

# LiFE lessons from India

The benefits of advancing the Lifestyle for Environment (LiFE) initiative through the G20



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# Key findings

- The Lifestyle for Environment (LiFE) initiative was launched by Prime Minister Narendra Modi of India at COP26 in Glasgow in November 2021. It aims to encourage the adoption of sustainable lifestyles in India and internationally to tackle the challenges of environmental degradation and climate change.
- India has integrated several policies in its energy transition strategy that are aligned with LiFE.
- India's economy is already 10% more energy efficient than both the global and G20 average. India took less time to go from half to full electricity access than other major economies.
- Already the third largest national market globally for renewables, India has recently seen the growth of consumer-centric solutions like distributed solar PV take off, with rooftop solar growing 30-fold in less than a decade. Supportive policies and awareness campaigns in India have also driven electric passenger vehicles to a market share of almost 5% in 2022 – with sales tripling from 2021.
- India's example shows the importance of behavioural change and consumption choices in driving energy transitions. The IEA has analysed the impact of measures like those proposed by the LiFE initiative, such as buying an EV or taking public transport, as part of comprehensive energy transition strategies.
- According to the IEA's modelling, the adoption worldwide of the kinds of actions and measures targeted by LiFE – including behavioural changes and sustainable consumer choices – would reduce annual global carbon dioxide (CO<sub>2</sub>) emissions by more than 2 billion tonnes (Gt) in 2030.
- This is about one-fifth of the emissions reductions needed by 2030 to put the world on a pathway to net zero emissions.
- We estimate that around 60% of the emissions saving by LiFE measures could be directly influenced or mandated by governments. How individuals behave and choose to consume is shaped by the norms, policies, incentives and infrastructure around them.
- Thus, although the measures envisaged in LiFE are carried out by individuals, there is a clear role for governments to simultaneously provide a supportive policy framework.
- LiFE measures would also save consumers globally around USD 440 billion in 2030, according to the IEA's modelling, equivalent to around 5% of all spending on fuels across the global economy that year.
- LiFE measures also help lower inequalities in energy consumption and emissions between countries. The reductions in per capita CO<sub>2</sub> emissions in advanced economies by 2030 (relative to a 'business-as-usual' trajectory) are three- to four-times greater than in emerging market and developing economies.
- India's first G20 Presidency could strengthen the LiFE initiative by anchoring it in the G20's current framing of energy transitions and initiating processes to gather experience and best practices of policies and programmes that G20 members are already conducting.

# Introduction

In November 2021 at COP26, Prime Minister Narendra Modi of India announced the launch of the Lifestyles for Environment (LiFE) initiative, which aims to promote more environmentally responsible consumption and behaviour worldwide. In today's context of the global energy crisis and the continued challenge of climate change, LiFE is an important opportunity to accelerate clean energy transitions. This paper looks at how India has integrated measures aligned with LiFE into its energy transition strategy, outlines the role of behavioural change and consumer choices in clean energy transitions, and provides a quantification of the emissions reduction potential of LiFE at the world level. It concludes with some reflections of the implications of LiFE for the G20.

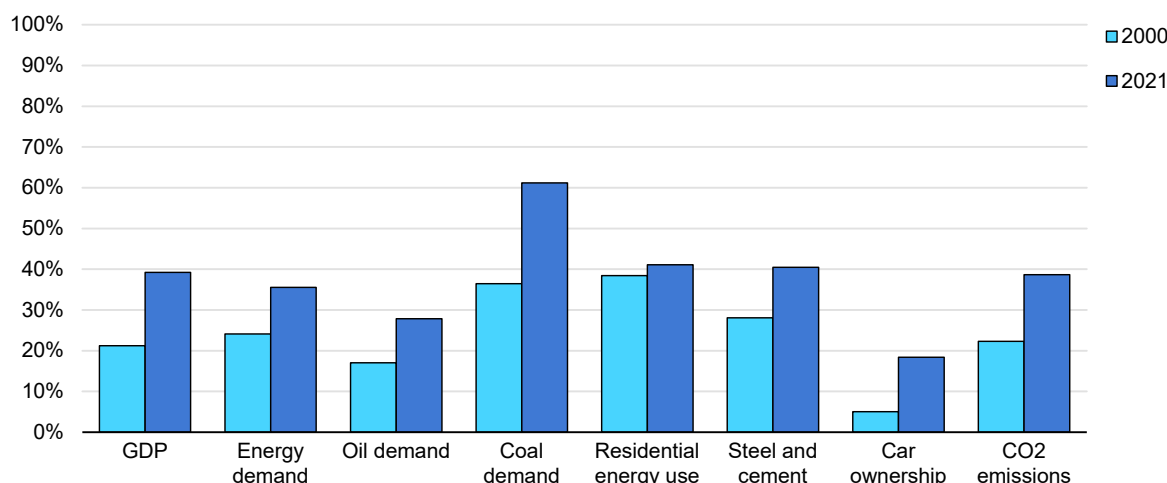
## India's energy transition

### Framing India's transition

Energy has been at the heart of India's developmental journey. For decades, India worked to provide its growing population with access to electricity, fuel for transport, and clean cooking fuels such as liquefied petroleum gas (LPG). These efforts involved scaling up power generation, coal mining and oil refining capacity, and strengthening energy infrastructure and distribution networks. This helped lift millions of people out of poverty and fuelled the nation's industrialisation.

