



libelium

Behind the change. Beyond the challenge.

# Report

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How can **IoT** help to reach  
**SDGs?**



# IOT - The driving force behind the United Nations' Sustainable Development Goals (SDGs)

## 1. Libelium perspective

Following the vision of the World Economic Forum in shaping a sustainable, inclusive and trustworthy digital future, **Libelium is currently addressing the Sustainable Development Goals (SDGs) in the development of IoT technology.** The Sustainable Development Goals are the blueprint to achieve a better and a more sustainable future for everyone.

IoT is about measuring and remotely controlling unconnected 'things,' reaching people and objects that technology could not reach before and also supporting the sustainable development goals in the process.

Although IoT benefits are clearly linked to sustainable development, the awareness of this is limited.

Companies and public administrations must **prioritize sustainable objectives in the design phase of their IoT projects** and, at the same time, maximize the social impact of their activity by increasing the value of their proposals.

From the private sector, companies are aware of these new opportunities and implement models of collaborative development between companies seeking a common goal: the creation of an ecosystem that fosters win-win relationships.

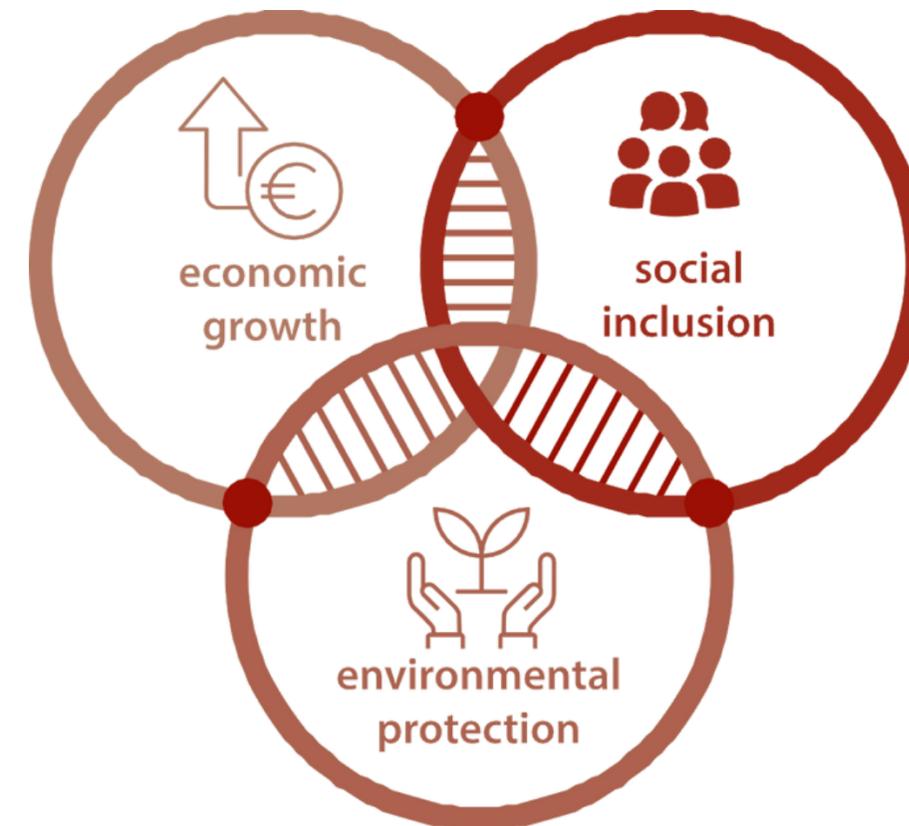
However, there are **barriers** that limit the development of the Internet of Things market in relation to sustainability:

- Deployments are often proofs of concept, which does not favour economies of scale.
- There is a lack of standards in technology that does not allow effective interoperability.
- There is a gap between those who have the technology and those who have the money.

Authorities need to get involved; in the short term, their action is necessary to promote sustainable development policies supported by the IoT, both at the regulatory and economic level.

