The Enablement Effect 2021

How can mobile tech help us reach Net Zero faster, easier, and cheaper?

#MobileNetZero

The GSMA is a global organisation unifying the mobile ecosystem to discover, develop and deliver innovation foundational to positive business environments and societal change. Our vision is to unlock the full power of connectivity so that people, industry and society thrive. Representing mobile operators and organisations across the mobile ecosystem and adjacent industries, the GSMA delivers for its members across three broad pillars: Connectivity for Good, Industry Services and Solutions, and Outreach. This activity includes advancing policy, tackling today's biggest societal challenges, underpinning the technology and interoperability that make mobile work, and providing the world's largest platform to convene the mobile ecosystem at the MWC and M360 series of events.

We invite you to find out more at gsma.com
Follow the GSMA on Twitter: @GSMA

GSMA Intelligence is the definitive source of global mobile operator data, analysis and forecasts, and publisher of authoritative industry reports and research. Our data covers every operator group, network and MVNO in every country worldwide – from Afghanistan to Zimbabwe. It is the most accurate and complete set of industry metrics available, comprising tens of millions of individual data points, updated daily.

GSMA Intelligence is relied on by leading operators, vendors, regulators, financial institutions and third-party industry players, to support strategic decision-making and long-term investment planning. The data is used as an industry reference point and is frequently cited by the media and by the industry itself.

Our team of analysts and experts produce regular thought-leading research reports across a range of industry topics.

www.gsmaintelligence.com
info@gsmaintelligence.com

Introduction

The mobile industry is at the forefront of the digital revolution, delivering impact through global initiatives. Our leaders are driving carbon eduction within their operations and enabling other industries to follow suit.

Two thirds of mobile network operators by revenue are committed to rapidly reducing their whole value chain emissions by 2030. Due to this, the industry was recognised by the UN's 'Race to Zero' as one of the first sectors to 'Breakthrough' on net zero targets.

There is much to transform. Countries must go further, urgently, and no country should be left behind without the opportunity to deliver climate action that creates jobs, cuts emissions, and protects from climate change impacts.

This requires strong and effective global partnerships, and we are ready to engage governments, investors, and innovators. We will work together to discover what action is already being taken and what we need to reach our goals.

Smart connected technologies have a large role to play in reducing carbon emissions. This report shows not only the impact of the mobile industry reducing their emissions but also the enabling effect mobile connectivity will have in four industries – energy, manufacturing, transport, and buildings.

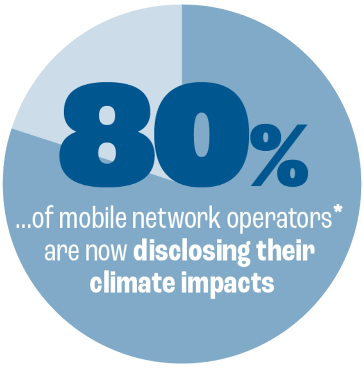
Mobile sector going net zero

gsma.com/betterfuture/climate

In **2019** the GSMA Board set an ambition for the mobile sector to reach net zero carbon emissions by **2050**, at the latest.

WE HAVE MADE A STRONG START TO THE JOURNEY

We need to understand where we're starting...



...and then know where we're heading...

2/3 of mobile network operators* are committed to rapidly cutting emissions by **2030**

1/3 have gone further to target **NET ZERO** by **2050** or earlier

*by revenue

This led to the mobile industry being recognised as one of the first UN

RACE TO ZERO **BREATHROUGH SECTORS**

To be able to reach these goals the mobile industry needs:

1. All countries to target Net Zero by 2050 or earlier
2. Policymakers to commit to halve emissions by 2030
3. Governments to support businesses with their decarbonisation journeys
4. Investment into renewable energy and a removal of fossil fuel subsidies

