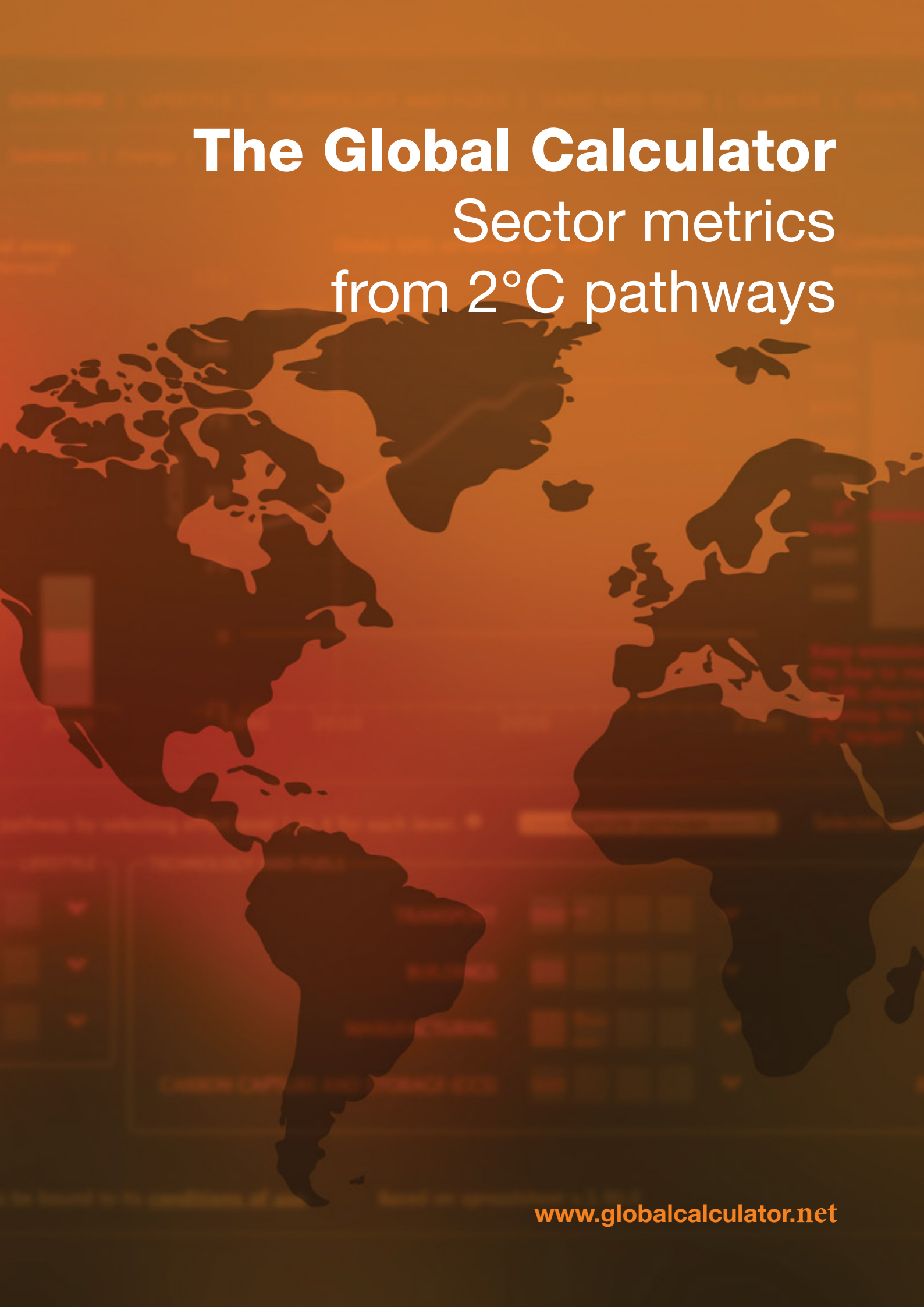
The Global Calculator

Sector metrics from 2°C pathways



www.globalcalculator.net

The Global Calculator: sector metrics from 2°C pathways

This note sets out how the global transport, buildings, manufacturing, electricity generation, and land, food and bioenergy sectors could change in the period to 2050 if the world was on track to meet the 2°C target.

These results are based on four plausible pathways which all have a 50% chance of constraining global mean temperature increase to 2°C, as set out in the Global Calculator tool[1]. These pathways all have lifestyle settings consistent with economic development. However, they differ according to the technologies, fuels and land use choices used to service these lifestyles. For more detail on these pathways, see the annex of our main report: *Prosperous living for the world in 2050: insights from the Global Calculator*.

Businesses may be interested in using these tables to understand how the market for clean technologies may evolve in the period to 2050. Governments may want to use these metrics as a benchmark for assessing their own country's pathway to 2050.