## Dimensions of Sustainable Development

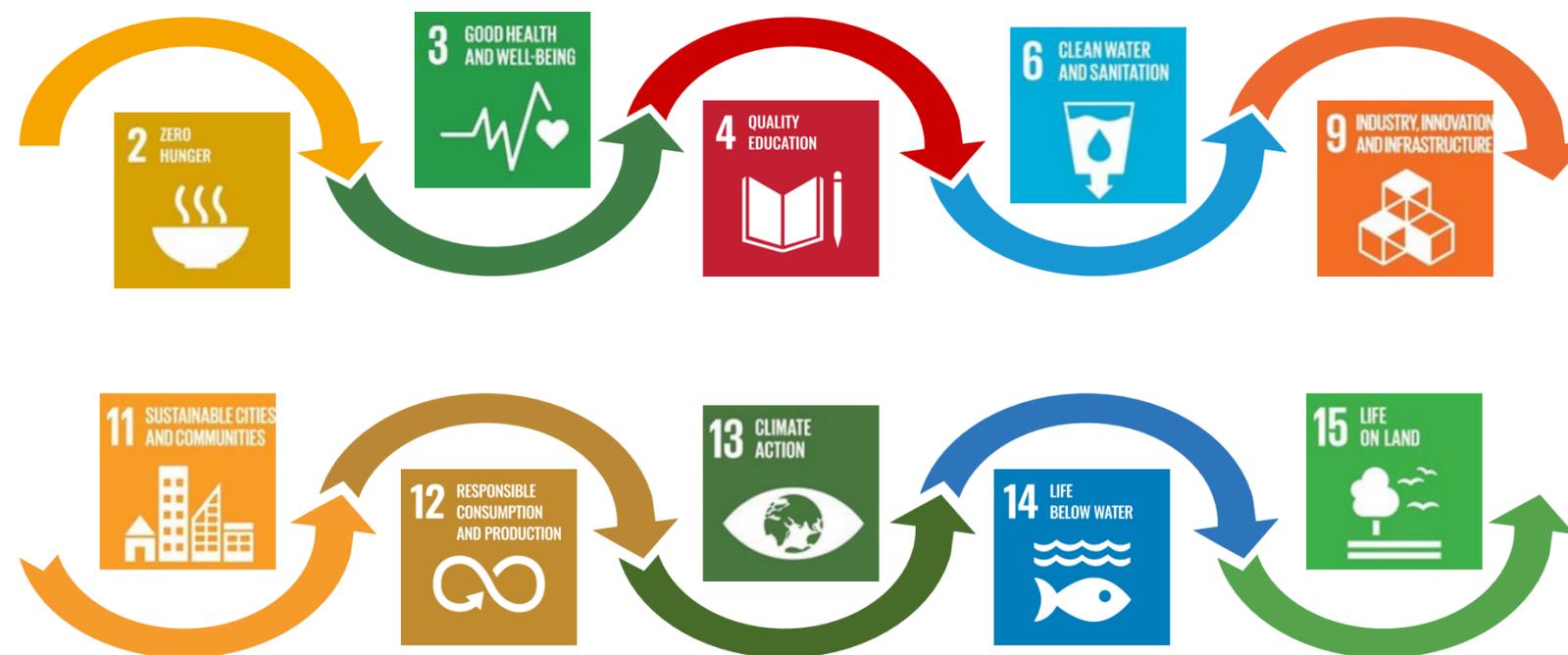
**Libelium** values and encourages the prioritisation of sustainability goals to maximise the impact that IoT can provide for a better world. Especially considering that the **SDGs cover the three dimensions of sustainable development:** economic growth, social inclusion and environmental protection.



## 2. IoT technology for SDGs

A WEF report stated in 2018 that **84% of IoT deployments** were addressing or had the potential to address the SDGs.

Among the 17 Sustainable Development Goals, Libelium has identified the following SDGs as those that can be addressed by the IoT projects developed over the last five years.



## Let's take a look at

How IoT technology is contributing to achieve these goals and how Libelium has done so in real use cases.

# 2 ZERO HUNGER



## IoT TECHNOLOGY for SDGs

### ZERO HUNGER

To end hunger, achieve food security and improved nutrition and promote sustainable agriculture.



“ **2 billion people** in the world do not have regular access to safe, nutritious and sufficient food in 2019.

”

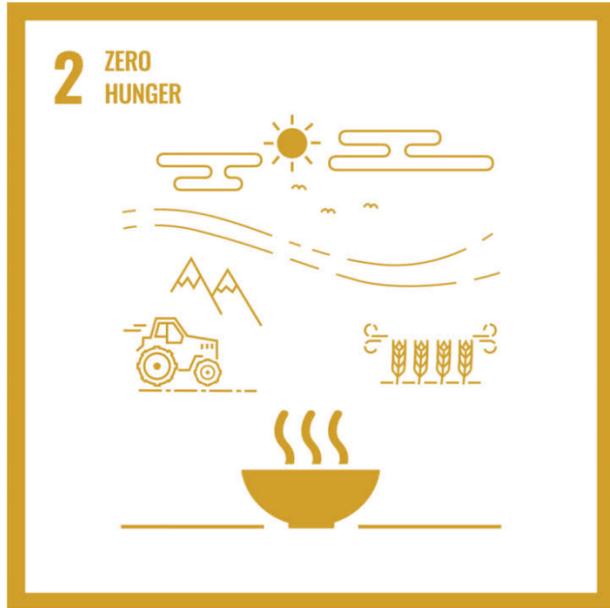




### Why are there so many hungry people?

Along with conflict, climate shocks and the locust crisis, the pandemic poses an additional threat to food systems. Civil insecurity and declining food production have all contributed to food scarcity and high food prices.

Investment in the agriculture sector is critical for reducing hunger and poverty, improving food security, creating employment and building resilience to disasters and shocks.



### How can we achieve zero hunger?

Food security requires a multi-dimensional approach – from social protection to safeguard safe and nutritious food especially for children – to transforming food systems to achieve a more inclusive and sustainable world.