Mobile enabling net zero energy

gsma.com/betterfuture/climate

To achieve net zero by **2050** we have to

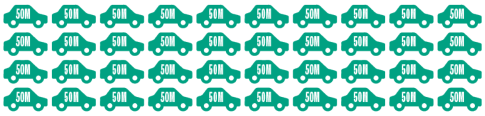
halve

the emissions of the energy sector by **2030**

This is

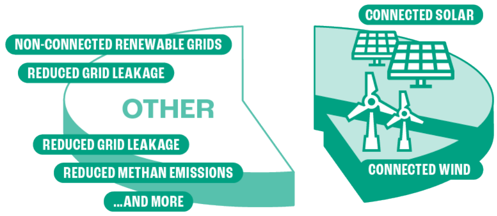
9 GIGATONNES

of CO_2 emissions

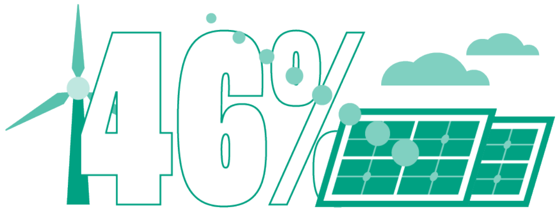


the same as taking **2 BILLION** cars off the road for a year

How much of the 9 GT CO_2 reduction by 2030 in the power sector will come from...?



...connected wind and solar power will enable



of the reduction needed in CO_2 emissions by 2030

46% equals just over

FOUR GIGA TONNES

CO_2 emissions

THE SAME AS 4 BILLION FLIGHTS FROM NEW YORK TO PARIS

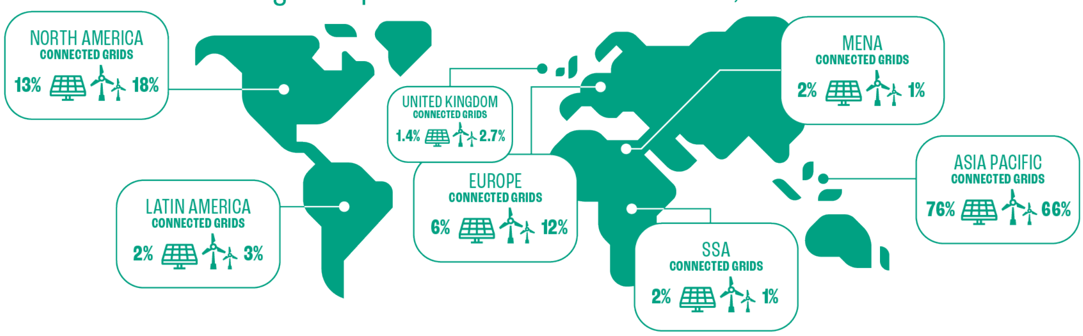
...this equates to around

1000

ON
OFF

coal power plants being decommissioned globally by 2030

Regional splits of CO_2 emission reductions, 2020-30



Why connected grids are better...

1. They outperform legacy distribution technology by balancing supply and demand in real time
2. They monitor energy flows to/from grid users to evenly distribute where required in a country
3. They reduce reliance on legacy fossil fuel infrastructure eg, coal, which can increase carbon emissions
4. They improve grid resilience and mitigate risk of blackouts and brownouts

Mobile enabling net zero manufacturing

gsma.com/betterfuture/climate

The manufacturing sector needs to reduce CO_2 emissions by

8.6 GIGATONNES

by 2030 to be on a path to net zero by **2050**

The GSMA have forecast smart factories will account for...

