.65	1,768.99
Kitui power station Unit 2	115.86	46.91	660.31	1,173.27	1,996	2.37	0.96	13.49	23.97	40.79	8.86	3.59	50.47	89.68	152.58	104.63	42.37	596.35	1,059.63	1,802.98
Kitui power station Unit 3	118.03	47.79	672.68	1,195.26	2,034	2.41	0.98	13.74	24.42	41.55	9.02	3.65	51.41	91.36	155.44	106.59	43.16	607.53	1,079.48	1,836.76

Plant	Year	Country	Scenario	Include in	Age-weighted mortality rate by plant				Base cases				
	AnnualCountry_List		AnnualScenario	AnnualInclude_	COPD	LC	IHD	ST					
		text	text	text	COPD	lung cancer	ischemic heart	stroke	COPD	lung cancer	ischemic heart	stroke	Total
Río Turbio power station Unit 2	2020	Argentina	Coal Capacity	1	0.025%	0.033%	0.102%	0.055%	6,620	8,942	27,232	14,662	57,456
Río Turbio power station Unit 2	2021	Argentina	Coal Capacity	1	0.025%	0.033%	0.102%	0.055%	6,706	9,058	27,585	14,852	58,202
Río Turbio power station Unit 2	2022	Argentina	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	2023	Argentina	Coal Capacity	1	0.025%	0.033%	0.102%	0.055%	6,878	9,289			
Río Turbio power station Unit 2	2024	Argentina	Coal Capacity	1	0.025%	0.033%	0.102%	0.055%	6,963	9,405			
Río Turbio power station Unit 2	2025	Argentina	Coal Capacity	1	0.025%	0.033%	0.102%	0.055%	7,049	9,520			
Río Turbio power station Unit 2	2026	Argentina	Coal Capacity	1	0.025%	0.033%	0.102%	0.055%	7,131	9,632			
Río Turbio power station Unit 2	2027	Argentina	Coal Capacity	1	0.025%	0.033%	0.102%	0.055%	7,214	9,743			
Río Turbio power station Unit 2	2028	Argentina	Coal Capacity	1	0.025%	0.033%	0.102%	0.055%	7,295	9,853			
Río Turbio power station Unit 2	2029	Argentina	Coal Capacity	1	0.025%	0.033%	0.102%	0.055%	7,376	9,962			
Río Turbio power station Unit 2	2030	Argentina	Coal Capacity	1	0.025%	0.033%	0.102%	0.055%	7,456	10,071			

Deaths per tonne of $PM_{2.5}$

COPD	lung cancer	ischemic heart	stroke	Total
0.0000	0.0000	0.0002	0.0002	**0.0004**
0.0000	0.0000	0.0002		
0.0000	0.0000	0.0002		
0.0000	0.0000	0.0002		
0.0000	0.0000	0.0002		
0.0000	0.0000	0.0002		
0.0000	0.0000	0.0002		
0.0000	0.0000	0.0002		
0.0000	0.0001	0.0002		
0.0000	0.0001	0.0002		
0.0000	0.0001	0.0002		

Total deaths from $PM_{2.5}$

COPD	lung cancer	ischemic heart	stroke	Total
0.00	0.00	0.01	0.01	**0.03**
0.00	0.00	0.01	0.01	**0.03**
0.00	0.00	0.01	0.01	**0.03**
0.00	0.00	0.01	0.01	**0.03**
0.00	0.00	0.01	0.01	**0.03**
0.00	0.00	0.01	0.01	**0.03**
0.00	0.00	0.01	0.01	**0.03**
0.00	0.00	0.01	0.01	**0.04**
0.00	0.00	0.01	0.01	**0.04**
0.00	0.00	0.01	0.02	**0.04**
0.00	0.00	0.01	0.02	**0.04**
0.00	0.00	0.02	0.02	**0.04**

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

Setting up the tool

Ambition to Action

INPUTS > >

...