There will need to be investments in rural and urban areas and in social protection so poor people have access to food and can improve their livelihoods



► How the IoT contributed to achieving this goal:

COSTS



Improving agri-food productivity by **reducing production costs and increasing product quality**

IMPACT



**Reducing the impact of agricultural activity** on the consumption of natural resources

PRODUCTION



**Multiplying the production** and income of small producers

DIVERSITY



Maintaining and improving **genetic diversity in food products**



► How the IoT contributed to achieving this goal:

FOOD MARKET



Achieving a stable, sustainable and **accessible food market** for everyone

SUSTAINABILITY



Achieving a **sustainable and resilient** agricultural production

ALLOCATION



**Preventing market distortions** (too much food for too few people and vice versa)



## ► How Libelium has achieved this ...



Avoiding greenhouse **crop losses** in Australia



Increasing **cocoa production** in Indonesia



Improving the **time to market** of greenhouse strawberries



Improving the quality of **vineyards** in various European countries



Encouraging on the efficient use of fertilizers and irrigation in the **cultivation of salad leaves** in Italy



Increasing the productivity of **maize fields** in Italy



# 3 GOOD HEALTH AND WELL-BEING



## IoT TECHNOLOGY for SDGs

### GOOD HEALTH AND WELL-BEING

To ensure healthy lives and promote well-being for all at all ages.



“

**3 billion people** worldwide **lack access** to basic **sanitation**. **Noncommunicable diseases** alone will cost low- and middle-income countries more than **\$7 trillion in the next 15 years.**

”





## GOOD HEALTH AND WELL-BEING

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### 3 GOOD HEALTH AND WELL-BEING



**3 GOOD HEALTH AND WELL-BEING**

**VACCINATE YOUR FAMILY.**

Vaccinations resulted in an 80% drop in measles deaths between 2000 and 2017.

**SUSTAINABLE DEVELOPMENT GOALS**

### How can we achieve zero hunger?

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There will need to be investments in rural and urban areas and in social protection so poor people have access to food and can improve their livelihoods



► How the IoT contributed to achieving this goal:

ACCESS



Providing **online** access to **health care services**

EDUCATION



Educating the population in **health self-management** to streamline primary health care systems

MONITORING



Helping to **monitor** basic health **parameters** for **chronic disease patients**

INFORMATION



Promoting **cloud access** to facilitate the medical information of patients from **any geographical point**



## ► How Libelium has achieved this ...



Improving **medical assistance** for the Sahrawi population in **North Africa**



Providing **safe and clean water** to **indigenous** communities in **Canada**



Preventing **asthma attacks** in children with a sensor network that monitors **air quality conditions** in play areas



# 4 QUALITY EDUCATION



## IoT TECHNOLOGY for SDGs

### QUALITY EDUCATION

Ensure inclusive and quality education for all and promote lifelong learning.



“ About **258 million children** and youth were still out of school in 2018, nearly 1/5 of the global population in that age group. ”



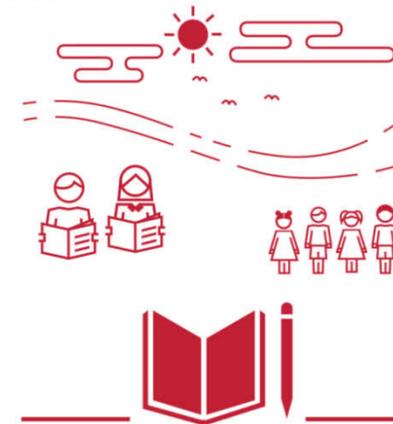


### How much progress have we made so far?

The primary school completion rate reached 84% in 2018, up from 70% in 2000 and under current trends, is expected to reach 89% globally by 2030.

The global adult literacy rate (aged 15 years and older) was 86% in 2018, while the youth literacy rate (15 to 24 years) was 92%.

### 4 QUALITY EDUCATION



### HELP EDUCATE THE CHILDREN IN YOUR COMMUNITY.

617 million children and adolescents lack minimum proficiency in reading and mathematics.



### What challenges remain?

Despite years of steady growth in enrolment rates, non-proficiency rates remain disturbingly high. In 2018, some 773 million adults—two-thirds of whom are women—remained illiterate in terms of reading and writing skills. And the sheer magnitude of school closures due to COVID-19 is likely to set back progress on access to education.



➤ How the IoT contributed to achieving this goal:

EQUALITY



Reducing **inequalities** to foster tolerance and more peaceful societies.

INFORMATION



Sharing **information with the citizens** to facilitate their inclusion.

ACCESS



IoT knowledge **accessible** to everyone.

EDUCATION



**Educating the population** on how technology can make a more sustainable world.



## ➤ How Libelium has achieved this ...



Provide **security**, connectivity and extra services to students in a simple and scalable way



Libelium configures its new learning portfolio by promoting skills with **specialized** courses.



# 6 CLEAN WATER AND SANITATION



## IoT TECHNOLOGY for SDGs

### CLEAN WATER AND SANITATION

To ensure access to safe water sources and sanitation for all.



“ 2.2 billion people around the world still lack safely managed drinking water, including **785 million** without **basic drinking water**. ”





## CLEAN WATER AND SANITATION

### Are water and climate change linked?

Water availability is becoming less predictable in many places. In some regions, droughts are exacerbating water scarcity and thereby negatively impacting people's health and productivity and threatening sustainable development and biodiversity worldwide.