16%

...of the required reduction

which equates to 1.4 gigatones of CO_2

The remaining portion will come from several factors, much of which are part of a 'circular economy'

'Circular economy'

...and others

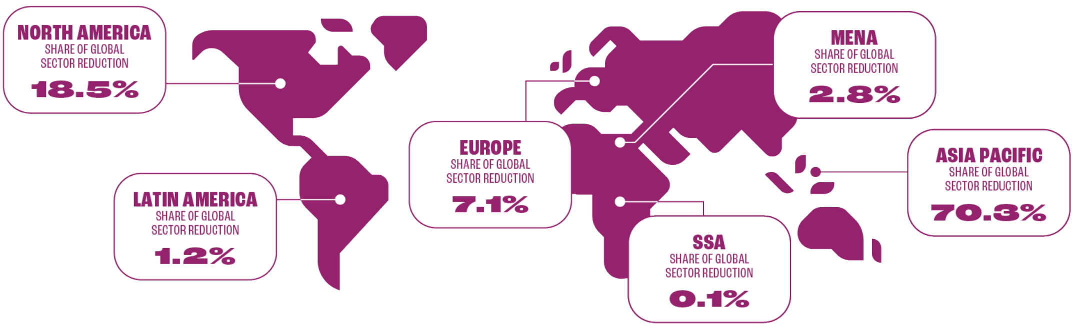
- Use of recycled materials in production
- Re-use of waste products and base materials (steel, cement) at end of life
- Renewable energy to power factories and material construction

GSMA have forecast that smart factories would reduce emissions that **is equal to manufacturing...**

140M CARS

Of the world's **9 MILLION FACTORIES** only **1%** are currently **SMART**

Regional split of CO_2 emission reductions, enabled by mobile connectivity, 2020-30



Connected factories enable integrated technology that improves productivity

1. IoT sensors connect machinery and production parts for analytics dynamically adjusting production on factory floor
2. Connected robotics substitute manual labour, freeing up time to spend on design, innovation and other skilled tasks.
3. Augmented reality, virtual reality and digital twins enable remote equipment and plant maintenance
4. Automated storage and retrieval systems enable better inventory management

Mobile enabling net zero transport

gsma.com/betterfuture/climate

The transport sector needs to reduce CO_2 emissions by

4.4 GIGATONNES

by 2030 to be on a path to net zero by **2050**

The GSMA forecast mobile connectivity can enable

...of the required reduction

this breaks down to...

- **9%** WORKING FROM HOME
- **24%** ELECTRIC VEHICLES
- **21%** SHIPPING*
- **11%** HGVs*

across the transport sector (by 2030)

*routing and fleet management

Potential emissions savings in these four areas equals*

2.8 GIGA TONNES

of CO_2 by 2030

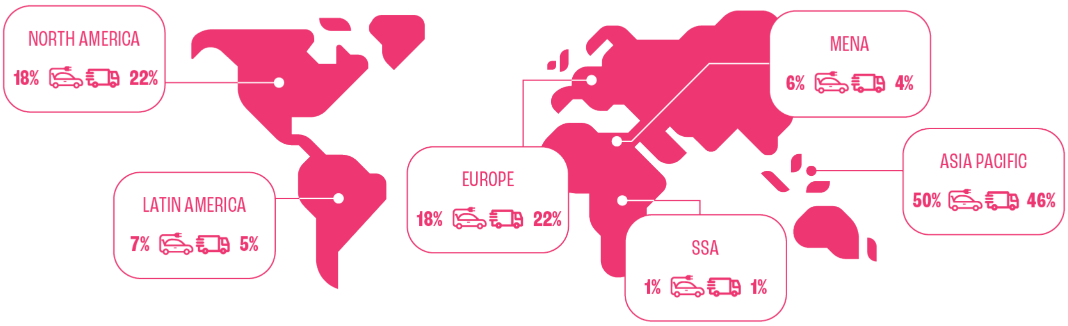
CO_2 avoidance from the use of connected transport is equivalent to*

2.8 BILLION FLIGHTS

from New York to Paris

*GSMA forecast

Regional splits of CO_2 emission reductions, enabled by mobile connectivity, 2020-30



How does it all work:

1 ELECTRIC VEHICLES
Charging stations are enabled by IoT connectivity while on board telematics drive fuel savings.

2 WORKING FROM HOME
CO_2 savings come from reduction in commuting journeys (especially by cars), which average 15-18km each way