CALC > >

PrematureDeaths

ValuationPD

RESULTS > >

YLL_BaseCases

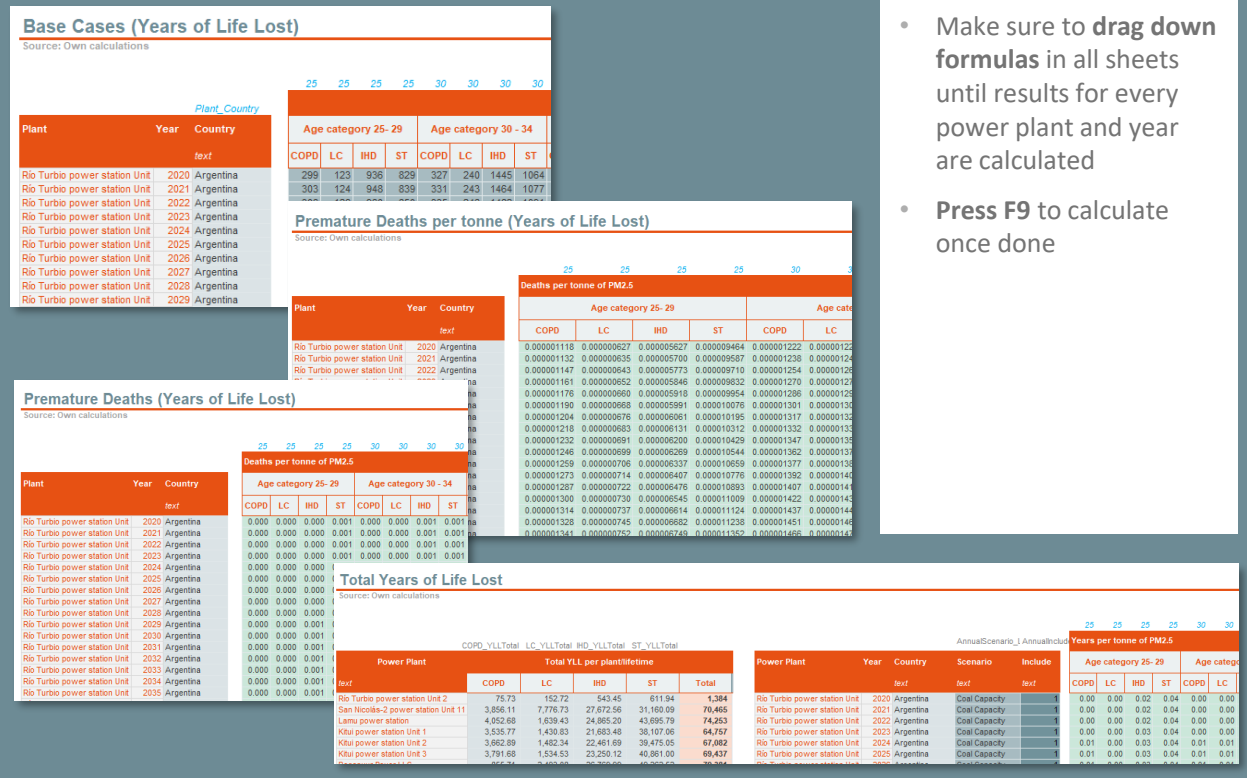
APPENDIX > >

YLL_PerTonne

YLL_TotalDeaths

YLL_TotalYears

ValuationYLL



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

Setting up the tool

Ambition to Action

INPUTS > >

...

CALC > >

PrematureDeaths

ValuationPD

RESULTS > >

YLL_BaseCases

APPENDIX > >

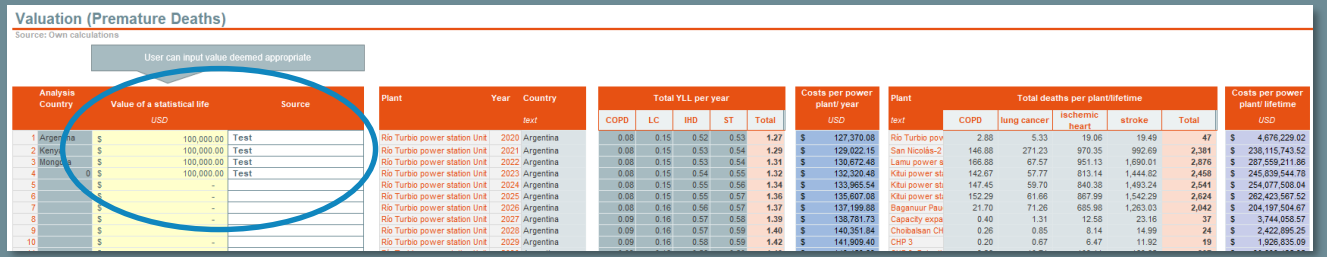
YLL_PerTonne

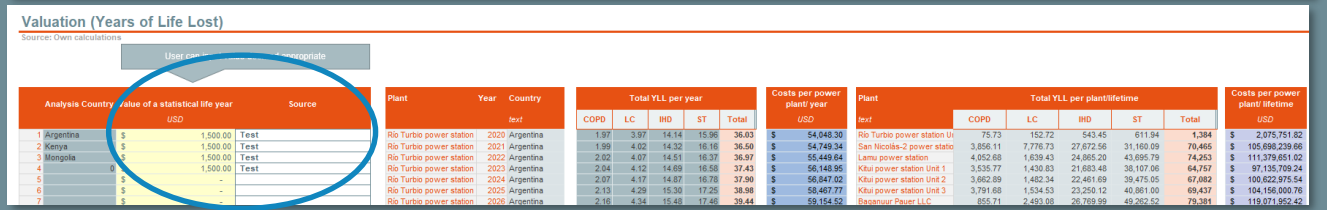
YLL_TotalDeaths

YLL_TotalYears

ValuationYLL

- 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





Setting up the tool

Ambition to Action

INPUTS > >

CALC > >

RESULTS > >

- Scenario
- Country
- PowerPlant

APPENDIX > >

- 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 set-up
- Graphs and result tables will automatically update

Setting up the tool

Ambition to Action

INPUTS > >

CALC > >

RESULTS > >

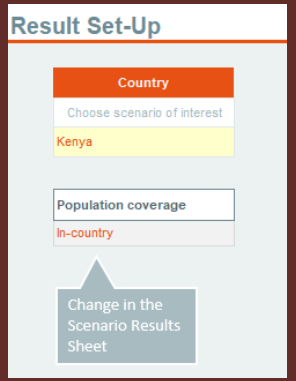
Scenario

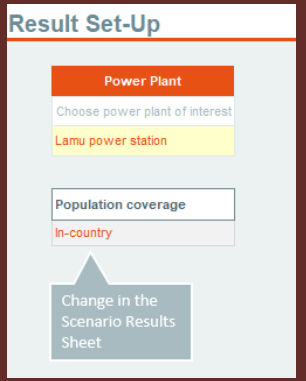
Country

PowerPlant

APPENDIX > >

- 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 set-up
- Graphs and result tables will automatically update





QUESTIONS / COMMENTS / FEEDBACK

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