Without better infrastructure and management, millions of people will continue to die every year from water-related diseases such as malaria and diarrhoea, and there will be further losses in biodiversity and ecosystem resilience, undermining prosperity and efforts towards a more sustainable future.



### What are the challenges to lack of access to safe water and sanitation?

In 2017, an estimated 3 billion people worldwide lacked the ability to safely wash their hands at home – one of the cheapest, easiest and most effective ways to prevent the spread of diseases like the coronavirus.

And today, 4.2 billion people are still faced with daily challenges accessing even the most basic of services. Of these, 673 million people practised open defecation.



► **How the IoT contributed to achieving this goal:**

QUALITY



Monitoring **water sanitation systems** for human and animal consumption and for irrigation use

PREVENTION



Preventing **floods in rural and urban areas** due to river overflows

SAVING



Reducing water wastage with intelligent management of supply networks



## ► How Libelium has achieved this ...



Developing an early **flood detection** and warning system in Argentina



Monitoring **water and air quality** in civil works in Oviedo



Establishing an early **warning system** to **prevent floods** and allow disaster management in **Colombian rivers**



Monitoring mooring berths by **controlling sea level** and weather conditions in a touristic **port in Greece**



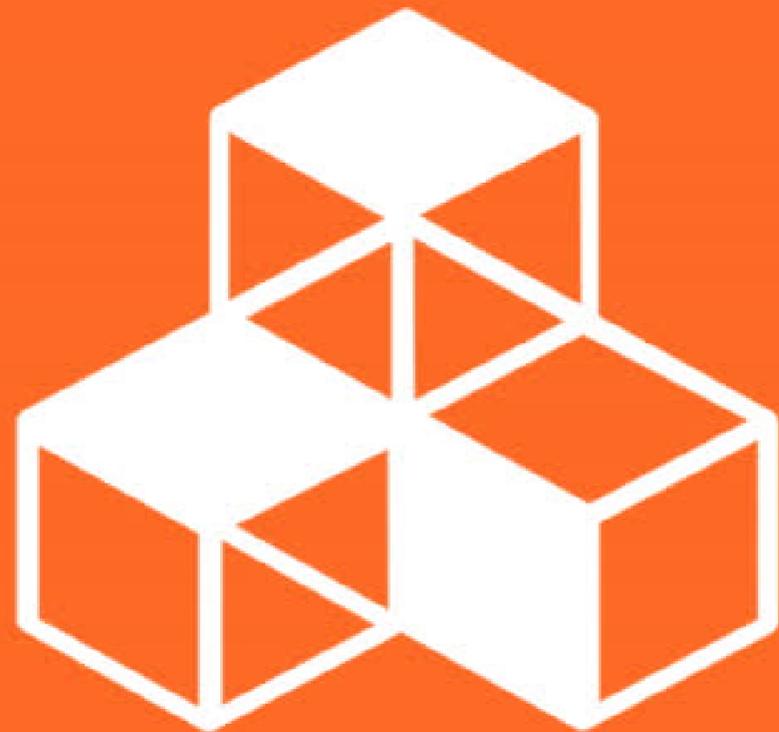
Managing **waste water treatment** in isolated communities



**Drones, sensors and blockchain** for water quality control in the **Volga river** to promote data and transparency trustworthy



# 9 INDUSTRY, INNOVATION AND INFRASTRUCTURE



## IoT TECHNOLOGY for SDGs

### INDUSTRY, INNOVATION AND INFRASTRUCTURE

To build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation



“ **54%** of the global population use the Internet. In the least developed countries **only 19% have online access.** ”



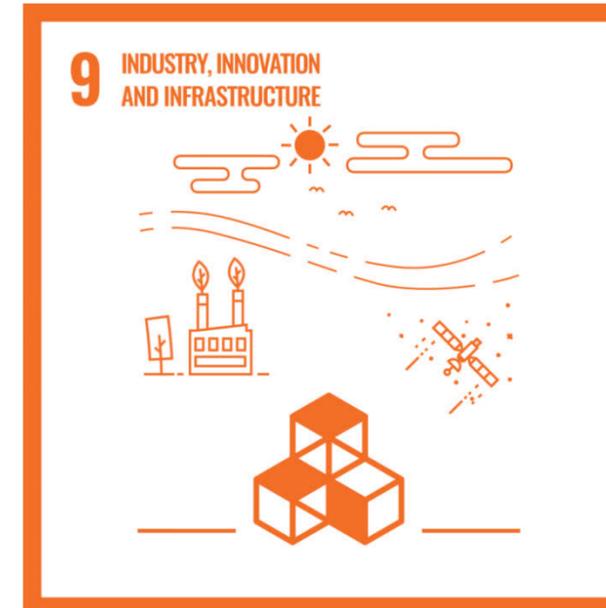


# INDUSTRY, INNOVATION AND INFRASTRUCTURE

## What's the problem?

Even before the outbreak of the COVID-19 pandemic global manufacturing has been steadily declining due to tariffs and trade tensions. The manufacturing decline caused by the pandemic has further caused serious impacts on the global economy.

