# The Green Book of IoT 2023 Libelium's annual report





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## "Data is a language that brings us all together"

Alicia Asín, CEO of Libelium, reviews the year 2023 from a corporate and technological point of view, and advances the plans and forecasts for 2024.

Earlier this year you published a LinkedIn post predicting things to come in the IoT sector in 2023. You said the technology would mature, and standards and regulations were on the way. "With recession around the corner, only the numbers will support businesses." Do you think these predictions have come true? I think so, especially those linked mostly to the economic side. In terms of the technology maturing, we are seeing that IoT has been around for two decades with tried and tested projects that mean the technology has matured. But we have also noticed that customers are also maturing, and those pilots, those proofs of concept that were carried out over the last few years are now scaling **(** Economic uncertainty means that investors are not in such good spirits and are becoming more demanding, more vocal".

up. In Libelium's case, we are seeing that our customers are increasing their average ticket, they are scaling up the projects they had with us and are moving to mass production deployments. On the other hand, I also talked about it being a year in which only the numbers would support the performance of companies and that is what is happening.

Many consolidation moves are taking place in the fragmented market of IoT. Due to economic uncertainty, investors are feeling less optimistic, and are becoming more demanding and rigorous. This leads them to focus on more experienced companies and support them in acquiring companies with smaller market reach, but with higher chances of innovation to reduce risks. This is something we have seen and will continue to see in the coming year.

#### Indeed, Libelium has been part of this consolidation process with the acquisition of Hopu in 2022. How do you assess the operation one year on?

That's right. I am extremely positive about what we have achieved with this integration. In addition to the typical optimisations and benefits of an acquisition that appear in all the company books, in our case we have managed to increase the knowledge that Libelium already had with data intelligence services, thus acquiring the capacity to deploy turnkey projects. Of all the lessons I have learned from this acquisition, the main one is renewing the visions within the company itself. Instead of always having an inbred vision cultivated over many years, we now find that this way of doing things can be challenged or confirmed by people who come in with a fresh point of view and no other prejudices.

### What is your assessment of 2023?

2023 has been a very positive year for Libelium. We met our strategic objectives set out in 2021, with the entry of Axon Partners. We then began a new phase in which we wanted to prioritise growth and lead a build- up process by acquiring new companies.

In 2022 we succeeded in acquiring the first company, and in 2023 we have not only completed this integration, but we have already seen the benefits in the income statement. We have doubled our turnover compared to the previous year. We have also managed to ensure that the message we are giving to the market about the strength and maturity of Libelium is opening the door to much larger projects that we didn't have the opportunity to do before.



#### In the last two years, 26% of IoT platform companies have ceased operations. It felt like just making it to 2023 without falling is an achievement in itself. How has Libelium coped with this critical year?

We have faced a lot of challenges. The first of these has been the cultural integration of another company, such as Hopu, into our organisation. The tasks are simple to integrate, but getting everyone on the same page is achieved with projects that are exciting, motivating and, above all, credible for all those who work in the company.

And we are getting that motivation through these great projects that are pushing us to give a little more of ourselves in order to reach our objectives and results.

We have managed to be one of the SMEs in the FutureFastForward consortium, led by the Volkswagen Group, with a stake of around 2 million euros in the project, carrying out a development that would have been unthinkable a couple of years ago, both because of the type of industry we are targeting and the technological challenges we are solving. We are working on projects where we deploy the turnkey solution. This not only means that we have to excel in the products we develop, but also in the associated services we are providing and in operations, something that is critical especially this year with the whole context of the component crisis we have experienced.

We have to be excellent on both an engineering level and an operational level. Finally, we have been able to transfer this new final solution model to large projects that we are developing in different countries. This year, for example, we are working on a lot of projects in Saudi Arabia, participating in megaprojects with much higher standards than we were able to cope with in the past. We have also expanded our international presence with the opening of an office in Germany. In short, all of this entails a series of

learning experiences that involve all the people who are part of Libelium. If we were not able to give a little bit more of ourselves every day, this would not be possible.