Since 2000, India's per capita income has increased threefold, power generation capacity fourfold, and the stock of vehicles sixfold. Starting from a low base, key indicators of economic growth and development have caught up considerably with global averages. Nonetheless, India's per capita GDP and CO<sub>2</sub> emissions are only 40% of the world average.

### Key per capita indicators in India as a percentage of global averages, 2000 and 2021



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This development contributed to increasing prosperity but also led to increases in greenhouse gas emissions, air pollution and imports of fossil fuels. The Indian government has therefore chosen an ambitious energy transition pathway to reach net zero emissions by 2070.

The International Monetary Fund estimates that India will be the world's [third largest economy](#) by 2027, and India is already on course to become the most populous country this year. Its critical challenge is to ensure secure and affordable energy for growth while advancing its net zero transition over the coming decades.

To meet these challenges, India has embarked on a dynamic new phase in its energy transformation, which spans three broad areas.

Firstly, it has launched important initiatives to bring down the prices and increase the supply of clean energy. These include a target of non-fossil fuel sources contributing to 50% of India's power generation capacity by 2030; a National Green Hydrogen Mission with the ambition of establishing annual renewable hydrogen production of 5 million tonnes (Mt) by 2030; and biofuel mandates that target 30% blending of ethanol in petrol by 2030.

Secondly, India is seeking to domesticate parts of the global supply chains that will be critical to its new energy economy. This includes the Production Linked Incentive (PLI) scheme that promotes the domestic manufacturing of solar PV, advanced batteries and electric vehicles.

Thirdly, the government has focused on demand-side measures including taking the first steps towards the creation of a national carbon market, an energy efficiency trading scheme for industries, incentivising the purchase of electric



vehicles, bulk procurement of electric buses for public transport, standards and labelling of appliances, and most recently, the Lifestyles for Environment (LiFE) initiative that aims to nudge behaviours and individual consumption choices towards cleaner alternatives.

These measures have immense potential but need global support. The IEA estimates that India will need USD 145 billion per year until 2030 in clean energy investment to put it on a path towards net zero emissions by 2070. This is triple the current level of annual clean energy investment in India.

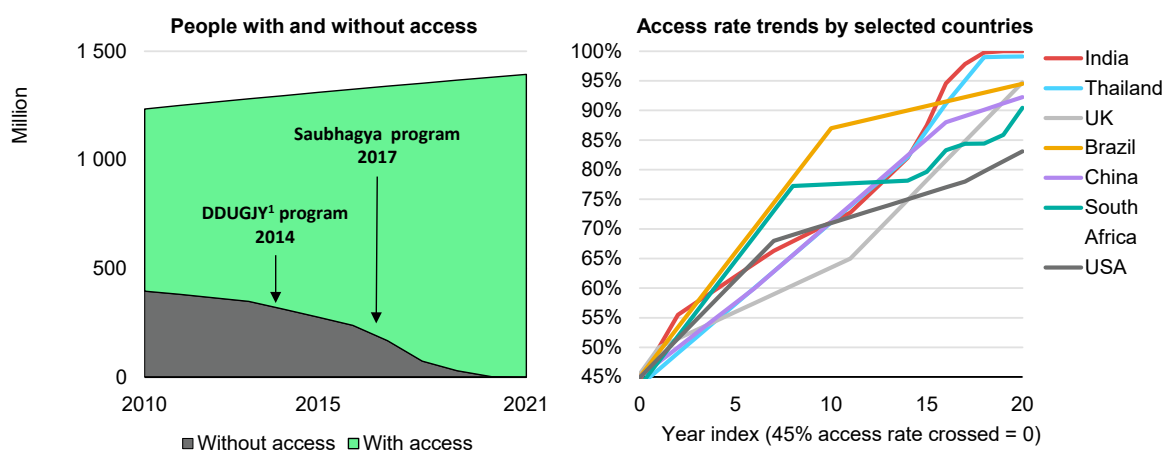
The following sections provide some examples of recent policy-making on energy transitions in India, with a focus on measures related to nudging behavioural change and consumer choice.

## Energy access

### Electricity

Around 50 million Indians – equivalent to the total population of South Korea – have gained access to electricity every year since 2010, mostly through the national grid. This contributed to more than half of the global improvement in access to electricity over this period. India has been one of the fastest countries in progressing from half of the population having access to achieving full access.