In addition, the airport industry, also an important driver of economic development, faced the steepest decline in its history in the first five months of 2020, with a 51% drop in airline passengers due to the global lockdowns. Basic infrastructure like roads, information and communication technologies, sanitation, electrical power and water remains scarce in many developing countries.



## Why should I care?

Inclusive and sustainable industrialization, together with innovation and infrastructure, can unleash dynamic and competitive economic forces that generate employment and income.

They play a key role in introducing and promoting new technologies, facilitating international trade and enabling the efficient use of resources.



► How the IoT contributed to achieving this goal:

PREVENTION



Monitoring production processes to **optimize and prevent failures**

DETECTION



Detecting the **structural health** of the facilities

STORAGE



**Controlling** storage spaces

SECURITY



Improving security and **surveillance systems**



► How the IoT contributed to achieving this goal:

TRANSPORT



**Tracing goods** and controlling their condition for animal transport, feeding, frozen, etc

PARKING



Controlling traffic and parking **infrastructures**

TRAFFIC PEOPLE



Managing the flow of people in **places of great affluence** (airports, stations, shopping centres, etc)



## ► How Libelium has achieved this ...



Controlling the **cold chain** in the transport of goods



Enhancing customers' experience in shopping centers



Reducing logistics' **environmental impact** by air quality monitoring in the **Baltic Sea Port** of Gdansk, Poland.



Measure and control the **environmental impact** during the **construction of a highway**.



**Detecting mass movements** in crowded public spaces for evacuation routes



# 11 SUSTAINABLE CITIES AND COMMUNITIES



## IoT TECHNOLOGY for SDGs

### SUSTAINABLE CITIES

To make cities inclusive, safe,  
resilient and sustainable



“ **Half of humanity** – 3.5 billion people – **lives in cities** today and 5 billion people are projected to live in cities by 2030. The world’s cities occupy just **3% of the Earth’s land**, but account for **60–80% of energy consumption and 75% of carbon emissions.** ”





### Why?

Over 90% of COVID-19 cases are occurring in urban areas, with the 1 billion residents of the world's densely populated slums being hit the hardest. Even before the coronavirus, rapid urbanization meant that 4 billion people – over half of the global population – in the world's cities faced worsening air pollution, inadequate infrastructure and services, and unplanned urban sprawl.

Successful examples of containing COVID-19 demonstrate the remarkable resilience and adaptability of urban communities in adjusting to new norms.



### What are some of the most pressing challenges that cities face today?

Inequality and the levels of urban energy consumption and pollution are some of the challenges.

Cities occupy just 3% of the Earth's land, but account for 60-80% of energy consumption and 75% of carbon emissions.

Many cities are also more vulnerable to climate change and natural disasters due to their high concentration of people and location so building urban resilience is crucial to avoid human, social and economic losses.



► **How the IoT contributed to achieving this goal:**

GREEN SPACES



Favouring the creation of spaces that are more **livable, greener, less polluting** and more welcoming to its citizens

TOURISM



Boosting the tourist attraction of visitors to **sustainable destinations**

CITY HALLS



Helping managers of administrations to make better decisions based on the **data** obtained

DATA



Generating new business models for big-data exploitation of **smart cities projects**

RESOURCES



Improving the management of **natural resources** and **public spaces**



► How the IoT contributed to achieving this goal:

POLLUTION



Controlling **environmental pollution**

WASTE



Improving **waste management**

WATER



Monitoring water **sanitation systems**

MOBILITY



Facilitating **intelligent mobility**

ENERGY



Optimising **energy consumption**



## ► How Libelium has achieved this ...



Promoting **environment monitoring** in a smart tourist destination (Getaria)



Enhancing environmental control and **reducing emissions** in Nordic Smart Cities



Saving water with a **smart irrigation system** in Barcelona



Inform visitors in **real-time** about the availability of **parking spaces** around a busy beach.



Controlling **shipping traffic** in the Netherlands canals with wireless sensors



Monitoring **traffic and road conditions** in Málaga





## ► How Libelium has achieved this ...



Monitoring snow and ice in UK winter highways for **smart road** management



Reducing **noise pollution** and controlling **environmental impact** in Athens airport



Detecting **road modality** and occupancy patterns to enhance **urban planning** in Dordrecht



Teaming with Ericsson to develop an **IoT environmental control platform** in the city of Tilburg (NL)



Controlling **environmental impact** on Palma de Mallorca's harbor to become a smart tourist destination



# 12 RESPONSIBLE CONSUMPTION AND PRODUCTION



## IoT TECHNOLOGY for SDGs

### RESPONSIBLE CONSUMPTION & PRODUCTION

To ensure sustainable consumption and production patterns.



“

*Electronic waste grew  
by **38%** but **less than 20%**  
is recycled.*

”





## RESPONSIBLE CONSUMPTION & PRODUCTION

### What needs to change?

There are many aspects of consumption that with simple changes can have a big impact on society as a whole. For example, the global material footprint– an indicator of the pressure put on the environment to support economic growth and to satisfy the material needs of people – grew by 17.4% to 85.9 billion metric tons in 2017 as compared to 2010.