🚜 IOT ANALYTICS

# Number of publicly known "IoT Platforms" (2015-2021) Number of publicly known "IoT Platforms" (IoT Analytics Research) Selection of 40+ IoT Platform providers



**((** At Libelium we advocate datacracy, which is giving power to the data, letting the data speak".

As a speaker you preach about how smart technology can help us build a more sustainable planet. Do you consider yourself an activist CEO?

Rather than an activist CEO, I consider myself a rationalist CEO. We work with data and we think it can shed a lot of light on how climate change is being tackled. We live in a time when we are facing real and urgent challenges and yet we still encounter resistance from a society that still questions whether climate change is a reality, whether global warming exists or whether it is our responsibility. Because of the way I am, and because of the role Libelium plays in society, our role is to shed light on this greenwashing movement that many people are jumping on to claim to be environmentally friendly, but don't really explain how they are doing it. At Libelium we advocate datacracy, which is giving power to the data, letting the data speak. It should be a given but sadly it is not. There are many decisions related to environmental impact made on the basis of ideologies and economic interests that should be purely technical and could be explained to the public with data and information on how they are impacting measures to combat climate change. We could be much more rational. That's why we advocate datacracy to raise awareness.

#### Of course, data is the new oil...

Amid the fight against climate change we are currently facing, I am not entirely convinced by the association of data with a fossil fuel.

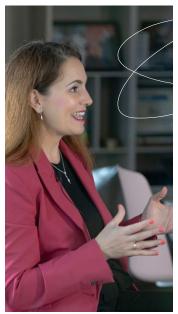


I prefer to say that data is a universal language that puts us all on the same page. When data is of high quality, accuracy, and contextualization, it can be transformed into information, making it a language. It seems that citizens and consumers are increasingly demanding that cities and companies produce in a way that is sustainable for the planet. How can Spanish companies incorporate sustainability in their day-to-day business?

Companies need to consider our Mission, Vision and Values: what impact are we going to make, what are we here for? In addition to bringing wealth to society and the country, at Libelium we have given great importance (and our employees value it highly) to ensuring all the projects have a very high sustainability component. Either because we help to make more efficient use of resources, or because we help to rationalise decision-making.

**C** The latest product we developed, One, was designed not only by listening to our customers, but also with the parameters in mind to do it in the most energy–efficient way".

We strongly believe that technology is here to help us and it has to be seen in a positive light. But we must also be self-critical and not fall into the selfcondescension of solving problems with technology while the mere creation of technology is generating other problems. The latest product we developed, One, was designed not only by listening to our customers, but also with the parameters in mind to do it in the most energyefficient way (with a solar panel to avoid using extra energy), designed with durability over time in mind (One has a two points higher repairability index than smartphones).



Through these small actions, we are not only a company that creates a positive impact with the development of our products, but we also do not create any negative impacts when developing them.

Compared to large corporations that have specific departments to work on sustainability, how can SMEs, which ultimately make up 90% of the business industry in Spain, do it?

I believe that sustainability can be a lot simpler than it is said. In the end it is about trying to minimise our impact and knowing how much we are minimising it. So we keep coming back to the idea of how IoT and the power of data can help

**C** Today we live in a reality where on the one hand, ESG and sustainability terms are practically omnipresent, but on the other hand, it is very difficult for SMEs to make these terms tangible and really grasp them".

companies measure their processes and thus know what they are implementing, whether the decisions they are making are actually effective or not. Unfortunately, today we live in a reality where on the one hand, ESG and sustainability terms are practically omnipresent, but on the other hand, it is very difficult for SMEs to make these terms tangible and really grasp them. In this sense, we are working on a tool at Libelium that will allow us to defend and guarantee the integrity of this data. We want to democratise the presentation of ESG indicators in the simplest possible way. This is iris360, a very exciting new project with which anyone can start as small as they want and measure from the first minute how much real impact they are having.







**(** 70% of the land is located in developing countries in areas that are very difficult to access and where it is not cost-effective for an insurer to send an expert to carry out the necessary checks".