#### Recent progress in access to electricity in India and normalized rate of improvement in electrification in selected countries



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Sources: IEA (2022), [IEA access to electricity database](#), National Family Health Survey (2023), [India's National Family Health Surveys](#), Johansson, T. B., Patwardhan, A. P., Nakićenović, N., & Gomez-Echeverri, L. (2012). [Global Energy Assessment – Toward a Sustainable Future](#)

This was possible thanks to several government policies, a strong central political commitment, and the creation of institutions equipped with the resources and mandates to pursue electrification. Another key to success was the use of geospatial data for planning and monitoring.

In 2014, under the leadership of the Prime Minister Modi, the Government of India launched the [DDUGJY](#) programme focused on strengthening distribution networks and facilitating connections by co-financing grid projects. In 2017, the [Saubhagya](#) scheme was introduced, aimed at addressing last-mile connections by offering them for free and providing decentralised solutions to reach remote areas.

However, [the 2019-21 National Family Health Survey](#) suggests that around 45 million people, of which three-quarters live in Central and Eastern India, still did not have access to electricity in that period, largely due to problems affording a grid connection. [Important progress is being made](#) on the reliability of supply, with the availability of power supply doubling in some regions and satisfaction levels increasing more than tenfold between 2015 and 2020.

## Clean cooking

On clean cooking, the government has launched one of the most effective LPG campaigns globally, contributing to a 55% increase in the number of people with clean cooking access since 2015. The Pratyaksh Hanstantrit Labh ([PAHAL](#)) has been subsidising LPG refills since 2015 and the Pradhan Mantri Ujjwala Yojana ([PMUY](#)) has provided more than 80 million deposit-free LPG connections<sup>1</sup> to women in poor households since 2016. Ten million wealthier households have voluntarily renounced their access to LPG subsidies under the [Give It Up](#) campaign since 2015 – a great example of behaviour change allowing better targeting of support to the poorest households.

## Energy efficiency

India's energy demand is set to grow by more than any other country's in the coming decades. India's policies therefore aim to reduce energy demand growth, using both traditional energy efficiency policies and behavioural change.

In December 2022, India passed an amendment of its Energy Conservation Act, which expands the scale and scope of its energy conservation regime. It includes

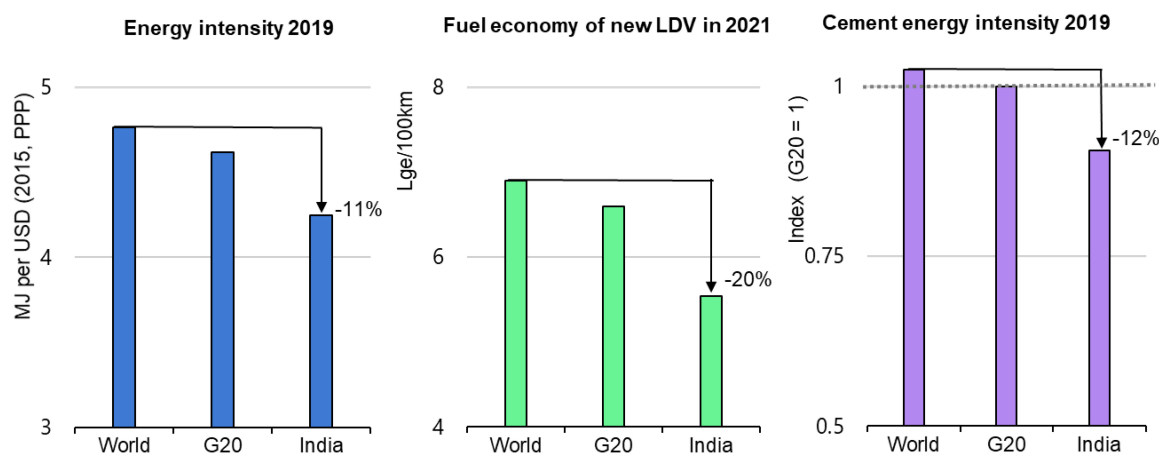
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<sup>1</sup> Interest free loan for the cost of the LPG stove and a first canister refill.

new building codes and new policies to drive improvements in appliances, vehicles, industrial facilities and commercial buildings.

India's robust energy efficiency programme has been successful in reducing energy use from all sectors. As a consequence, India already has a lower energy intensity than the G20 average for the economy as a whole and for key sectors.

### Key energy efficiency indicators, India versus G20 and world averages



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Note: LDV = light duty vehicles.

India is the world's second largest cement producer. The country's cement industry is among the world's most energy efficient, with energy consumption of grey clinker [10% lower than the G20 average](#). India is also the world's third largest car market. Average fuel consumption of new cars was 5.5 litres of gasoline equivalent/100 km in 2021, which is 20% below the global and G20 averages.