Transport

	Metric	Unit	2011	2020	2030	2040	2050
Lifestyle	Average domestic travel per person per year	Passenger-km per person per year	7,500	8,900	9,900	10,600	11,000
	Proportion of domestic travel by car	%	40	40	40 to 45	45	45 to 50
	Average distance travelled per person per year by air	Passenger-km per person per year	770	870 to 880	940 to 960	1,040 to 1,070	1,160 to 1,220
	Cars per person	Number	0.12	0.14 to 0.15	0.15 to 0.18	0.15 to 0.21	0.15 to 0.24
Technologies and fuels	Efficiency of the average passenger car (all cars – internal combustion engine, electric, hydrogen, etc.)	litres per 100km	8.6	7.1 to 7.2	5.6 to 5.9	4.6 to 4.9	3.9 to 4.1
	Efficiency of the average passenger car (internal combustion engine only)	litres per 100km	8.6	7.3 to 7.4	6.1 to 6.2	5.2 to 5.2	4.3 to 4.5
	Number of internal combustion engine cars on the road	Million	850	970 to 1,120	890 to 1,380	750 to 1,620	560 to 1,820
	Number of electric cars on the road	Million	2	30 to 40	80 to 140	140 to 280	230 to 460
	Number of hydrogen cars on the road	Million	–	0 to 30	0 to 100	0 to 200	0 to 340
	Number of plug-in hybrid cars on the road	Million	–	30 to 50	70 to 170	140 to 350	230 to 570

1 These pathways are: distributed effort http://tool.globalcalculator.net/distributedeffort, consumer reluctance http://tool.globalcalculator.net/consumerreluctance, low action on forests http://tool.globalcalculator.net/lowactiononforests, and consumer activism http://tool.globalcalculator.net/consumeractivism

Buildings

	Metric	Unit	2011	2020	2030	2040	2050
Lifestyle	Sales of light bulbs	Billion	7.7	9.6 to 9.9	11.7 to 12.5	13.6 to 15.2	14.7 to 17.9
	Sales of refrigerators	Million	160	210	270 to 300	330 to 400	390 to 550
	Sales of televisions	Million	470	640 to 650	840 to 940	1,060 to 1,300	1,290 to 1,740
	Lifespan of the average television	Years	7.0	6.7 to 7.0	6.1 to 7.0	5.6 to 7.0	5.0 to 7.0
	Average number of washing machines per household	Number	0.6	0.6	0.7	0.8	0.9
	Average household size	m^2	87	90	93	95	99
	Average urban indoor home temperature during the summer	°C	26.5	26.0	25.4	24.7	24.1
	Average urban indoor home temperature during the winter	°C	17.5	18.0	18.6	19.3	19.9
	Access to electricity in urban areas	% of households	94	95	97	98	98
	Access to electricity in rural areas	% of households	68	71	75	78	81
Technologies and fuels	Proportion of heat for urban buildings from zero carbon or electric sources	%	5	8 to 12	14 to 25	19 to 37	25 to 50
	Rate of heat loss (urban homes)	GW/m^2	16.9	15.3 to 15.7	12.2 to 13.5	9.1 to 11.2	6.0 to 9.0
	Proportion of households using electric cookers	% total	13	20	30	30 to 50	40 to 60
	Power of the average washing machine	Watts	700	650	570 to 580	490 to 500	420 to 430
	Power of the average TV	Watts	250	240	230	210	190 to 200

Manufacturing

	Metric	Unit	2011	2020	2030	2040	2050
Technologies and fuels	Iron and steel production	Billion tonnes	1.5	1.7	1.8 to 1.9	1.8 to 2.1	1.9 to 2.3
	Chemicals production	Billion tonnes	0.8	0.8 to 0.9	0.9 to 1.1	1.0 to 1.3	1.0 to 1.6
	Pulp and paper production	Billion tonners	0.6	0.7	0.8 to 0.9	1.0 to 1.1	1.1 to 1.4
	Cement production	Billion tonnes	3.6	3.7 to 3.9	3.5 to 3.9	3.3 to 3.8	3.1 to 3.6
	Timber production	Billion tonnes	0.8	0.9	1.0 to 1.1	1.2 to 1.3	1.3 to 1.5
	Proportion of total industry CO_2 emissions captured by CCS	%	0	0	0 to 9	8 to 26	16 to 43
	Reduction in energy demand per unit of iron/steel	%	0	4 to 6	8 to 13	12 to 19	15 to 25
	Reduction in energy demand per unit of chemical	%	0	0.3 to 0.7	0.5 to 1.3	0.6 to 1.8	0.9 to 2.4
	Reduction in energy demand per unit of paper/pulp	%	0	10	20	30 to 40	40 to 50
	Reduction in energy demand per unit of cement	%	0	3 to 5	6 to 9	6 to 12	6 to 15