Reducing food loss and waste can contribute to environmental sustainability by lowering production costs and increasing the efficiency of food systems. Currently, we lose 13.8 % after harvesting and during transport, storage and processing alone, amounting to a cost of over \$400 billion a year. We are also polluting water faster than nature can recycle and purify water in rivers and lakes.



### How can I help as a business?

A better understanding of environmental and social impacts of products and services is needed, both of product life cycles and how these are affected by use within lifestyles.

Innovation and design solutions can both enable and inspire individuals to lead more sustainable lifestyles, reducing impacts and improving well-being.

### How can I help as a consumer?

There are two main ways to help: 1. Reducing your waste and 2. Being thoughtful about what you buy and choosing a sustainable option whenever possible.



► How the IoT contributed to achieving this goal:

POLLUTION



Controlling **environmental pollution**

WASTE



Improving **waste management**

ENERGY



Optimising **energy consumption**

RESOURCES



Improving the management of **natural resources** and **public spaces**

TRANSPORT



**Tracing goods** and controlling their condition for animal transport, feeding, frozen, etc



## ► How Libelium has achieved this ...



Understand the dynamics of a city **waste generation** to redesign more **efficient and cost-effective routes**



**Libelium One** has been designed taking into account the **5Rs**: Reduce, Repair, Reuse, Refurbish, Recycle.



Controlling **environmental impact** on Palma de Mallorca's harbor to become a smart tourist destination



Reducing **noise pollution** and controlling **environmental impact** in Athens airport



Monitoring **aquatic parameters** to encourage **salmon spawning** and reduce pollution in Oslo



Reducing logistics' **environmental impact** by air quality monitoring in the **Baltic Sea Port** of Gdansk, Poland



# 13 CLIMATE ACTION



## IoT TECHNOLOGY for SDGs

### CLIMATE ACTION

Taking urgent action to tackle climate change and its impacts.



“

*Given current concentrations and on-going **emissions of greenhouse gases**, it is likely that by the end of this century, the **increase in global temperature** will exceed 1.5°C.*

*Global emissions of carbon dioxide (CO<sub>2</sub>) **have increased by almost 50% since 1990***

”

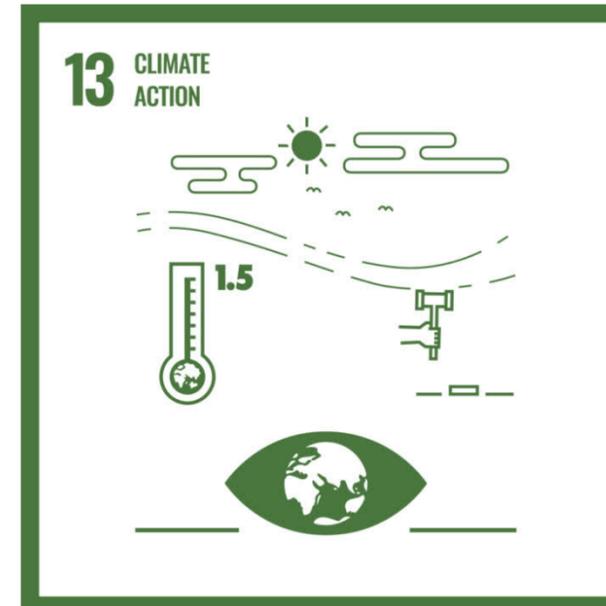




### How are people being affected by climate change?

Climate change is affecting every country in the world. It is disrupting national economies and affecting lives and livelihoods, especially for the most vulnerable.

Weather patterns are changing, sea levels are rising, and weather events are becoming more extreme, affecting more than 39 million people in 2018.



### Can we solve this problem or is it too late to act?

The world must transform its energy, industry, transport, food, agriculture and forestry systems to ensure that we can limit global temperature rise to well below 2°C, maybe even 1.5°C.

However, investment in fossil fuels continues to be higher than in climate activities to the amount of \$781 billion in 2016. To achieve a low-carbon, climate-resilient transition, a much greater scale of annual investment is required.



► How the IoT contributed to achieving this goal:

RESOURCES



Managing **natural resources** to get the most out of the **least environmental impact**

POLLUTION



Controlling **environmental pollution**

ENVIRONMENT



Increasing **plant production** for consumption and **environmental care**

WATER



Monitoring water **sanitation systems**



## ➤ How Libelium has achieved this ...



Protect the **air quality** in a very crowded residential, tourism, cultural, and service areas



Business Intelligence and Blockchain technology **reduces methane emissions** in a cattle farms