India's efficiency policies also extend to promoting behavioural change and consumer awareness. Efficient consumption is promoted through programmes such as the recent campaign on setting air conditioners at 24 °C. Policies have also supported market transformation through a combination of demand-side and supply-side measures. For example, India has achieved impressive results through bulk purchasing programmes such as the Unnati Jyoti by Affordable LEDs for ALL (UJALA) programme that radically pushed down the price of LEDs available on the market. India is also implementing the world's [largest agricultural demand-side management](#) programme, aiming to replace inefficient agricultural pump sets. There are more than 21 million grid-connected pump sets in India and their deployment is on the rise. The programme aims to distribute 200 000 highly efficient pump-sets to farmers. These are all examples of government policies that aim to facilitate more sustainable behaviours and choices.



## Electric vehicles

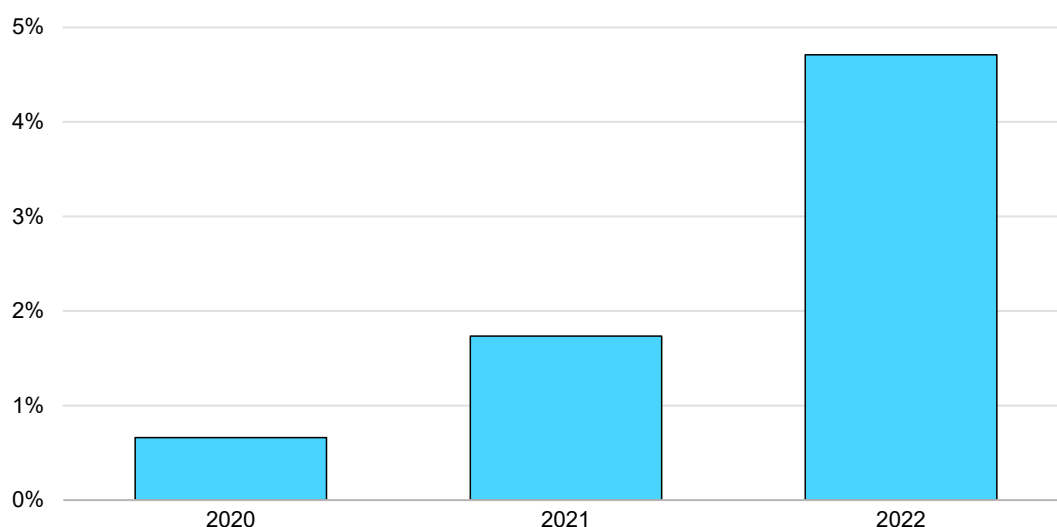
In 2022, electric passenger vehicle sales in India reached nearly 1 million units across all segments – a record annual growth rate of over 200%. This resulted in EV's share of the overall market rising to nearly 5%. Most of these were electric two- and three-wheelers. Given that this segment accounts for over 80% of the Indian vehicle market, electrification here can bring large reductions in emissions and fuel expenditures. At the same time, the market for larger passenger vehicles in India is growing rapidly. In 2022, India surpassed Japan to become the third largest car market in the world. Electric cars' share of the Indian car market tripled in 2022 to reach nearly 1.5%.

Ambitious policies such as the FAME II scheme support consumers to choose electric vehicles. To date, three electric car models are manufactured domestically in India and this number is expected to grow to nearly 20 in the coming years. As of January 2023, India has offered companies investing in battery cell technology just over USD 2 billion in government incentives, and over USD 1 billion worth of subsidies to consumers to accelerate the adoption of electric vehicles. The shift towards electromobility creates a new landscape of both opportunities and challenges for the Indian automotive industry. It also offers consumers significant cost savings: the [IEA estimates](#) that the payback period of an electric car is 5-6 years and only two years for an electric motorbike in India today.

The Ministry of Power and the Ministry of Road Transportation launched the “Go Electric” campaign in 2021 to raise awareness of the benefits of electromobility. This is a good example of a LiFE measure supporting consumer awareness and market transformation. India is also undertaking a multi-stakeholder effort to finalise a tender for more than 5 500 electric buses for public transport, which would make the country one of the largest markets for electric buses.

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### Electric passenger vehicle market share in India, 2020-2021



Source: IEA (2022), [World Energy Outlook 2022](#).