It is said that the ecological transition must be fair, quick and cheap, but it seems that it is impossible to meet all three requirements. If it is fair and quick, it is not cheap; if it is cheap and quick, it is not fair, an so on. How is it possible to square the circle? 70% of all arable land in the world lacks crop insurance. This is not by chance. It turns out that 70% of the land is located in developing countries in areas that are very difficult to access and where it is not cost-effective for an insurer to send an expert to carry out the necessary checks. If we implement technology and aive insurers access to the data generated during the process of checking events that require payment of a premium, the process becomes automatic and much cheaper than having to send a person. This is another example where we are enabling technology to improve the quality of business in developing countries. These businesses are related to sustainability and their improvement leads to a much fairer world.

On a personal note, in 2023 you have been recognised by the Government of Aragon with the Medal of Professional Merit, in recognition of your entire career, from the founding of Libelium as a spin-off from the University of Zaragoza until now, when it is on the verge of being listed on the stock exchange. It makes you dizzy just thinking about it.

When I look back over the long term, it is very dizzying to think that a project that came out of a final project at university has gone through different stages, such as obtaining funding, acquiring a company and now considering going public. These 17 years have been a constant succession of incremental improvements and changes, each day a little bit more, and I have had to reinvent myself as CEO and learn as the company has grown. In the early years, it was a survival phase and then I had to complement my engineering education with financial knowledge to meet the daily challenges. What I value most about

Libelium is that, without changing companies, I have had a very enriching professional career without leaving my city of birth. The fact of having incorporated corporate development **((** The fact that I have incorporated corporate development activities and now have the process of going public in my hands is something I am very grateful for".

activities and now have the process of going public in my hands is something I am very grateful for, as the company itself allows me to grow and constantly pushes me forward. It is a very positive gift that I take with me.

#### From what you say, 2024 looks to be an exciting year. What are your goals for Libelium?

We are currently executing a strategic plan that started in 2021 and ultimately aims to list the company on the alternative market. This is a very ambitious goal, but so far we can say that we are also meeting other ambitious targets such as the integration of another company and turnover figures. In 2024, we are looking to further strengthen our growth and prepare for an IPO process in late 2024 or early 2025.



DITORIAL



### A trillion euros for a more sustainable future

AUTHOR: Antonio J. Jara, CSO at Libelium and professor for the Govtech Innovation master's degree at IE Business School.

The European Union is committed to improving sustainability with economy, and improving economy with sustainability.

AT A TIME WHEN the European Union is putting a trillion dollars on the table for projects with a significant sustainability component, the magnitude and complexity of the moment we are in is evident.

The signing of the European Green Deal at the end of 2019 marked a turning point in EU economic policy. With the target of achieving a climateneutral EU by 2050 and to reduce the temperature by 1.5°C, any economic growth was linked to sustainability. The Multiannual Financial Framework 2021-2027 has earmarked EUR 1,074.3 billion to build a smarter, more connected, social and sustainable Europe. This unprecedented investment aims to drive necessary reforms in Member States to achieve a sustainable and resilient postpandemic recovery, while promoting a greener and more equitable economic model.

But this money, unsurprisingly, also comes with more obligations than ever. The more ambitious a company's environmental, social and governance (ESG) targets are, the better positioned it will be to obtain support and subsidies. However, to avoid the temptation of greenwashing, the EU makes 60% of support conditional on meeting the established targets. If a company fails to meet these targets, that 60% in support will become a debt owed to the EU. When more than 1 trillion euros of EU debt and the future of the EU is at stake, sustainability reports from companies are as

important as, if not more important than economic reports when it comes to defining profitability criteria.

**G** RegTech makes it possible to assess and measure the environmental, social and economic effects of a project, programme or policy in relation to sustainability".

## Entering the era of compliance

The term RegTech comes from the combination of 'Regulatory Technology' and refers to the use of smart technology to facilitate and improve regulatory compliance in different business sectors. It is technology applied to achieving the 2030 Agenda.