Monitoring **rain forests** for climate change control in Peru



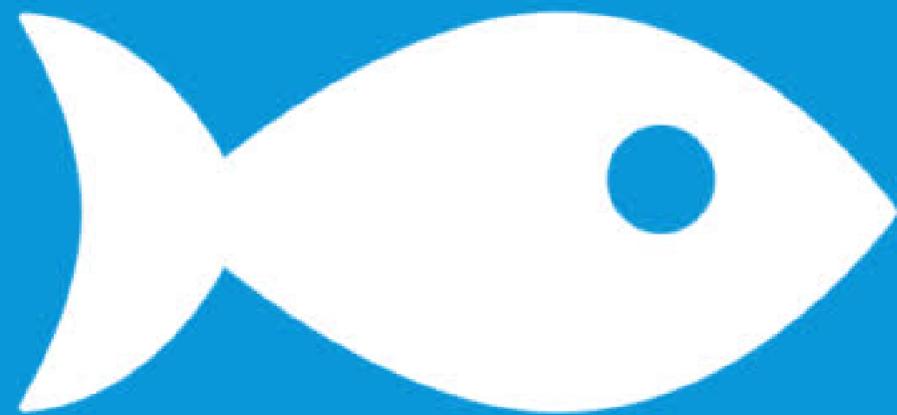
IoT technology to track, forecast and **reduce pollution** in European cities



Enhancing environmental control and **reducing emissions** in Nordic Smart Cities



# 14 LIFE BELOW WATER



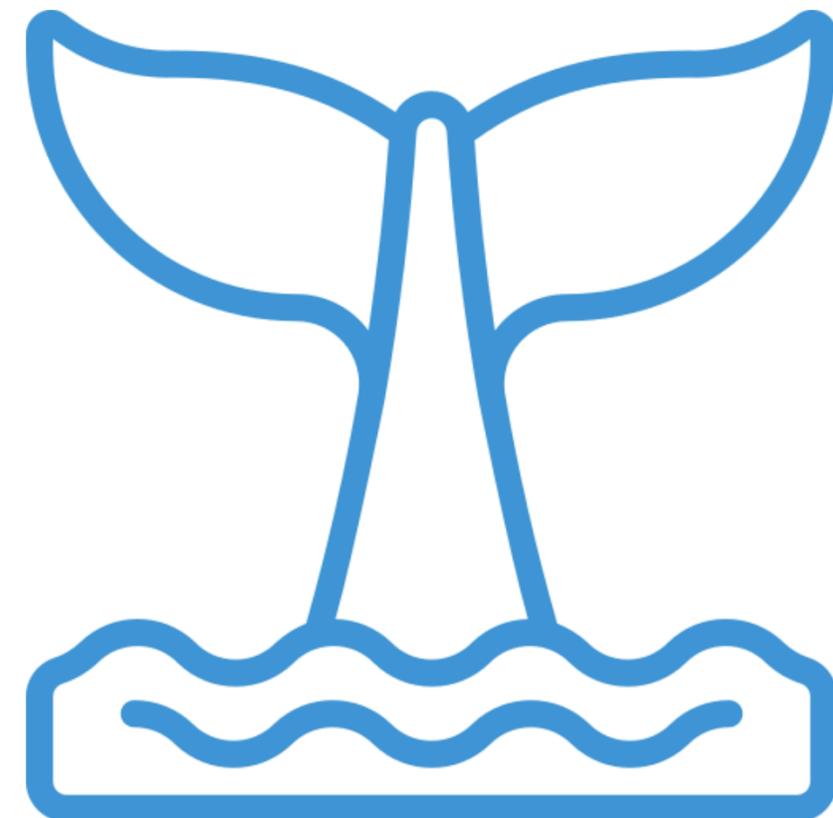
## IoT TECHNOLOGY for SDGs

### LIFE BELOW WATER

To conserve and sustainably use the world's ocean, seas and marine resources.



“ Over **3 billion people** depend on marine and coastal biodiversity for their livelihood. Globally, the **market value** of marine and coastal resources and industries is estimated at **\$3 trillion per year** or about 5% of global GDP.

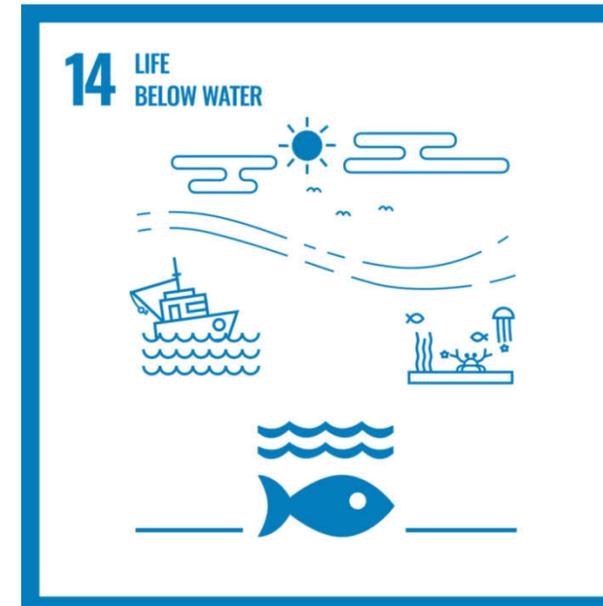




### So what's the problem?

The ocean absorbs around 23% of annual CO2 emissions generated by human activity and helps mitigate the impacts of climate change. The ocean has also absorbed more than 90% of the excess heat in the climate system. Ocean heat is at record levels, causing wide-spread marine heatwaves, threatening its rich ecosystems and killing coral reefs around the world.

