

digital. for green

The UN Intergovernmental Panel on Climate Change (IPCC) has warned of the irreversible damage being done to the environment.

The next ten years will be crucial if we are to keep global warming to a maximum of 1.5°C and protect our planet. Even half a degree over this limit will significantly worsen the risk of drought, floods, extreme heat and poverty for millions of people:



Energy



Energy processes were responsible for **78% of total EU emissions** in 2015

Within this, buildings are responsible for **40% of EU energy consumption** and **36% of CO² emissions**



Agriculture



Agriculture accounted for **10% of the EU's total GHG emissions** in 2015

Agriculture accounts for over **40% of EU land use**, leading to habitat loss and deforestation



It is estimated that up to **50% of water used for irrigation is wasted**, exacerbating stress on water resources



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In response to the risks posed by global warming and climate change, the EU has pledged to become climate neutral by 2050 as part of the [European Green Deal](#) and to become a global climate leader. The Green Deal provides an action plan to boost clean, affordable and secure energy, cleaner industries and production process, energy efficient buildings, sustainable and smart mobility, sustainable agriculture and biodiversity restoration.

“
**This is shaping the world we want to live in...
A world where we use digital technologies to
build a healthier, greener society.”**

Commission President Ursula von der Leyen

Achieving a fair and sustainable transition to a climate-neutral Europe by 2050 will require action and investment in digital solutions across multiple sectors including agriculture, energy, mobility and construction. In recognition of this, the EU has pledged to allocate 37% of the **Recovery and Resilience Facility fund** to drive green investments and reforms with 20% required to foster the digital transition.

delivering the twin digital and green transformations

To achieve the green targets and arrest global warming, Europe needs to drive a significant change across the value chain, from the point of resource extraction and input production through to the behaviour of consumers.

All regions, sectors and applications across the EU will require digital at the centre of their recovery plans as they seek to drive efficiency, and reduce their environmental footprint, reach more customers and shape the future.



The creation of smart ecosystems will be at the heart of this digital and green transformation. They will connect fragmented value chains to provide greater levels of information and transparency to all stakeholders, including consumers and governments. This will improve the sophistication of stakeholders' interactions and capacity to deliver the green transformation and the circular economy.

Digital solutions and connectivity are critical enablers of the technologies that enable greater sustainability within smart ecosystems. Connectivity underpins use cases throughout the value chain, from smart agriculture to smart logistics, smart cities and smart energy. These use cases will leverage technology solutions such as IoT, machine learning, artificial intelligence and Big Data to develop and commercialise new applications. However, these technologies will all require fast, secure and reliable connectivity to gather and process data, making 5G deployment a key driver of successful adoption of these new applications.



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Connectivity and IoT as critical enablers to delivering green impact across value chains (non-exhaustive)

Primary goods and raw materials production

Processing, manufacture and assembly

Storage and logistics

Delivering products and services

Managing consumption



Smart agriculture

- Lower impact on natural resources
- Less emissions from fertilisers
- Biodiversity restoration
- Regenerative agriculture
- Better animal welfare
- Smaller land use



Smart logistics

- Lower fuel consumption
- Few emissions
- Continuous incremental efficiency gains
- Less waste (including food)
- Supply chain traceability



Smart manufacturing

- Greater resource efficiency
- Circular economy potential
- Lower energy consumption
- Less pollution and waste
- Improved health and safety
- Greater precision, fewer faults



Smart cities

- More energy efficient delivery of services
- Better traffic flows, less congestions
- Less waste
- Improved air quality (lower pollution)



Smart energy meters

- Empowerment of people to change behaviours
- Reduced energy consumption
- Transparency
- Next generation grid management



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IoT applications to reduce emissions:



Smart agriculture

enables farmers to manage their crops and livestock more efficiently and sustainably through connected monitoring devices and farming equipment. **Reductions in raw materials requirements of up to 20% have led to reduced damage to local environments and habitats** through lower natural resource consumption and fertiliser use.