Electricity generation and fuels

	Metric	Unit	2011	2020	2030	2040	2050
Technologies and fuels	Carbon intensity of electricity generation	gCO_2/kWh	580	445 to 470	310 to 350	150 to 210	-5 to 70
	Coal primary energy supply	EJ	160	155	130 to 140	90 to 110	45 to 60
	Oil primary energy supply	EJ	180	190 to 200	170 to 190	130 to 160	90 to 130
	Gas primary energy supply	EJ	120	130	125 to 130	110 to 120	70 to 90
	Installed capacity of carbon capture and storage	GW	0	20 to 30	110 to 380	220 to 760	490 to 1,490
	Installed capacity of nuclear	GW	360	480 to 510	530 to 660	600 to 820	690 to 1,030
	Installed capacity of wind	GW	240	600 to 820	840 to 1,650	1,290 to 2,800	2,320 to 4,710
	Installed capacity of hydroelectric	GW	970	1,410 to 1,510	1,520 to 1,670	1,630 to 1,870	1,750 to 2,100
	Installed capacity of marine	GW	1	3 to 4	20 to 30	60 to 100	100 to 240
	Installed capacity of solar	GW	70	280 to 320	590 to 910	1,150 to 2,400	2,200 to 4,150
	Installed capacity of geothermal	GW	10	20 to 25	40 to 60	100 to 170	170 to 290
	Installed capacity of storage	GW	120	180 to 190	250 to 310	310 to 500	400 to 800

Land, food and bioenergy

	Metric	Unit	2011	2020	2030	2040	2050
Lifestyle	Calories consumed	kcal per person per day	2,180	2,200	2,220	2,260	2,330
	Calories consumed which are from meat	kcal per person per day	190	190	190	200	200 to 220
	Total non-commercial forest area	Millions of hectares	3,800	3,700 to 3,800	3,800 to 3,900	3,800 to 4,000	3,800 to 4,100
Land use	Bioenergy crop production	EJ	10	15 to 20	30 to 45	35 to 70	40 to 95
	Growth in crop yields relative to 2011	%	–	10 to 15	20 to 30	30 to 45	40 to 60
	Proportion of cattle that are fed grains and residues (intensified)	%	6	5.6 to 7.3	4.7 to 9.9	3.9 to 12.4	3 to 15
	Increase in animal density for pasture-fed cattle	%	–	10	20 to 25	35 to 40	45 to 50
	Proportion of food crops that are wasted post-farm	%	25	25	20	20	15 to 20

Emissions and miscellaneous

		2011	2020	2030	2040	2050
Global greenhouse gas emissions	Billion tonnes CO_2e	50	47	41 to 42	31 to 32	19 to 21
Global population	Billion	7.0	7.7	8.4	9.0	9.6
Urbanisation	% of global population that live in urban areas	52	56	60	63	66
Number of households	Billion	2.3	2.7	3.0	3.4	3.8
Emissions per person	Tonnes CO_2e per year	7.1	6.1	4.9 to 5.0	3.4 to 3.5	1.9 to 2.2

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The Global Calculator

Use the free Global Calculator tool.
Read our report showing what the Calculator tells us about climate change and international development.

A prosperous world for everyone in 2050

Your browser can't play this video.
Learn more

The Global Calculator is a free and interactive tool that helps you to understand the link between our lifestyles, the energy we use, and the consequences for our climate. It is aimed at anyone interested in exploring what a low-carbon world could look like in 2050. The Calculator shows that it *is* possible to prevent dangerous climate change and ensure people's living standards continue to improve if we act now.

Access the Global Calculator ›

Insights from the Calculator: read our report

lifestyles continue to improve while still tackling climate change, we must transform the technologies and fuels we use, and make smarter use of our limited land resources. The report Prosperous living for the world in 2050 (PDF 1.43MB) uses evidence from the tool to show what we need to achieve.

in Paris later this year, this Calculator demonstrates to our political leaders that a cleaner, safer and fairer future is possible. *Friends of the Earth*

What we found ›

friends of the earth

Want to dig deeper into the data?

The Global Calculator is the most open-source model of the world's energy system ever built. You can download the full Excel model to explore all the assumptions used and methodology used. You can even make your own version to test out your ideas.

Access the spreadsheet ›

Our team

The Calculator is funded by the UK Government's International Climate Fund and the EU's Climate-KIC, and has been built by an international team from the following organisations:

About us

The Global Calculator is an open-source model of the world's energy, land and food systems to 2050 that allows you to design your own vision of the future and see the implications for the climate instantly. It is funded by the UK Government's International Climate Fund and the EU's Climate-KIC, and has been built by an international team.

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