Every year, an estimated 5 to 12 million metric tonnes of plastic enters the ocean, costing roughly \$13 billion per year – including clean-up costs and financial losses in fisheries and other industries. About 89% of plastic litter found on the ocean floor are single-use items like plastic bags.



### How is the ocean connected to our health?

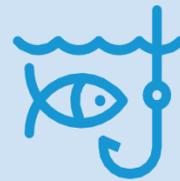
The health of the ocean is intimately tied to our health. According to UNESCO, the ocean can be an ally against COVID-19 – bacteria found in the depths of the ocean are used to carry out rapid testing to detect the presence of COVID-19. And the diversity of species found in the ocean offers great promise for pharmaceuticals.

Furthermore, marine fisheries provide 57 million jobs globally and provide the primary source of protein to over 50% of the population in least developed countries.



► How the IoT contributed to achieving this goal:

CONDITIONS



Improving **water quality** in **fish farming** activities for **food consumption**

PROTECTION



Monitoring water quality to preserve **the habitat of** marine species

CONSERVATION



Monitoring **toxic spills** into rivers and seas for **species conservation**



## ► How Libelium has achieved this ...



Smart Water solutions to get the best quality **mussels and salmon in New Zealand**



Protecting and conserving the **Beluga whale habitat in Alaska**



Controlling **fish farm water quality** with smart sensors in **Iran**



Monitoring diverse **environmental conditions** of the largest **fluvial Aquarium** in Europe.



# 15 LIFE ON LAND



## IoT TECHNOLOGY for SDGs

### LIFE ON LAND

To sustainably manage forests, combat desertification, halt and reverse land degradation, and halt biodiversity loss.



“

***Two billion hectares** of land on Earth are degraded, affecting some **3.2 billion** people, driving species to extinction and intensifying climate change.*

”

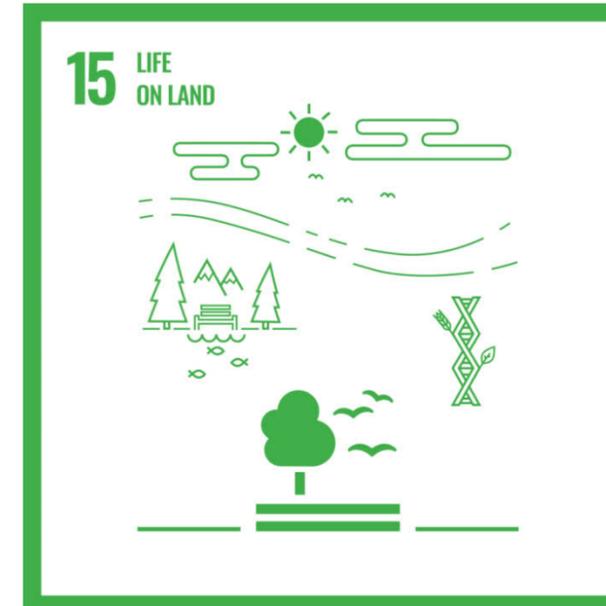




### What does loss of forests mean?

Lost forests mean the disappearance of livelihoods in rural communities, increased carbon emissions, diminished biodiversity and the degradation of land. While forest loss remains high, 2020 data show that the proportion of forests in protected areas and under long-term management plans increased or remained stable at the global level and in most regions of the world.

A recent UN report on biodiversity found that around 1 million animal and plant species are now threatened with extinction, many within decades, more than ever before in human history.



**15** LIFE ON LAND

**PLANT A TREE AND HELP PROTECT THE ENVIRONMENT.**

Forests are home to more than 80% of all terrestrial species of animals, plants and insects.

 SUSTAINABLE DEVELOPMENT GOALS

### How does it affect our health?

Increased demand for animal protein, a rise in intense and unsustainable farming, the increased use and exploitation of wildlife, and the climate crisis are all driving the increased emergence of zoonotic diseases – diseases transmitted from wildlife to people – like COVID-19.

Every year, some two million people, mostly in low- and middle-income countries, die from neglected zoonotic diseases. In the last two decades alone, zoonotic diseases have caused economic losses of more than \$100 billion, not including the cost of the COVID-19 pandemic, which is expected to reach \$9 trillion over the next few years.



➤ **How the IoT contributed to achieving this goal:**

DETECTION



Applying early **fire detection systems**

NATURAL



Developing systems for the early **detection of natural disasters** (eruptions, floods, etc.)



## ► How Libelium has achieved this ...



Establishing an early **warning system** to **prevent floods** and allow disaster management in **Colombian rivers**



Preventing **natural disasters**: volcano eruptions, floods and extreme weather conditions



Preventing **forest fires** in Galicia





Now, we are in the countdown to achieve these goals for 2030 and IoT is a key tool to accomplish it.

**IoT** allows the connection between the physical and digital world. We can take action by measuring and controlling any environmental parameter and sending the information to the Internet.

**That's the first step towards change. Let's go beyond the challenge!**



## **Libelium**

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