Smart logistics

embeds IoT technologies in vehicles to optimise route management, vehicle maintenance and driver behaviour. **Vodafone's IoT vehicle solutions are able to deliver cuts in fuel consumption of up to 30%, saving an estimated 4.8 million tonnes of CO₂e last year.**

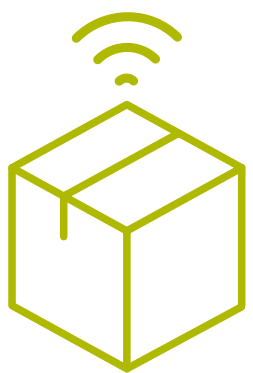
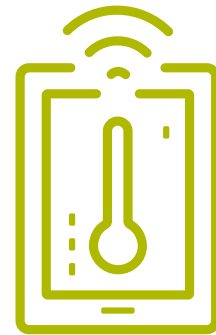


Smart cities

improve the efficiency of energy-intensive services such as public transport, road networks and street lighting. In Guadalajara (Spain), **13,500 LED street lights were connected to a central management system, reducing energy consumption by 68%.**

Smart energy meters

enable households and businesses to monitor and reduce their energy use, lowering energy bills and the environmental impact of energy production. Worldwide, **Vodafone's IoT platforms have connected over 12 million smart meters, saving c.1.6 million tonnes of CO₂e last year.**



Smart manufacturing

enables factories to be more efficient, reduce wastage and have a lower environmental impact through emissions and pollution reduction. Connected machinery can be **continuously monitored to reduce maintenance and downtime**, as well as allowing remote monitoring to reduce engineer callouts. NB-IoT networks also enable low-power sensors to reduce energy consumption. **eHealth:** remote consultations and using wearables / medical implants to enable clinicians to track patient health remotely, reducing the number of visits (and therefore travel) patients need to make.



Reducing the environmental footprint of the telecoms sector

As part of the Green Deal, the EU has identified the need to reduce carbon emissions of the ICT sector as key to supporting the green transition.

Vodafone is committed to reducing its own environmental footprint, taking the lead in the sector, and demonstrating the value of digital in achieving this.

Vodafone's total global carbon emissions will be 'net zero' by 2040

Vodafone's 2030 carbon reduction targets have been approved by the Science Based Targets initiative as in line with reductions required to keep warming below 1.5°C

Vodafone's European networks will be powered by 100% renewable electricity from July 2021, creating a Green Gigabit Net for its customers



Vodafone case studies

Vodafone's commitment to enabling the green transition through digital is reflected in its commitment to help businesses save **350 million tonnes of CO₂e by 2030**, equivalent to **Italy's total annual carbon emissions**. This impact will be driven mainly by Vodafone's IoT services as outlined on the page above, enabling the development of smart ecosystems, including logistics and fleet management, smart metering and manufacturing activities.



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Vodafone has led a number of initiatives across Europe to promote Digital for Green.

The map highlights some of the key projects:

- Agriculture
- Energy
- Smart Cities
- Mobility

Landnetz
 Testbed with Dresden University that aims to show 5G productivity and efficiency benefits, e.g. autonomous vehicles, connected machinery and sensor networks.

IFA – Soil Technology Pilot Project

Farmers receive insight about their soil, leading to the optimisation of fertilisers and other inputs, reducing costs.



Ireland

Moocall

Using non-invasive sensors to predict when cows are in heat or likely to give birth, alerting farmers by text.

Sevilla municipal government

Optimising municipal services using Vodafone’s Smart Cities Platform to deliver energy savings, reduce water waste and improve public transport.

Smart crops IoT platform

Protecting the environment by optimising the fertiliser, pesticide and water usage of the agriculture sector. Facilitating massive data analysis to enable better control of the performance of dairy and beef herds.



France

Smart meters & EDP HC Energía

One of Spain’s leading energy providers has installed more than 600,000 smart meters, powered by Vodafone’s IoT technology, which allows them to be read remotely, reducing travel emissions and costs.