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## Renewable energy

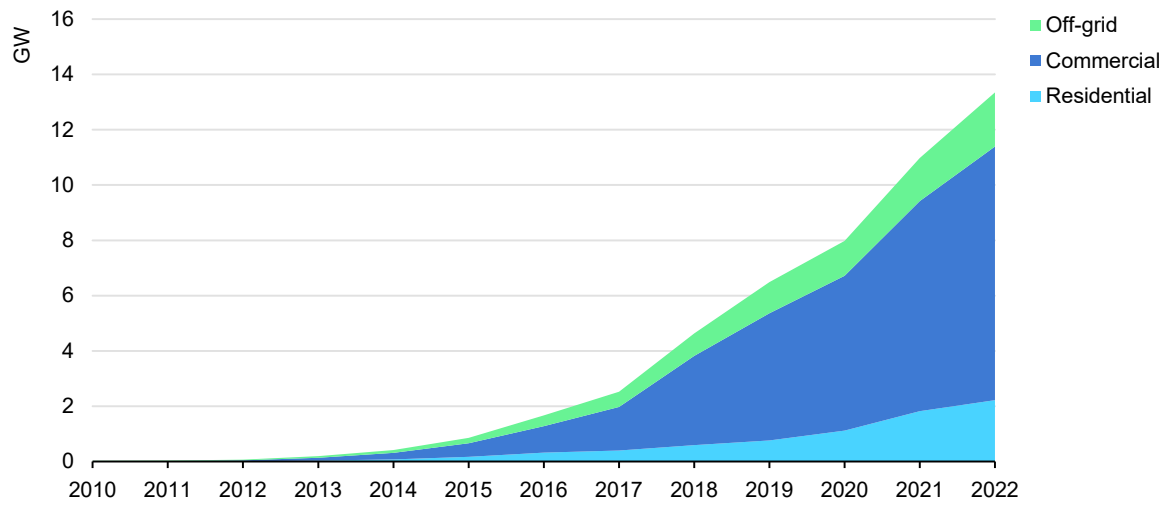
With average capacity additions of about 12 gigawatts (GW) of solar and wind power per year, India has been the third largest renewable energy market in the world for the last five years. India also has the third largest installed capacity of renewables in the world, with around 110 GW of wind and solar at the end of 2022. The country's total renewable energy capacity, including hydro and bioenergy, stood at 175 GW. Even adjusting for India's large population, India saw one of the largest increases of installed capacity of wind and solar of any emerging economy over the last decade.

The growth of the renewables sector has been driven by a strong and stable policy framework. The target of installing 175 GW of capacity by 2022 gave clear direction to the sector, and government schemes helped to derisk investment. Policies such as the development of large solar parks facilitated access to land and infrastructure. As a result, the Indian renewable energy sector has attracted relatively low-cost capital from both domestic and international sources, including USD 13 billion in foreign direct investment inflow in the last two decades,

[according to the DPIIT](#). This, coupled with India's excellent resources and technical know-how, has resulted in some of the lowest-cost renewable energy tariffs anywhere in the world.

Consumer awareness and behaviour change have played a role here too. In particular, the residential and commercial rooftop solar PV sectors have seen rapid growth in recent years despite a slow start. In 2022, there were about 2.2 GW of residential rooftop solar PV (a roughly 30-fold increase on 2014), and more than 9 GW of commercial rooftop solar PV (a 40-fold increase). Programmes are also being developed to enable farmers to benefit from renewables, notably solar PV. For example, the government of Gujarat recently launched Suryashakti Kisan Yojana (SKY), giving fiscal support and low-interest loans to support solar PV for 150 000 farmers. Not only does this raise awareness among the agricultural community, it can also generate additional income for farms and potentially save money on rural electricity supply.

### Increase in distributed solar PV capacity in India, 2010-2022



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India's renewable energy sector will need to continue to grow strongly. Reaching the very ambitious target of 500 GW of non-fossil fuel capacity (including large hydro) by 2030 would require accelerating annual renewable capacity additions by several times compared with the average of recent years.

# Understanding the LiFE initiative

## Introducing LiFE

The Lifestyle for Environment (LiFE) initiative was announced by Prime Minister Narendra Modi at COP26 in Glasgow in November 2021 to encourage the adoption of sustainable lifestyles to tackle the environment and climate crisis. The initiative was further developed and formally launched in October 2022 by Prime Minister Modi and the UN Secretary General António Guterres as Mission LiFE, a global mass-movement led by India to nudge individual and community behavioural change in order to reduce emissions, protect the environment and conserve resources. The Government of India's think tank, NITI Aayog, published a [summary paper](#) outlining LiFE's principles and theory of change.

LiFE draws on India's experience of mounting successful large-scale behavioural change campaigns to address waste, sanitation and clean cooking challenges. NITI Aayog's paper gives examples of environmentally friendly 'LiFE actions' to adopt in daily life to conserve energy and water, reduce waste and plastic usage, promote healthy lifestyles and adopt sustainable food systems. Examples of LiFE actions regarding energy include choosing to use public or active transport, adopting energy efficient appliances, installing rooftop solar panels and practising fuel-efficient driving.

The stated objective of Mission LiFE is to mobilise at least one billion Indians and other global citizens to take individual and collective action to protect and conserve the environment in the period 2022-28. The theory of change is to prompt interrelated shifts in the approaches of individuals, industry and government policy.