We are entering the era of compliance. It is in the interest of both the European Union and public and private companies to monitor their targets in detail in an accurate, consistent and automated way. Companies like Libelium have to move from collecting data to exploiting it so that the data speaks and reports for itself. To this end, we must make an effort to normalise the data and standardise it to be able to mix such disparate concepts as, for example, a company's cash flow and its carbon footprint. Only in this way we can help companies to avoid having to make blind decisions that compromise not only the budget but also the health of citizens. ReqTech makes it possible to assess and measure the environmental, social and economic effects of a project. programme or policy in relation to sustainability. This way is possible to comprehensively identify and analyse both the positive and negative impacts that actions may have on the environment, society and the economy. This type of assessment takes into account the perspectives of various stakeholders, such as local communities, environmental groups, businesses and other relevant stakeholders. Integrating these different views requires the implementation of algorithmic models based on information from dataspaces. Algorithmic models are applied to digital twins to find out what impact an action will have and match it with its cost. This is the only way to achieve the desired balance between citizen welfare and the economy.

We can, for example, simulate the felling of trees in a certain area using a digital twin to see what would happen to both the economic impact (cost savings, jobs destroyed, etc.) and the welfare impact (increase in temperature, noise, reduction of traffic) in both the short and long term. The Sustainable Impact Assessment seeks to ensure more equitable and transparent decisionmaking that promotes sustainable development and citizen welfare in the long term. This is the only way to achieve the EU's sustainability targets.







## A sustainable future enabled by IoT is the only option

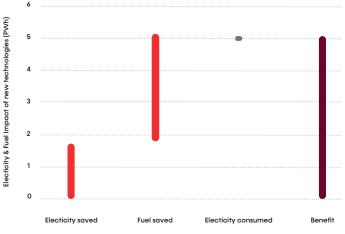
AUTHOR: Jim Morrish, Founder Partner of Transforma Insights

The Internet of Things (IoT) and environmental sustainability are two of the defining themes of our times. Fortunately, both for the planet and for enterprises of all kinds, the synergy between these two concepts is very strong.

MOVING GOODS, vehicles and people around and heating buildings up and cooling them down all consume significant amounts of energy with an associated sustainability footprint and financial cost for resources consumed. Accordingly, technology-based solutions that increase enterprise efficiency will often reduce both costs and the consumption of resources such as electricity, (hydrocarbon) fuel and water. Closely monitoring all kinds of assets (from wind turbines to cows and more) to ensure efficient operations also typically both reduces costs and the levels of resources consumed and so the associated sustainability footprint. Meanwhile, evolving consumer preferences with a premium placed on 'sustainably sourced' goods and services and emerging requirements for organisations of all kinds ARTICLE

to monitor and report their sustainability footprint are driving the adoption of more sustainable business practices. With these developments sustainability is becoming both a competitive differentiator in many markets, and also a critical consideration for day-to-day business operations. A comprehensive analysis of all IoT applications based on Transforma Insight's extremely granular IoT forecasts suggests that the net impact of IoT on electricity and fuel consumption will be a reduction of about 5 PWh by 2030, as illustrated in figure below.





Source: Transforma Insights, 2021

The underlying dynamics are slightly different in Consumer and Enterprise markets. In the former, IoT and associated technologies are often deployed to enhance the functionality of a device (such as a connected television), which can often have a negative net sustainability impact.

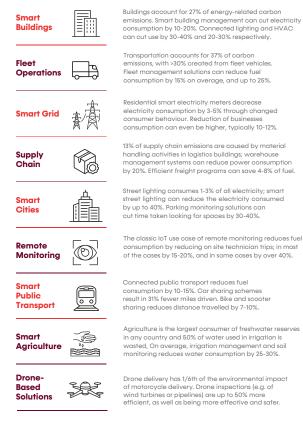
But in an enterprise context, the impact

of IoT is much more uniformly beneficial in terms of efficiency, cost and sustainability impact. Additionally, enterprise deployments of IoT solutions often have the effect of shifting energy consumption away from (hydrocarbon) fuel by substituting electricity consumption, which itself tends to be beneficial from a sustainability perspective since it is considerably easier to generate electricity from renewable sources than it is to manufacture sustainable fuel substitutes.

An example might be a CCTV security solution enabled by IoT connectivity and

Artificial Intelligence-based image recognition. Clearly, such a solution 'costs' in terms of electricity consumption, but it would also typically unlock considerable savings in fuel consumption due to the reduced need for security personnel to monitor the same locations.