Spain

Sensing4Farming (Borges) IoT monitoring

Integrating satellite and ground sensor data to provide information on the crop growth and high added-value agroclimate indices for smart farm management. Using IoT to measure temperature, relative air humidity, and concentration of CO, CO2, LPG or ammonia to improve productivity.

Utility Smart Meters
 Using 119,000 Vodafone SIMs to power 70,000 industrial smart meters and 49,000 routers to connect c.5m residential smart meters.

Germany

Czech Republic

5G microgrid in Jeseník

Using IoT to test and develop innovative new electricity micro grids for the future.

Vehicle tracking

Using location data to reduce the distances travelled and fuel consumption of vehicles.



Romania

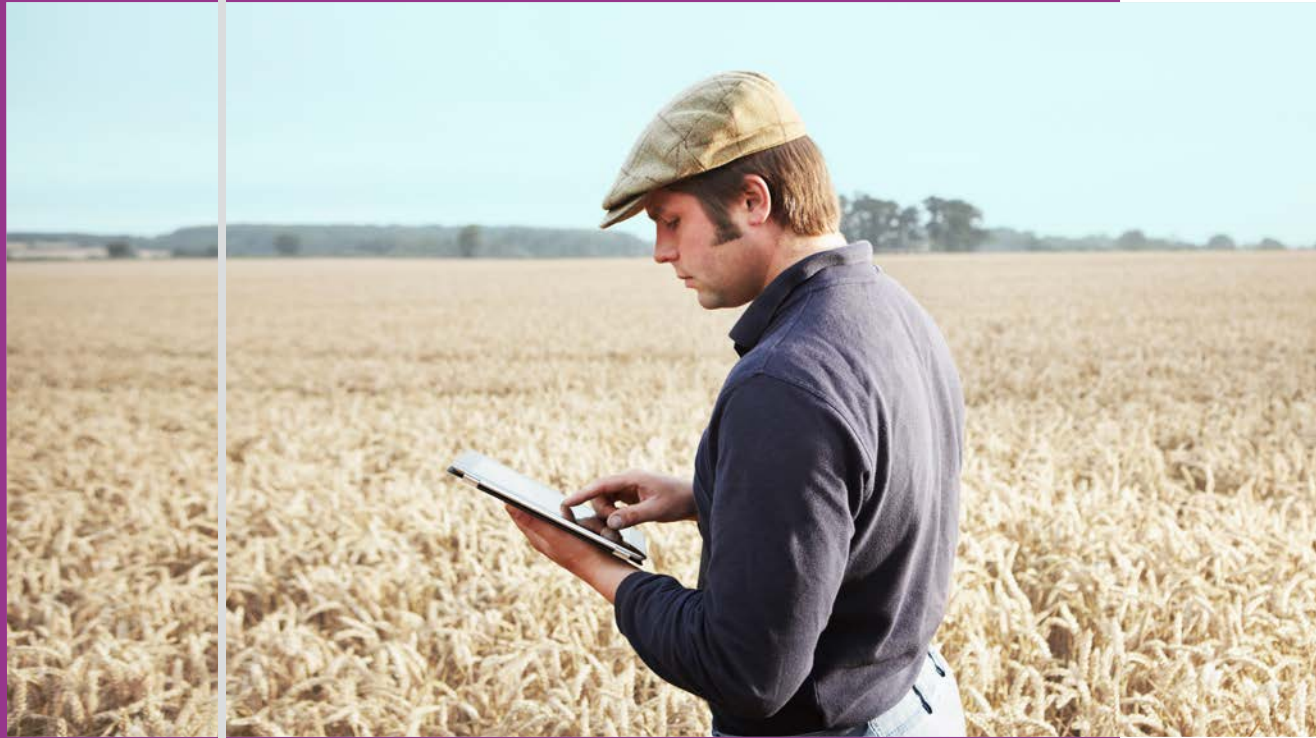
Italy

Albania

Energy data management

Reducing utilities consumption across water, gas and electricity by up to 15%.