Within the Government of India, the LiFE Mission is being piloted by NITI Aayog and will be implemented by the Ministry of Environment, Forest and Climate Change. India is promoting LiFE through its engagement in multilateral fora, including it in the country's Nationally Determined Contribution ahead of COP27 and making LiFE an overarching theme of its G20 Presidency.

## Behavioural change and consumer choice in energy transitions

The choices of individuals are critical to enabling energy transitions and can have substantial impacts on markets and regulation. For example, the rapid move away from single-use plastics was led in many instances by public sentiment, followed by government-enforced bans.

But there is also a clear and simultaneous role for policy. The availability of infrastructure, consumer awareness and prevailing socio-cultural norms affect the likelihood of consumers changing their behaviour. For example, if public transport infrastructure is undersupplied, unreliable or inconvenient, consumer choices will be driven towards private transport modes.

The challenge for clean energy transitions is to create a virtuous circle where individual choices drive market transformation and government policy, and where policy and market transformation simultaneously enable more sustainable consumption choices by citizens.

Unsustainable choices can also undermine climate mitigation efforts. For example, the rising global popularity of SUVs (which are around 25% less fuel efficient than a standard car) has nullified much of the reduction in emissions from growing EV sales. Indeed, SUVs rank among the [top causes](#) of energy-related CO<sub>2</sub> emissions growth globally over the last decade. SUV ownership is highly unequal: in 2021, almost five times more SUVs were sold per capita in advanced economies than in emerging and developing economies.

The IEA models both behavioural changes and sustainable consumption choices in its energy transition scenarios:

- **Behavioural changes:** This refers to active and ongoing changes in energy use by consumers which tackle excessive or wasteful energy consumption. Examples of the kind of measures that the IEA models include replacing business flights with teleconferencing; driving more slowly on highways; reducing car use in favour of active or public transport; and adjusting thermostats in buildings.
- **Sustainable consumption choices:** This refers to consumer purchases of low-emissions equipment and technologies, as a result both of policy support and greater awareness. Examples include consumers preferring electric vehicles; purchasing highly efficient appliances; or switching from natural gas to induction-based cooking.

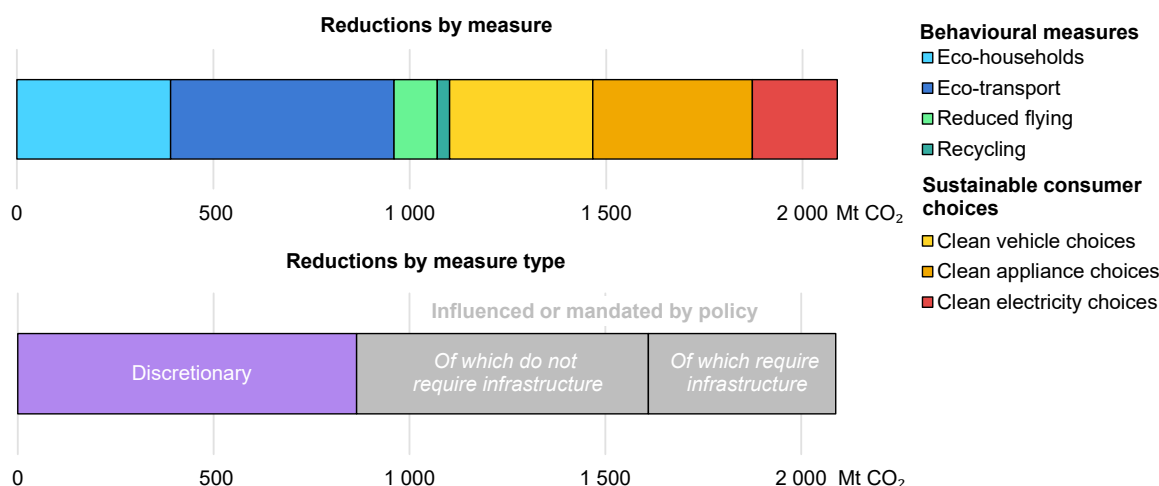
The following sections quantify the emissions reductions and co-benefits achievable at the global level through the implementation of LiFE.

# Quantifying the LiFE initiative

## Global emissions

If adopted worldwide, the type of actions and measures targeted by LiFE – including behavioural changes and sustainable consumer choices – would reduce annual global CO<sub>2</sub> emissions by more than 2 billion tonnes in 2030. This is about one-fifth of the emissions reductions needed by 2030 to put the world on a pathway towards net zero emissions. Just over half of these emissions reductions – about 1.1 Gt of CO<sub>2</sub> – are associated with behavioural changes while the remainder comes from sustainable consumption choices.

