

Profiling the open innovation models in the energy-water nexus- Atlantic Area - February 2022

Executive Summary

Water and energy are two essential resources for the prosperity of societies. They are both critical for citizens and represent the main raw material and the basis of much of the productive system. In a context of energy transition marked by climate change that will make both commodities more scarce and precious in the future, it is vital to understand the situation that connects both elements and to address the actions of the business world, the public sector and academia to anticipate the challenges of the future.

In order to prevent a water resources crisis in a few decades, it is necessary to work on appropriate water management, taking into account its complex and dynamic relations with the energy and food sectors. The 2030 Agenda for Sustainable Development includes this strategic resource in one of its specific goals, due to its fundamental role in meeting the needs of both current and future generations.

The energy-water-food nexus is a concept that seeks to balance the different uses of the resources present in ecosystems. In its latest World Water Development¹ report, UNESCO warns that in various parts of the world, water for food production is used inefficiently, and is one of the main causes of environmental degradation. Improved water security would protect aquifers and prevent water levels being reduced and ecosystems being degraded, and it could also help lessen poverty among the population.

The report also points out that, although this resource is increasingly valued in the pan-European region, efforts to improve its management are inadequate, especially where cross-border basins are concerned.

The open innovation model could be key to developing relevant technological solutions. Collaboration between the different agents, such as corporations, universities and technology centres, has encouraged the creation of broad innovation ecosystems, which tend to use start-ups as a vehicle for innovation and knowledge transfer.

This report explores the open innovation ecosystem related to the energy-water nexus of Spain, Portugal, France, the United Kingdom and Ireland, in order to identify the main agents, the innovation tools used, the core areas of study and technological lines of the nexus, as well as highlighting good practices and success stories.

1. The open innovation ecosystem in the Atlantic area

Below are the main findings of the report in the Atlantic area (Portugal, Spain, France, the United Kingdom and Ireland):

¹United Nations Educational, Scientific and Cultural Organization. (2021). *The United Nations World Water Development Report 2021. Valuing water*. Paris: UNESCO. Taken from: <http://www.unesco.org/reports/wwdr/2021/en>

Portugal

A key feature of the Portuguese ecosystem is the strong presence of foreign players driving initiatives in the country, although Portuguese power company EDP is the main agent promoting open innovation.

At the same time, innovation providers, whose ultimate purpose is to promote and develop innovation (universities, technology centres and so on), which only comprise 21.4% of the agents identified, are not as present as they are in the other countries analysed, and this determines how the country's own plans for innovation unfold.

With regard to public agents, the efforts of two in particular stand out. These are the **Câmara Municipal de Lisboa** (the Lisbon Municipal Chamber), which has implemented the **Made in Lisboa** initiative, a strategic project that aims to develop the entrepreneurial ecosystem in the capital, and the **Agência para a Competitividade e Inovação** (the Competition and Innovation Agency [IAMPEI]), which created **Startup Lisboa** in order to support the creation of businesses and jobs.

The most widely used open innovation tool in the Portuguese ecosystem, with eight initiatives, is the **acceleration programme** (29%), followed in joint second place by **strategic partnerships** (14.6%) and collaborative R&D&I projects, in this case financed through the Horizon2020 framework (14.8%), which has now become the Horizon Europe programme.

The most noteworthy area of study is the one that focuses on **Renewable Energies**, with 32% of the start-ups being created through the initiatives identified, followed by **Water Management and Energy Efficiency**, each with 24%.

Spain

Spain is a country with great opportunities for innovation in the energy-water nexus, due to its dedication to renewables and commitment to electrification.

Energy corporations are the main open innovation agents in Spain. Companies like Naturgy, Endesa, Iberdrola, Red Eléctrica, Enagás and Repsol are behind 20.3% of all initiatives identified.

Public innovation agents are the least well represented in the ecosystem, encompassing 29.3% of the agents identified. In this regard, Spain needs to strengthen public support for innovation initiatives and networks, as well as increasing the presence of public agents in the ecosystem. The arrival of European funds, with their commitment to the energy transition, is an opportunity to propel this forward.

The most widely used open innovation tool in the initiatives identified in the Spanish ecosystem are **collaborative R+D+I projects**, with a representation of 28.5%; in second place are **strategic partnerships**, employed for 21.1%; while third place goes to **acceleration programmes**, which correspond to 14.63% of initiatives.

The most recurrent area of study for the start-ups resulting from the initiatives identified is **water management** (29%) followed by **energy efficiency** (20.77%).

France

With a well-established ecosystem and a long tradition in driving open innovation, France has very strong initiatives in this area. Although the total agent count includes fewer corporations than public agents or innovation providers, **large private companies add a lot of value and numerous initiatives as a result of a direct involvement in the drive for innovation**. They understand innovation as a whole and not as an airtight area. Of these, and as with the Spanish ecosystem, the role of large national corporations in the energy sector stands out. So **ENGIE, EDF and Total Energies** have been involved in almost half of the initiatives identified.