Bialetti
 Using Vodafone’s Energy Data Management IoT solution to improve energy performance and reduce costs



Deep Dive: Digital for Green in Agriculture

Agriculture, which accounts for 10% of total EU greenhouse gas emissions and 44% of total water abstraction in Europe, is a key sector where transition to a smart ecosystem will be integral to promoting and delivering greater sustainability. Connectivity providers such as Vodafone are working with partners across the value chain, including farmers, equipment manufacturers, suppliers and research institutes to introduce new applications and technologies.

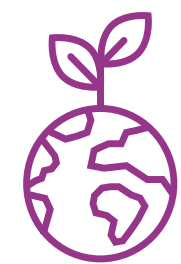
The availability of connectivity is already enabling a greener approach, with more efficient use of resources via real-time monitoring. However, to realise the full benefit digital technology will need to be deployed at scale. Partnerships between the agricultural industry, governments and connectivity providers are critical to ensuring the digital infrastructure and funding is in place to deliver this and create greener, smart, digital ways of working.

Sensing4Farming with Emilio Moro in Spain

Emilio Moro, a Spanish wine producer, is aiming to maximise efficiency and minimise the environmental impact of its wine production.

Through Vodafone's Sensing4Farming solution, a network of sensors has been installed in Emilio Moro's vineyards which, combined with the high resolution satellite images obtained in real time, allow the measurement of key environmental factors such as humidity, temperature, soil conductivity, water absorption and the health of the grapevines. This data is sent to the winery oenologists and technicians so that the winery can identify the ideal quantity of irrigation and fertiliser needed by the vines, as well as which require pruning and when to harvest.

The key benefits of the project include:



Lower environmental impact due to reduced fertiliser use and water consumption



Reduced production costs through reduced water, fertiliser and energy consumption



Increased quantity and quality of production by permitting a more selective application of treatments

KEENAN and IoT improving sustainability of livestock farming

KEENAN, an Irish manufacturer of diet feeders for livestock, is using Vodafone's IoT solutions to enable farmers to measure, monitor and manage feed efficiency. This leads to a reduction in feed waste and an overall improvement in animal health. KEENAN's diet feeders are used on farms across Europe and globally. Their diet feeders automate the mixing and delivery of feed to livestock, and, with IoT connecting the machines to the cloud, farmers can easily monitor and analyse the resulting data.

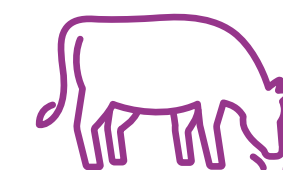
By incorporating IoT services into the equipment:



The efficiency of animal feed **increased by 10%**, reducing input requirements and waste



Yields increased; dairy farms saw milk production **increase by 1.74kg per cow per day**



Animal health improved, reducing vet bills and enhancing welfare

supporting emissions reductions across key sectors

Member States supporting digital technologies across various key sectors can help the EU deliver its goal of reducing greenhouse gas emissions. Considering the examples in smart agriculture, smart energy meters and smart logistics, together these applications **could deliver savings of over 36m tonnes CO₂e annually in the EU**, equivalent to the emissions from the population of Barcelona each year.¹

Below are just a few examples

Sector GHG emissions as a share of total EU27 GHG emissions (% CO₂e)



Source: European Environment Agency. GHG emissions from these sectors may not be mutually exclusive.

¹ Based on emissions per capita in Spain and city population estimates.

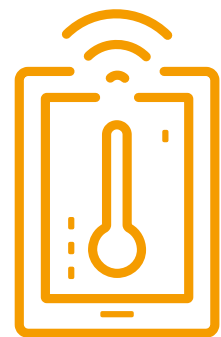


Smart Agriculture

IoT-based solutions are increasing the amount of information that farmers have available to them, enabling them to optimise their operations and use of resources. This enables a fall in the use of pesticides and fertiliser, which reduces emissions, water use and resource consumption, as well as improving the protection of biodiversity and increasing yields.