### Reductions in annual global CO<sub>2</sub> emissions from LiFE measures, 2030



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Note: eco-households refers to measures such as adjusting thermostats in buildings or switching off appliances; eco-transport refers to measures such as slower driving speeds, car pooling, and public transport use; reduced flying includes substituting flights with teleconferencing or modal shift to high speed rail; recycling refers to recycling of goods to reduce the need for primary production of materials like steel or plastics; clean vehicle choices includes purchase of EVs; clean appliance choices refers to the purchase of energy efficient or low emissions appliances; clean electricity choices refers to the installation of rooftop solar PV on households.

Within behavioural changes, the largest share (0.7 Gt) comes from the transport sector, through measures such as increased use of public transport in cities, more eco-efficient driving practices, and reduced flying through the use of teleconferencing or modal shift to high-speed rail, for example. About 0.4 Gt of emissions reductions are achieved in households. Critical measures in this regard include the reduction of indoor heating temperatures and the increase of indoor cooling temperatures, and turning off lights and appliances when not in use. There are also small reductions from behavioural changes impacting industrial production, such as increased recycling.



In addition to such behavioural changes, a further 1 Gt of reductions can be achieved by shifting consumer choices towards low-emissions options. Around 0.4 Gt of this occurs through households purchasing energy efficient appliances and equipment, and shifting to low-emitting technologies such as induction cooking and heat pumps. Household purchases of EVs provides another 0.4 Gt of emissions reductions, while the use of residential rooftop solar PV provides the remaining 0.2 Gt.

## The role of governments

We estimate that around 60% of the emissions savings by LiFE measures could be directly influenced or mandated by governments. They are carried out by citizens but need to be encouraged and facilitated through transparent and consistent policy support and messaging. Examples of this include introducing low-emissions zones in cities or supporting consumer investments in clean energy technologies such as efficient air conditioners, heat pumps or solar PV panels. The more discretionary changes, such as reducing the water temperature of domestic boilers or raising air conditioning temperatures, can be encouraged by awareness campaigns. There is a growing focus on how behavioural insights and social science can help shape policies effectively.

In some cases, there is also a need for infrastructure to facilitate the measures in LiFE. We estimate that about a quarter of CO<sub>2</sub> emissions savings would require infrastructure support. Important examples include public transport infrastructure in urban areas, high speed rail infrastructure, and EV charging stations.

LiFE measures therefore can provide a substantial share of the emissions reductions needed to put the global energy system on track towards net zero. Individuals cannot achieve this alone, however. A virtuous circle between individual choice, market supply and innovation, and government regulation is critical to delivering on the potential of LiFE.

## Co-benefits

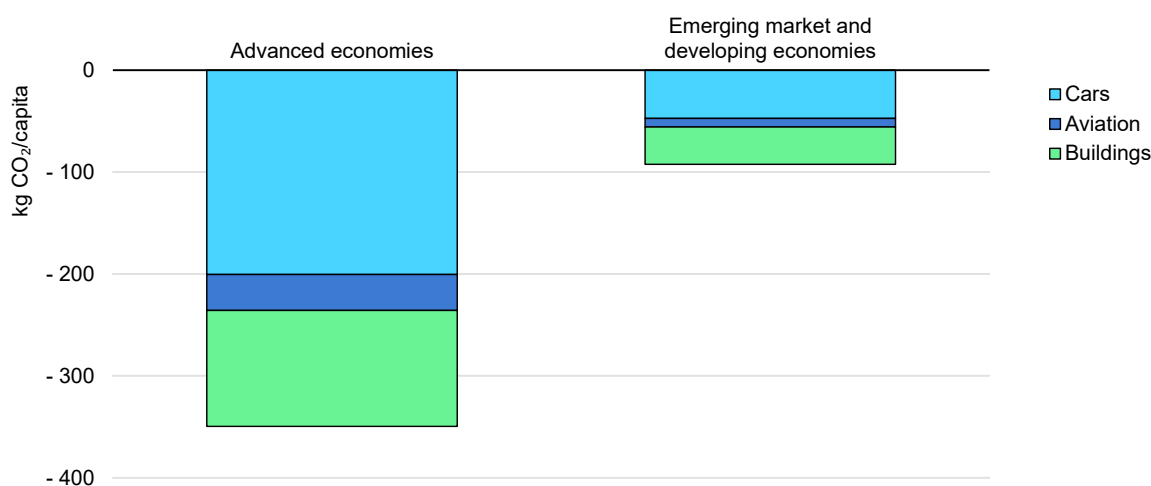
Proactive global implementation of LiFE measures can also bring substantial co-benefits in terms of reducing inequalities in energy consumption, mitigation of air pollution, cost savings, and improvements in well-being and health. This section briefly examines some of these co-benefits.