The two most heavily used open innovation tools are **strategic partnerships** and **acceleration programmes**. These two models account for more than half of all initiatives in the French ecosystem. Of the 42 start-ups identified, 40.4% are involved in the study area of **Renewable Energies**, and 21.4% in **Water Treatment**.

United Kingdom

The British ecosystem has a series of **public bodies** that are undertaking their own extremely fruitful programmes and driving open innovation in the energy-water nexus. In addition, the ecosystem revolves around a major city (London), with a strong presence of initiatives that are headquartered there, but that are active throughout the country.

In the case of the United Kingdom, **innovation providers often work together**, giving rise to more than 9 shared initiatives. Meanwhile, the role of the UK public innovation agency **Innovate UK**, an innovation agency that has promoted strong initiatives, stands out within the public agents of the energy-water nexus open innovation ecosystem.

Unlike in France or Spain, **the large national energy corporations do not feature heavily**. Only ENGIE UK & Ireland has an open innovation initiative of the energy-water nexus, called the UK Clean Growth Innovation Fund, which it is undertaking together with the public agent Innovate UK.

Acceleration programmes are the most widely used open innovation tool (31.3%), followed by **strategic partnerships** (19.6%). Concerning the most noteworthy areas of study, among those dedicated to the energy-water nexus, **Water Management** predominates with 28.5%.

Ireland

Among the countries analysed, Ireland has the least presence of open innovation in the energy-water nexus. **Its weak point is the strong dependence of its ecosystem on the public sector**, as 78% of the agents identified fall under this category. It is also worth noting that 80% of the initiatives promoted by the government are programmes shared with other agents.

In terms of **open innovation tools**, the most widely used in the Irish ecosystem is the **pilot programme (Open Call)** (33.3%), which is present in five of the initiatives. Of equal weight are **strategic partnerships** and **innovation awards**, with 20% each.

As for areas of study, the most relevant is **Energy Efficiency** with 44% of start-ups, followed by **Renewable Energies** with 37.5%. To improve, the Irish ecosystem needs greater momentum from the privatesector and a shift in mindset from the key agents, as their perspective is tootraditional and they have a limited ability to implement open innovation initiatives.

2. Open innovation models in the Atlantic area

The ecosystem agents have been divided into three categories (corporate, innovation providers and public) for the purpose of analysing their degree and type of participation in the innovation of the Atlantic area. Across these three types, a total of **266 agents** were identified.

Open innovation model of corporations

Corporations account for **29.4%** of the players across all the regions analysed. It is worth noting here that the large European electricity companies have a significant presence in the various initiatives - on average, each one is involved in almost five.

The open innovation tools most used by corporate agents are **strategic partnerships, acceleration programmes, corporate venture capital funds and pilot programmes (Open Call)**.

Open innovation model of universities

Only **23** of all the agents identified in the five countries are **universities**, both public and private. The main feature of these institutions is that they are **highly collaborative** - 15 of the 22 initiatives (68.1%) in which they participate are shared with other types of actors such as innovation providers.

Concerning the principal open innovation tools, **strategic partnerships** are the most widely used. Nevertheless, differences were detected between regions in terms of the use of these tools, so it cannot be concluded that there is a favourite across the whole of Atlantic area.

Open innovation model of technology centres

The number of technology centres within the open innovation ecosystem is limited - only ten were identified. Furthermore, the number of initiatives is small, and they are mainly focused on the **innovation and energy sector**.

The **use of innovation tools** by technology centres **varies widely** and depends on the country studied. While strategic partnerships are the most commonly employed tool in Spain, the two technology centres identified in the UK opt for acceleration programmes. For its part, the French centre Innoenergy France uses incubation programmes and, lastly, Portugal uses collaborative R&D+I projects.

Conclusions

Open innovation in the energy-water nexus in the Atlantic area is showing signs of strength, although it requires a greater impetus in the face of the challenges of the coming decades. Policies to combat climate change and promote the energy transition are boosting clean energy and innovative technological solutions. In this context, **the energy-water nexus is an essential element and, because of its collaborative nature, open innovation is an exceptional opportunity to incentivise this** as it makes it possible to add skills and reduce the time between the emergence of an idea and it being launched.

The major energy corporations seem to have understood that start-ups bring new perspectives and add value, while these newly created companies clearly recognise how much they can learn from the experience of large organisations. Countries like Spain, France and the United Kingdom already possess a powerful interconnected network that blends creativity, innovation and new trends with know-how thanks to a long track record in the sector.

Spain has the potential to become a relevant innovation hub for the energy-water nexus, due to its experience in renewables and the presence of important corporate agents that have spearheaded powerful initiatives in this regard and collaborate with various innovation providers. The weak point of their ecosystem is the lack of public support for these innovation initiatives and networks, as well as the small number of public agents in the ecosystem. Using the United Kingdom as a reference in this area, alongside the arrival of European funds committed to the ecological transition, may be key to boosting government support.

Thanks to a long tradition of innovation, **the French open innovation ecosystem in the energy-water nexus shows notable maturity**. Its success is undoubtedly down to the global approach of its large corporations to open innovation, as they are committed to innovation understood as a whole rather than in isolation. In this sense, large corporations are driving the entire innovation process, from investment and accelerating initiatives, to partnerships with universities and the public sector.