3 SHIPPING AND PORTS
Fuel savings on shipping journeys, enabled by IoT telematics which optimise routing and port arrival times. Reduced idling time at ports through just-in-time arrival/departure systems with port operators

4 TRUCKS/HAULAGE
CO2 reductions from fuel savings in trucks connected with IoT telematics which optimise routing and arrival times at consignment points

Mobile enabling net zero buildings

gsma.com/betterfuture/climate

The buildings sector needs to reduce CO_2 emissions by

5.1 GIGATONNES

by 2030 to be on a path to net zero by **2050**

The GSMA forecast mobile connectivity can enable

43%

...of the required reduction

this breaks down to...

6% SMART BUIDINGS – COMMERCIAL ELECTRICITY

9% SMART BUIDINGS – COMMERCIAL GAS

12% HVAC*

16% SMART METER – RESIDENTIAL ELECTRICITY

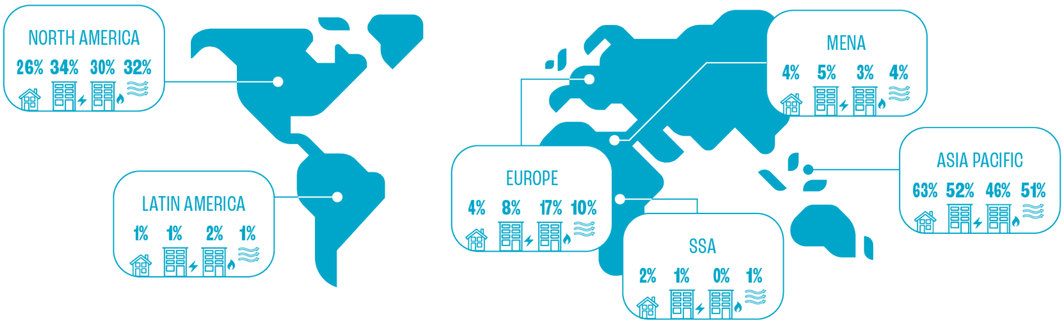
across the buildings sector (by 2030)

*Heating, ventilation and air conditioning systems (HVAC)

This is equal to
2.2 GIGATONNES
of CO_2 savings

Which is equal to heating **90 MILLION** homes over the same period.

Regional splits of CO_2 emission reductions, enabled by mobile connectivity, 2020-30



How does it all work:

1 RESIDENTIAL SMART METERS
Smart electricity meters track energy usage in real time, which customers can monitor. The energy savings relative to households without a connected meter is approx. 3-5% per year.

2 COMMERCIAL SMART METERS (ELECTRICITY)
AI can be used to analyse real time data stream and automatically modify electricity use based on occupancy, ambient external temperatures and weather events

3 HVAC
These systems monitor and regulate temperatures in larger buildings and some transport settings. They can draw on AI to run analytics and modify temperature in real time, and reuse cool external air without drawing electricity

4 COMMERCIAL SMART METERS (GAS)
Complements smart electricity meters and are connected to a central buildings energy management platform. AI can be used to analyse real time data stream and automatically modify electricity use.