#### The most impactful IoT applications



**G** The benefits of many IoT solutions are not only limited to their sustainability impact. For instance, Smart Building solutions can improve the quality of life of inhabitants".

Of the solutions outlined above, the most impactful in terms of fuel consumption are Fleet Operations, Smart Grid, Smart Cities, Smart Public Transport, and Drone-based solutions. The most impactful in terms of electricity consumption are Smart Buildings and Smart Grid. Meanwhile Agriculture and Smart Grid solutions stand out in terms of their impact to water consumption.

The benefits of many IoT solutions are not only limited to their sustainability impact. For instance, Smart Building solutions can improve the quality of life of inhabitants, advanced Supply Chain solutions can be used to support the ethical sourcing of raw materials, and Smart Cities and Smart Public Transport solutions can enhance the day-to-day life and well-being of urban residents and commuters.

#### Sustainability isn't a choice

Sustainability has become a key goal for many enterprises and there is an increasing pressure to measure the environmental impact of goods and services along their complete value chains.

Meanwhile customers have become more demanding and selective in choosing vendors that have adopted enhanced sustainably practices and that provide more transparency with respect to their sustainability footprint. Conversely, enhancing sustainability performance can drive customer loyalty. Given this context, the deployment of digital technologies presents immense opportunities to increase efficiency, reduce sustainability footprints and drive customer loyalty and so business performance.

And, of course, there is no 'Planet B'!



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### The importance of IoT ambient air quality monitoring solutions for businesses

AUTHOR: Sotirios Papathanasiou, Air quality expert, author of the blog "See the air"

The Internet of Things (IoT) has revolutionized various sectors, including environmental monitoring. One of the key areas where IoT has made significant strides is Ambient Air Quality Monitoring.

IN RECENT YEARS, businesses have started to realize the value of IoT-based air quality monitoring systems, not just for compliance with environmental regulations, but also for contributing to public health and safety.

IoT-based air quality monitoring solutions represent a significant leap from traditional monitoring methods. Traditional air quality monitoring systems, which often rely on manual sampling and laboratory analysis, can be time-consuming, costly, and provide less real-time data. In contrast, IoT-based monitoring systems are equipped with various sensors to measure pollutants such as particulate matter (UFP, PM2.5 and PMI0), carbon monoxide (CO), sulfur dioxide (SO2), nitrogen dioxide (NO2), and ozone (O3) in real-time. These systems use internet connectivity to transmit data to a secure cloud-based platform, where it can be accessed and analyzed remotely.

This real-time data collection and analysis provide several benefits:

ARTICLE

#### Efficiency

IoT systems provide continuous, realtime monitoring, enabling businesses to access data immediately, leading to quicker decision-making and faster response times to potential issues.

#### Versatility

The ability to monitor a wide range of pollutants provides businesses with a comprehensive understanding of their environmental impact.

#### **Cost-effective**

Since IoT systems automate the monitoring process, it reduces the need for manual labor, leading to significant cost savings over time.

#### **Predictive Analysis**

With advanced analytics capabilities, IoT systems can predict future air quality conditions based on historical and current data. This helps businesses in planning and mitigating potential problems especially in mining and similar industries.

#### **Benefits to the Public Sector**

IoT Ambient Air Quality Monitoring Solutions are not just beneficial to businesses. They also offer numerous advantages to the public sector:

#### 1. Public Health

Real-time air quality data can be used to issue warnings to the public when poor air quality levels are detected, reducing exposure and associated health risks.

#### 2. Regulatory Compliance

IoT systems can help government agencies monitor and enforce environmental regulations more effectively. They can identify areas of high pollution and track businesses' compliance with emission standards.

#### 3. Urban Planning

Air quality data can guide urban planning decisions, helping to create healthier cities. This could include decisions about transportation systems, zoning laws, and green spaces.

#### 4. Climate Change Mitigation

Consistent, reliable data about air quality can support policy decisions related to climate change mitigation and adaptation.

#### 5. Transparency

By making air quality data public, governments can increase transparency and engage citizens in environmental protection efforts.

This could encourage businesses to be more environmentally responsible.