For instance, **Vodafone IoT technology** is being used to deliver real time app and SMS-based information to farmers concerning environmental factors such as insect presence, soil temperature, humidity and crop growth and local weather information. **This technology delivers a 20% increase in efficiency, driving a reduction in resource use and environmental impact.**

Scaling this impact over very large EU farms, with an illustrative adoption rate of 50%, **IoT technology could reduce pesticide use by 12,000 tonnes and fertiliser use by over 350,000 tonnes in the EU** (3.5% of total pesticide and fertiliser annual consumption) and reduce annual greenhouse gas emissions by 4.5m tonnes CO₂e.ⁱⁱ



Smart Energy Meters

Digital technologies are also helping save energy – for example, as part of Vodafone’s enablement targets it is estimated that smart energy meters can improve energy efficiency in **commercial buildings by 16.8% on average** and drive down greenhouse gas emissions. **Buildings are responsible for 40% of EU energy consumption and 36% of CO₂ emissions.** Therefore, even based on an illustrative 50% adoption of smart energy meters among energy inefficient commercial buildings in the EU, **as much as 15.5m tonnes CO₂e of annual EU emissions could be avoided** from wider rollout.ⁱⁱⁱ



Smart Logistics

Transport is responsible for **22% of EU GHG emissions**, and smart logistics are expected to improve vehicle and route efficiency, **reducing fuel consumption by up to 30%** and lowering congestion, resulting in improved air quality. Based on an illustrative 50% adoption across commercial vehicles and an average impact of 15% across the EU, **IoT-enabled smart logistics could save as much as 16.5m tonnes CO₂e** of annual EU emissions.^{iv}

ⁱⁱ Emissions are estimated based on **emission intensity for cereals** and **total crop production**. Emissions, **pesticide use** and **fertiliser use** are scaled by output of **very large farms**, defined as those with **output over €100,000**, as a share of total crop production and assuming a 50% adoption rate. This covers one third of total EU crop production measured by value. Improved efficiency savings (i.e. reduction in inputs and emissions intensity) of 10% are applied to account for greater efficiency of EU agriculture relative to the use example to estimate the scaled impact.

ⁱⁱⁱ Energy consumption of non-residential buildings is estimated based on total energy consumption from Eurostat, **non-residential share of total buildings floorspace** and **energy intensity of non-residential buildings**. Savings are applied to energy inefficient buildings (75% of the building stock), adoption is assumed to be 50% of these given that energy efficiency of buildings may be greater than the use case examples where impact has been measured. Total emissions savings are based on **average fuel mix** and **standard fuel conversion factors**.

^{iv} Savings are based on road transport emissions from the **European Environment Agency** and the **share of emissions from light commercial and heavy-duty vehicles**. Adoption is assumed to be 50% and the average impact 15% of emissions, scaling down the maximum potential efficiency savings from Vodafone Smart Logistics solutions by half.



delivering the green transformation

The world has known about the need to take action to tackle climate change for a long time. However by delaying action, a tipping point has been reached. It has now become critical that action is taken on a large scale, drawing on all available tools and resources, so that irreversible damage is averted in the next ten years.

Never before have the funds been available, the technology been ready and **EU leadership been willing to drive change to enable a green future at the same time.** The EU's Green Deal has pledged significant funding to tackling the climate crisis and to make the EU economy green, with digital as a core enabler.

The challenge now is in the execution. It will require strong partnerships between Governments, industry and citizens. Connectivity providers will play a key role in connecting value chains and being a part of these partnerships. Digital applications will empower consumers and businesses to effect change within value chains and enable ecosystems to be sustainable and adaptable. Data will be central to ensuring a consistent evidence base for decision-making and measuring the impact, requiring IoT technologies and connectivity.

Digital technologies, enabled by connectivity and data analysis, are essential for delivering the green transformation. Connecting to create transparent ecosystems creates the step change required to tackle the climate crisis by unlocking the potential of AI, automation, IoT and other technologies. These technologies will enable the shift to a green economy that is circular by design, focused on regenerative approaches to maximise productivity and efficiency across the ecosystem.



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