Methodologies

Mobile Sector

Climate targets by operator

Source: SBTI, UNGC and operator websites

MOBILE NETWORK OPERATOR	SCIENCE -BASED TARGETS	CARBON NEUTRAL TARGET YEAR	NET ZERO TARGET YEAR
A1 Telekom	1.5°C	2014	
America Movil	1.5°C		2050
AT&T	2°C	2035	
Airtel (Bharti)	Committed Aug 2019		2050
Bell (Canada)		2025	
BT (EE)	1.5°C		2045
Deutsche Telekom	1.5°C	2025	2040
Elisa	1.5°C	2020	
Far EasTone	2°C		
Iliad Group		2035	
JT Global		2030	
KPN	1.5°C	2015	2040
Liberty Global	1.5°C		
LG Uplus		2030	
Magyar Telekom	1.5°C	2016	2050
MTN Group	1.5°C (pending)		2040 (pending)
NTT DOCOMO	<2°C		
Orange	Committed May 2018		2040
Proximus	<2°C	2016	2050
Reliance Jio	Committed Aug 2019		2050
Safaricom	<2°C	2050	2050
STC	Committed Mar 2020		2050
Singtel	<2°C		2050
SK Telecom	Committed Feb 2020	2050	
Swisscom	1.5°C	2020	2050
Taiwan Mobile	2°C		
TDC	Committed Jul 2019	2028	2050
Tele2	Committed Jan 2020	2020	
Telefónica	1.5°C		2030*
Telenor Group	Committed Feb 2020	2030**	
Telia	1.5°C	2020	2030
Telstra	Committed Feb 2020	2020	2050
Telus	Committed Jan 2021	2030	2050
Verizon	Committed Aug 2019	2035	2040
Vodafone	1.5°C	2030	2040

* In its four main markets'
** Nordic operations

Science-based targets - see https://sciencebasedtargets.org/companies-taking-action/
Carbon neutral refers to reducing and offsetting carbon emissions from own operations (all Scope 1 and 2 emissions)
Net zero refers to the criteria used by the UN Race To Zero campaign: https://unfccc.int/climate-action/race-to-zero-campaign

Energy Sector

Methodology and approach

Two primary use cases for digital tech interventions in the power and energy sector were analysed, both of which are underpinned by IoT sensors and connectivity.

- **Connected solar grids**. Connected power grids to manage and distribute solar energy. Grids are equipped with IoT sensors that, in turn, connect to a mobile network, cloud and/or end user premises (residential or commercial) through cellular or non-cellular protocols.
- **Connected wind grids**. Connected power grids to manage and distribute wind energy. Grids are equipped with IoT sensors that, in turn, connect to a mobile network, cloud and/or end user premises (residential or commercial) through cellular or non-cellular protocols.

There was a three step process:

1. Forecasts were used from Exponential Roadmap[1] to determine the aggregate amount of CO_2 savings a given industry will need to make over the next 10 years to ensure it remains on track for net zero by 2050. For all sectors, this reduction is equivalent to 50% of 2020 CO_2 emissions.
2. For both use cases – connected solar and wind grids – estimations were made for the share of the renewable energy grids that are IoT connected at present and over the next 30 years to 2050, drawing on our proprietary IoT forecasts and publicly available research. This translates into an overall level of avoided CO_2 emissions through the substitution with fossil fuels that would otherwise emit carbon into the atmosphere.
3. The use case savings over a 10 year period are divided into the aggregate sector reduction (from step 1) to arrive at a contribution share (e.g. connected solar grids can account for 33% of the emission reductions required in the power sector over the next 10 years).

[1] J. Falk, O. Gaffney, et al. Exponential Roadmap. 1.5.1 (2020) www.exponentialroadmap.org

Key assumptions

Use case	Indicator	Trajectory	Supporting data/sources
Connected grid - solar	PV capacity growth	Annual net increase in solar PV capacity in 2020 applied for remainder of forecast period to 2030 at regional level.	International Energy Agency (IEA)
Connected grid - solar	% of solar grid connected with IoT sensors	35% in 2020, rising to 75% in 2050 in straight line fashion.	IEA, GSMA Intelligence
Connected grid - solar	Electricity emission factors (EEFs)	2019 base year EEFs calculated at regional level. Forward projections to 2030 for each region based on growth rate of UK EEF forecasts from UK Department of Business, Energy and Industrial Strategy (BEIS).	Carbonfootprint.com; IEA; UK BEIS
Connected grid - wind	Wind capacity growth	Wind capacity growth calculated by Global Wind Energy Council (GWEC) for 2019 and 2020. Assume annual growth of 4.5% from 2020-25 before reducing to 2% from 2025-50.	GWEC
Connected grid - wind	% of wind grid connected with IoT sensors	10% in 2020, rising to 75% in 2050 in straight line fashion.	GWEC, GSMA Intelligence
Connected grid - wind	Electricity emission factors (EEFs)	2019 base year EEFs calculated at regional level. Forward projections to 2030 for each region based on growth rate of UK EEF forecasts from UK Department of Business, Energy and Industrial Strategy (BEIS).	Carbonfootprint.com; IEA; UK BEIS