Global energy consumption and the resulting emissions are highly unequal between and within countries. Globally, North America is the region with the

highest energy consumption per capita, followed by Russia and Central Asia<sup>2</sup>, and the Middle East. On the other hand, Africa’s energy consumption is one-third of the world average, while India’s is 35%. But there are also large inequalities within countries. But there are also large inequalities within countries. In advanced economies, the poorest 30% have per capita emissions below the global average, while the richest 10% have emissions seven-times the global average. In emerging market and developing countries, the richest 10% have per capita emissions above the poorest 80% of the population in advanced economies.

On aggregate, there are more opportunities for LiFE measures to streamline energy demand and reduce emissions in advanced economies. Based on IEA modelling, the reductions in annual per capita CO<sub>2</sub> emissions from behavioural change in advanced economies by 2030 (relative to a ‘business-as-usual’ trajectory) are three- to four-times greater than in developing economies.

**Change in CO<sub>2</sub> per capita relative to baseline due to behavioural changes in 2030**



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In 2021, [air pollution](#) caused around 7.8 million premature deaths worldwide, and cost about 6% of world GDP. Addressing indoor and outdoor air pollution requires comprehensive policies to address all sources of air pollutants. Behavioural change cannot provide a silver bullet, but it can help. We estimate that around 5-10% of the total reductions in harmful nitrogen oxides (NOx) pollutants seen in a strong climate mitigation scenario by 2030 come from behavioural changes. This might seem small, but the health impact is likely to be larger than this number suggests. Behavioural change targets transport in particular, and transport NOx

<sup>2</sup>Armenia, Azerbaijan, Georgia, Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan and, Uzbekistan.

emissions are concentrated in cities, which have the highest levels of population density and exposure to air pollution. In addition, behavioural change can lead to health benefits by supporting more liveable cities with reduced noise and congestion, and improved road safety. Improved active health and better diets would also lower health expenditures and reduce the global epidemic of lifestyle-related disease.

In some sectors, such as aviation, achieving the level of reductions needed for net zero emissions for the energy sector as a whole will be challenging. In these instances, LiFE measures can make the energy transition easier by reducing energy demand. For example, without behavioural change in aviation about 40% more sustainable aviation fuel would be needed in 2050 in a strong mitigation pathway. This would put further pressure on the already huge scaling up of low-emissions technologies needed in this scenario, such as bioenergy, renewable electricity and low-emissions hydrogen production.

LiFE measures would also save consumers globally around USD 440 billion in 2030 through both lower consumption and lower prices, according to the IEA modelling. This saving is equivalent to around 5% of all spending on fuels across the global economy in that year. LiFE measures can thus help to improve energy affordability.

# Outlook and implications for the G20

Goal 12 of the UN Sustainable Development Goals relates to sustainable consumption and production – and is closely linked to the framing of the LiFE initiative. LiFE is about offering choices to individuals and consumers from a wider range of more sustainable options. This means the role of policy in providing infrastructure, information and incentives is central. But behavioural changes and customer choices can also provide a driver for transforming markets and government policies. The G20 can play an important role in internationalising LiFE, since G20 countries account for around 80% of world GDP, 75% of global trade, and 60% of the global population.

With this in mind, the conclusion to this paper offers some principles on the basis of which the G20 could strengthen LiFE by establishing a G20-specific initiative:

- **Country driven:** Different countries face different circumstances and have different cultural traditions and policy-making priorities. In some, heating is a significant source of energy demand; in others, it is cooling. Some countries are still urbanising; some are highly urbanised with long-established infrastructure. Some countries will prefer to focus on how consumers can drive technological and market transformation through their consumption choices; others may focus more on behavioural change. There is no one-size-fits-all approach to promoting behavioural change and sustainable consumption. LiFE can provide an impetus, but countries will need to choose their own priorities.
- **Building on existing approaches:** Essentially all G20 countries are already taking some measures related to LiFE, be they on energy efficiency in buildings, the adoption of EVs, the use of public transport, the deployment of rooftop solar PV, or reducing excess energy consumption for heating. Indeed, in the face of the global energy crisis, many governments are increasingly putting in place policies and campaigns focused on saving energy. The objective of LiFE is therefore not to duplicate these policies but to ensure a more active and visible engagement of consumers and citizens.
- **Policy driven:** Individuals are embedded in society. How they behave and choose to consume is shaped by norms, policies and the incentives and infrastructure around them. LiFE should have an active focus on how policies can enable consumer choice and behavioural change.
- **Information sharing and iteration:** Embedding LiFE within G20 working groups and engagement with international organisations offers an opportunity for countries to share best practices and success stories, and to ensure linkages between different policy areas. An iterative, bottom-up process of knowledge

gathering and information sharing can help strengthen the link between energy transitions, individual action and policy frameworks.

The IEA stands ready to support the mainstreaming of LiFE within the G20. The IEA can bring to bear its long-standing expertise in energy transitions, efficiency, policy tracking and modelling – and its understanding of the role of behaviour change and consumer choices in energy systems.

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