In the Atlantic area, **Portugal is the country with the least consolidated ecosystem**, as it does not enjoy the same quantity and quality of agents and initiatives as France or Spain. However, because of its healthy relationships with international players, it has **the potential to become an important catalyst for open innovation**.

The **English-speaking regions are rated as outstanding** for their collaboration with public agents, although in the case of Ireland there is an excessive dependence on them, hindering the development of a still immature ecosystem. The island needs new actors to boost open innovation, as existing ones follow a very traditional model.

Meanwhile, the **United Kingdom** has numerous public and private initiatives that give great importance to water resource management, and which attempt to generate prosperity mechanisms both nationally and in other countries, either through accelerators or via start-ups. **Despite the country having an established ecosystem and dynamic projects, open innovation could be put at risk due to possible isolation in the wake of Brexit**, which could prevent the UK from working with key European agents.

Essentially, this diversity in **its innovation ecosystems makes the Atlantic area a rich ecosystem in which the countries can learn from one another's strengths**. Creating, supporting and consolidating collaborative spaces between agents is therefore paramount if they want to tackle the future challenges of the energy-water nexus.

Glossary

Acceleration programmes: Similar in structure to incubation programmes (see definition below), this is the next stage of boosting existing start-ups by providing technical and business expertise to help scale business models that have already been approved by segments of interest in the market.

Acquisition of start-ups: The purchase of start-ups by corporations to access products for commercial development, complementary technology or capabilities, thereby solving specific business problems or entering new markets.

Agent: A person, entity or company that is present and participates in the field of open innovation through the use of open innovation initiatives.

Co-creation programmes: A corporation partners with other agent(s) to accelerate the development of an innovation project by means of a shared vision, synergies, and complementary resources and knowledge.

Collaborative R&D&I projects: These types of projects are carried out between public research bodies (technology centres and universities) and companies, through the sharing of human and technological resources.

Corporate agents: A set of private companies that drive open innovation initiatives to generate an impact on businesses and their customers as well as to support the industry transformation process, creating new innovation ecosystems.

Corporate investment funds: Internal venture capital funds to participate in start-ups that represent a potential medium/long-term impact for businesses or, in some cases, projects outside the scope of traditional innovation that focus on disruptive technologies.

Ecosystem: A system of collaborations between independent agents that work together, supported by an array of open innovation mechanisms.

External innovation vehicles: These are the possible collaboration models that can be designed and implemented to promote collaboration between an organisation's internal and external agents. Each vehicle has certain targets, financing mechanisms, governance models and other operational parameters for the implementation of projects.

Hackathons: Intensive workshops in which software and app developers (start-ups) collaborate, either individually or in teams, to find technological solutions to a business innovation challenge within a limited timeframe.

Incubation programmes: Incubation programmes are about developing business ideas with innovative potential and turning them into viable business plans with technologies and value propositions that meet an existing need.

Initiative: Plan or process of implementing an open innovation programme.

Innovation awards: Innovation awards are competitions to find an innovative solution to a specific challenge. During the competition, existing projects are presented in pitch format to a panel that evaluates and selects winners.

Innovation model: A framework aligned with the innovation strategy, specifically designed and used to achieve established innovation objectives.

Innovation providers: A group of private and independent agents, whose ultimate aim is to promote and implement innovation. This concept incorporates private universities, private technology centres, investment funds, innovation consultants and, in general, all those agents involved in the ecosystem whose intention is to foster the creation and development of new innovation ecosystems.

Open innovation: Process of creating and improving new products and services through collaboration with different agents that champion the joint development of initiatives.

Pilot programmes (Open Call): Open innovation platforms use pilot programmes with challenges shared through an Open Call to define interesting issues within a corporation and then identify the main existing start-ups in the ecosystem (scouting), so that they can participate in that organisation's innovation and problem solving activities.

Pilot programmes (Venture Client): Faced with a challenge, a corporation tests the impact of a start-up's solution in a business setting. Successful proofs of concept can give rise to a number of scenarios - a commercial agreement between the two companies, or a venture client when the corporation buys the first unit of the product.

Public agents: A set of agents and bodies that are supported or directly financed by public entities. The ultimate purpose of public agents is to bring about a positive social impact by revitalising ecosystems and business activities.

Sandbox: A set of standards that create a space where fintechs and technology companies can develop and test their products or services using different kinds of programmes.

Scouting: A term that refers to the various actions carried out to scan or monitor an innovation ecosystem in order to pinpoint the dynamics, agents and trends that exist within it.

Spin-off: This refers to the by-product or result of an innovation project with a start-up or a company.

Start-up: A term that refers to technology-based companies in their early stages of operation, which have the potential to achieve exponential growth in the short term.

Strategic partnerships: Direct collaboration between a partner, usually corporate or industrial, and another large corporation in order to develop an innovation project together, sharing key resources, knowledge, intellectual property and so on to take advantage of a strategic opportunity.

Technological field: A group or area of technologies that cover the same need or pursue the same objective.