Manufacturing sector

Methodology and approach

The manufacturing sector centres on the development of smart factories. There are several types of technologies within a smart factory that can improve productivity, lower energy consumption and reduce CO_2 emissions. Factories are fitted with connected technology and networks to improve overall productivity via automation. IoT sensors are typically fitted to machinery, which can be linked back to analytics suites to analyse very large streams of data in real time. This allows for production capacity to be shifted dynamically and faults to be repaired remotely.

There was a three step process:

Forecasts were used from Exponential Roadmap[2] to determine the aggregate amount of CO_2 savings a given industry will need to make over the next 10 years to ensure it remains on track for net zero by 2050. For all sectors, this reduction is equivalent to 50% of 2020 CO_2 emissions.

Assumptions were made for how much of manufacturing IoT connections are set in factories specifically. An average rate of energy savings per year is then applied to the number of smart factories and combined with the electricity emission factors to calculate a total CO_2 savings associated with smart factories in each region.

1. The use case savings over a 10 year period are divided into the aggregate sector reduction (from step 1) to arrive at a contribution share

[2] J. Falk, O. Gaffney, et al. Exponential Roadmap. 1.5.1 (2020) www.exponentialroadmap.org

Key assumptions

Vertical	Use case	Indicator	Trajectory	Supporting data/sources
Manufacturing	Smart factories	Number of smart factories	Total factories in operation worldwide estimated at 9.6 million as of 2020. Using the average IoT density figures, an estimate of 130,000 smart factories were in operation as of 2020, or 1.4% of the global total.	WEF, China Statistical Yearbook
Manufacturing	Smart factories	IoT proliferation	Assume approx. 420 million IoT connections in smart factories worldwide as of 2020, rising 40% per year to 2.1 billion by 2030.	GSMA Intelligence
Manufacturing	Smart factories	Energy savings	Assume energy savings of 15% per year on average for smart factories.	Bosch, Nokia (Oulu factory)

Transport sector

Methodology and approach

Four use cases for transport-related technology were analysed that covers connected fleets (HGV and maritime), electric vehicles (EVs), and working from home – an indirect but nevertheless material carbon saving from the reduction in commuting journeys.

There was a three step process:

Forecasts were used from Exponential Roadmap[3] to determine the aggregate amount of CO_2 savings a given industry will need to make over the next 10 years to ensure it remains on track for net zero by 2050. For all sectors, this reduction is equivalent to 50% of 2020 CO_2 emissions.

In each of the fleet management categories – HGVs and commercial shipping – assumptions were made on the level of telematics penetration and resulting fuel savings before extrapolating to a regional level. For EVs, a figure was estimated for current EV charging points, forecasted forward, and then fuel savings and associated CO_2 reductions were calculated based on the reduction in journeys using petrol and diesel cars. Working from home (WFH) uses estimates for the average WFH days per year per eligible worker, alongside GSMA forecasts for mobile and fixed line internet access in households as a pre-requisite for productive remote working.

1. The use case savings over a 10 year period are divided into the aggregate sector reduction (from step 1) to arrive at a contribution share.