#### Not all sensor technologies and IoT communications protocols are the same

The use of high-quality sensors from reputable manufacturers that are certified and tested for accuracy is very important in order to have data confidence. Properly calibrate sensors before deployment and the performance of periodic recalibration and maintenance are some of the must-have requirements.

As far as the IoT communications protocols, businesses need secure and reliable

networks that will not compromise the privacy of the network and the possible corruption of the data. To mitigate these risks, organizations and manufacturers should pay adequate attention to Industrial IoT and IoT security. Organizations'

Organizations

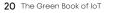
security teams should ensure that proper security mechanisms are in place when using protocols. It is also important for organizations to conduct risk assessments and follow best practices to secure machine- to-machine (M2M) communication.

The importance of IoT Ambient Air Quality Monitoring Solutions for businesses cannot be overstated. They provide a more efficient, cost-effective, and versatile way

to monitor air quality, leading to quicker response times, better decision-making, and significant cost savings. Moreover, these monitoring systems have farreaching benefits for the public sector, contributing to public health, regulatory compliance, urban planning, climate change mitigation, and data democratization.

As technology continues to evolve, it is likely that we will see an even more profound impact in the future.

SMART



# 2023, walking on an already paving way

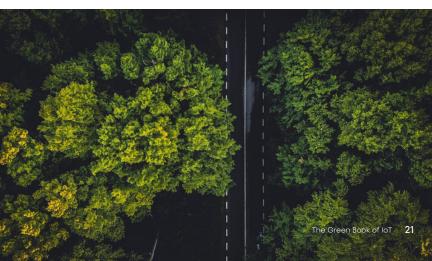
Libelium, aware of its role in sustainability, powers cities and companies with IoT for optimal decisions, moving towards a greener and more resilient future.

At Libelium we are aware of the enormous role that companies like ours have in redefining processes for a more sustainable and livable future. Our solutions help cities, companies and industry make the best decisions based on the most accurate data.

The first IoT projects in which Libelium participated carried the mark of sustainability: detecting the risk of fires, preventing floods or monitoring, collecting and analyzing the activity within bee colonies. We carry the DNA of sustainability from our origins and we are convinced that the IoT is the perfect partner to measure, analyze and optimize key processes towards a greener planet.

Therefore, when it is now urgent to adopt measures as a company to make ourselves more resilient, we are caught with many of our homework already done.

We walk a path that we have been paving since we were born.



## **Priority SDGs**

There are 17 SDGs and 169 targets in total. While they are all important and interrelated, Libelium has focused on a few of them to address our efforts as a company.



#### No. 03 – Good health and well-being

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



*No. 08* – Decent work and economic growth

To promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all.



#### No. 09 - Industry, innovation and infrastructure

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



#### No. 11 — Sustainable cities and communities

To make cities and human settlements inclusive, safe, resilient and sustainable.



#### No. 13 - Climate action

To take urgent action to combat climate change and its impacts.









### Positive Technology

We believe that technology can help us build more sustainable cities and companies for a fairer world, and that is why we launched the Positive Technology campaign, with which we asked friends in the sector to give their vision on everything that is technology brings us.

**66** Technology can make a much fairer society with much more motivating jobs.

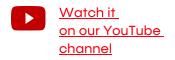
> María López CEO of Bitbrain

Technology allows us to better understand our surroundings.

**99** 

Sotirios Papathanasiou PM of Particle Plus





### Positive Technology



People are the true catalyst of digital transformation through the lever of technology.

> Ignacio Llopis Managing Director of IoTsens



#### We need diverse teams to create a fairer world through technology.

Cristina Aranda Co-founder of Big Onion







Watch it on our YouTube channel

The future is much more positive than what we have already experienced to date.

> Dimitris Bountolos CIIO of Ferrovial

ECOSYSTEM

## News

#### **Future: Fast Forward**

Libelium is part of Future: Fast Forward, led by the Volkswagen Group, the largest business group in the history of the automotive sector in Spain to improve the safety and sustainability of electric mobility. Libelium will receive near of 1 million euros, the 14th highest investment of the group.