[3] J. Falk, O. Gaffney, et al. Exponential Roadmap. 1.5.1 (2020) www.exponentialroadmap.org

Key assumptions

Vertical	Use case	Indicator	Trajectory	Supporting data/sources
Transport	EV's	EV charging points	Assume that EV charge points represent 1% of smart city IoT connections in 2021, rising to 10% by 2030.	GSMA Intelligence, Machina
Transport	EV's	Electricity consumption	A total of approx. 3,700 kWh is used per charge point per year.	Various
Transport	EV's	Electricity emission factors (EEFs)	2019 base year EEFs calculated at regional level. Forward projections to 2030 for each region based on growth rate of UK EEF forecasts from UK Department of Business, Energy and Industrial Strategy (BEIS).	IEA; UK BEIS; carbonfootprint.com
Transport	Smart routing and fleet management (HGVs)	HGVs in operation	Of the approx. 360 million commercial vehicles in use, we assume that 60 million (17%) are HGVs. Of these, we assume 50% are fitted with IoT telematics sensors, equating to 30 million connected HGVs.	GSMA Intelligence, Statista
Transport	Smart routing and fleet management (HGVs)	Fuel savings	Assume an average 5% fuel savings for connected HGVs based on range of studies reporting figures 5-20%.	Various
Transport	Smart routing and fleet management (maritime)	Shipping emissions	An average of 17,700 kg CO_2 per ship per year is derived from estimates for total ships in operation and associated aggregate fuel consumption using data from the IMO.	International Maritime Organisation
Transport	Smart routing and fleet management (maritime)	Fuel savings	Assume an average 2% fuel savings for commercial ships fitted with IoT telematics sensors.	Carbon Trust
Transport	Working from home (WFH)	Workforce enabled to work from home (WFH)	Annual FTE days WFH estimated based on propensity for certain occupations to WFH, with a downward adjustment to be conservative.	McKinsey
Transport	Working from home (WFH)	Employed population	Assume 70% of the working age population in each region is employed.	World Bank
Transport	Working from home (WFH)	Internet connectivity	LTE and forecast 5G mobile subscribers taken as proxy for having internet access of a sufficient quality to permit WFH.	GSMA Intelligence

Buildings sector

Methodology and approach

The buildings sector is split between residential and commercial segments. Four use cases were profiled for technology in support of lowering emissions covering smart electricity meters for households, smart electricity and smart gas meters in offices and industrial premises, and Heating Ventilation and Air Conditioning (HVAC) systems.

There was a three step process:

Forecasts were used from Exponential Roadmap[4] to determine the aggregate amount of CO_2 savings a given industry will need to make over the next 10 years to ensure it remains on track for net zero by 2050. For all sectors, this reduction is equivalent to 50% of 2020 CO_2 emissions.

1. For each use case, residential and commercial adoption (e.g. the proliferation of a smart gas meter in office buildings) is based on GSMA Intelligence forecasts for IoT connections in the utility and buildings sectors with some adjustments. Then an average energy saving is assumed for homes and commercial premises with a given connected technology compared to those without. Combined with the electricity emission factor, this then yields an abatement factor for each technology that is extrapolated to scale by multiplying with the adoption forecasts.

2. The use case savings over a ten year period are divided into the aggregate sector reduction (from step 1) to arrive at a contribution share.

[4] J. Falk, O. Gaffney, et al. Exponential Roadmap. 1.5.1 (2020) www.exponentialroadmap.org

Key assumptions

Use case	Indicator	Trajectory	Supporting data/sources
Smart meter - residential (electricity)	Smart electricity meters	Assume 80% of smart meter connections are residential. This figure is applied to GSMA Intelligence IoT forecasts for smart meters.	GSMA Intelligence
Smart meter - residential (electricity)	Energy savings for smart meter households	Assume average household with smart meter uses 3% less energy per year than those without the technology. This savings is applied to each region. Various studies have estimated energy savings to range between 3-15% for smart meter households. We assume a figure of 3% to be conservative.	Various
Smart buildings - commercial (electricity)	Energy savings	Assume electricity savings of approx. 10-15% in buildings fitted with smart electricity meters based on range of studies.	Various
Smart buildings - commercial (gas)	Energy savings	Assume gas savings of approx. 20-25% in buildings fitted with smart gas meters based on range of studies.	Various
HVAC	Energy savings	Assume energy savings of approx. 15% in buildings and other enterprise settings fitted with HVAC units. This is at the low end of studies which range from 15-30% savings.	Various