## Future Unicorn Award Nominee

#### Libelium

Spain

LIBELIUM is a company born from a university project in Zaragoza in 2006. Our smart solutions are focused on three verticals: Sustainability, to help companies become more sustainable, Smart Cities & Infrastructure, to develop more

#### **Future Unicorn Award**

Libelium in the top 10 Future Unicorn according to DIGITALEUROPE. The association recognized Libelium as one of the most promising European technology scale-ups. Libelium was, with Red Points, the only Spanish company nominee.

#### **World Smart City Award**

We were finalists of the World Smart City Awards, delivered by Smart City Expo World Congress. Mixing IoT and Digital Twin tech, our project for preserving UNESCO's Le strade Nuove e il Sistema dei Palazzi dei Rolli in Genoa, Italy inspired the jury.



ECOSYSTEM

### News

#### Libelium Lab's release

Libelium has taken a significant step in this direction by introducing Libelium Lab, a gas sensor calibration laboratory accredited by ENAC, national accreditation No 285/LC10.250 according to UNE-EN ISO/IEC 17025 regulations.





#### With Telefonica for REE

Libelium joins forces with Telefónica for a pioneering project in conjunction with Red Eléctrica. The key to this project lies in the use of IoT weather stations for the effective management of Red Eléctrica Española's critical infrastructure.

#### Yes to Kira Ventures

The leading energy transition firm, Kira Ventures, has investing in Libelium, the technology company specialized in intelligent solutions for smart cities, agriculture, and sustainability.



## Environmental monitoring in construction

The primary goal of environmental monitoring in construction is to ensure safe and healthy conditions for workers and residents at the worksites and surroundings, while also having real-time data to manage complaints and support internal compliance.

## Building more sustainable

Noise, dust and vibration monitoring is crucial for addressing issues related to the construction industry. In the past, measuring these parameters was done manually and infrequently, if at all.

- New Zealand
- Dust, noise, vibration



# IoT solution for optimal wine production

#### **Smart wineyard**

The installation of a Smart Agriculture solution at Bodegas Langa represents a great opportunity to take another step towards excellence combining tradition and technology to face the climate change.

#### 📀 Spain

Soil moisture, leaf moisture, air humidity and temperature, athmospheric pressure, wind direction and speed, rain gauge Climate change tests the knowledge acquired over years of vineyard experience and tradition. What was once certain (harvesting took place in September and flowering occurred in April) is now at the mercy of rising temperatures.



# Smart lampposts to measure air quality and noise

By using lampposts as nodes, it is possible to protect the urban landscape (by not adding more visual noise to the existing one in the city) and to take advantage of the potential of these "smart poles" to which other technologies such as security cameras, sensors, etc. can be integrated.

## Air Quality and noise

Libelium's technology has been integrated into 20 Signify lampposts that maps the city's air quality and noise levels, detecting the most sensitive areas for citizens' well-being.

#### 👂 Spain

NO2, CO2, SO2, VO, O3, Particle Matter (PM), CO, H2S, NO, NH3.

# Traffic and noise monitoring in shopping walks



## Influx of people in shopping areas

In Zaragoza, Libelium has installed fifty devices in two of the city's most commercial areas to digitize streets, collect data in real time and use AI to improve the experience of both citizens and retailers.

#### 💿 Spain

Crowd monitoring and noise level.

The "Paseos Comerciales de Zaragoza" (Zaragoza Commercial Walks) is a digitization initiative promoted by the City Council seeks to capitalize on the main shopping streets of the Aragonese capital it wants to count on local companies.



# The Line, sustainable from its foundations



Libelium plays a crucial role in the building of The Line in NEOM, a linear city conceived to be sustainable from its inception. Furthermore, the Libelium platform has opened up new opportunities in resource management, public safety, and urban planning.

With access to precise and upto-date data on air quality, NEOM can optimize its operations and ensure a healthy and sustainable environment for its residents.

## Construction sustainable

During the construction of The Line, Libelium monitors and controls the air quality. The challenge: sourcing and clustering air pollution from construction, the Red Sea port and desert sand.

Kingdom Saudi Arabia

Air quality parameters, pollution sources, pollutant propagation





## Behind the change. Beyond the challenge.

libelium.com