

SPAIN INDIA 2020

A joint reflection on the past,
present and future of our
bilateral relations

WORKING PAPER 5

Science, Technology and Innovation



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WITH THE COLLABORATION OF



Indo Spanish Chamber
of Commerce

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Design and layout: www.nolsom.com

Translation from the original Spanish

Madrid, October 2020

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Telescope at the IAC (Institute of Astrophysics of the Canary Islands) located in Roque de los Muchachos, in the island of La Palma.

5.1.

Framework of relations in the field of science, technology and innovation

From the beginning, relations in science and technology between Spain and India have been based on mutual interest and commitment, given the importance of science and innovation for both countries, their limited resources and their synergies in bilateral collaboration (see Illustration 39). The first agreement between the Centre for the Development of Industrial Technology (CDTI, by its Spanish acronym) and the Technology Development Board (TDB) in 2006 was followed by a framework agreement for cooperation in science and technology in 2007. It is currently the umbrella in which the bilateral commission on Science, Technology and Innovation between Spain and India is held, and where specific initiatives and collaboration programmes in science and technology between both countries are anchored, including the Indo-

Spanish Innovation Programme (ISIP), or the bilateral Scientific Cooperation Programme.

Since then, different bilateral milestones have followed in the field of science and technology. In 2011, the Ministry of Science and Innovation and the CDTI, with the support of the Spain-India Council Foundation, organised a Bilateral Summit on Science and Technology with a delegation made up of 75 organisations and 120 professionals from Spain. In 2013, Spain was a guest country at the BioAsia biotechnology forum in Hyderabad, also thanks to the support of the Spain-India Council Foundation, allowing the attendance of an important Spanish delegation of companies and centres in the biotechnology sector, led by the Secretary of State for Research, Development and Innovation, Ms. Carmen Vela. The 2014 visit of the Minister of Health and Family Welfare of India, Harsh Vardhan, brought about a promising bilateral exchange in the field of health, particularly organ donation and transplantation.

ILLUSTRATION 39 / Investment of Spain and India in R&D&I

	Expenditure in R&D, % of GDP	Expenditure in R&D, in billion \$	Global Innovation INDEX 2020, among 131 countries
Spain in 2018	1.24%	17.5*	30
India in FY 2018-2019	0.7%	16.8**	48

*Approximate value. Official figure: a 14,946 million euros

**Approximate value. Official figure: Rs 123,847 crores

Source: INE (National Institute of Statistics of Spain); Department of Science and Technology, Government of India, and Global Innovation Index 2020

The role of science and technology as a pillar of our bilateral relations was corroborated in 2017, on the occasion of the official visit of Prime Minister Modi to Spain, when innovation was included as one of the four fundamental pillars of the joint statement on the Association for Peace, Growth and Innovation (APCI). In this declaration, both countries acknowledged their interest in intensifying collaboration in research and innovation in sectors such as astrophysics, biotechnology, oncology, nanotechnology or clean technologies, among others. Following the collaboration strategy established by the APCI, the bilateral commission, held in September of that same year in Madrid, defined a roadmap to intensify relations in science and innovation between both countries.

Driven by this momentum, promoted by the APCI and the roadmap, new bilateral collaboration projects are being created. The large telescope of the Canary Islands (Gran Telescopio Canarias, GTC) and the Astrophysics Institute of the Canary Islands (*Instituto de Astrofísica de Canarias*, IAC) signed a collaboration agreement on astrophysics with the Indian Institute of Astrophysics (IIA) of Bangalore in September 2020. The International Iberian Nanotechnology Laboratory –a Spanish-Portuguese mixed centre based in Braga–signed two MoUs with the Jawaharlal Nehru Centre for Advanced Scientific Research (JNCASR) in 2018, with whom it organised a joint workshop that same year; and with the TERI-DEAKIN Nanobiotechnology Centre in February 2020. Other initiatives still in the initial phase have a

promising outreach, such as the virtual centre for research in oncology, in study phase with the Department of Biotechnology of India (DBT), or the biotechnology corridor.

5.2.

The dimension of dialogue, cooperation and bilateral science-technology diplomacy

Within the framework of the 2007 agreement on cooperation in the field of science and technology, between the Ministry of Education and Science and the Ministry of Industry, Tourism and Trade of Spain, and the Ministry of Science and Technology of India, three meetings have been held within the bilateral commission on Science, Technology and Innovation, currently led by the Spanish Ministry of Science and Innovation. They have been essential in promoting relations in these areas. During the first meeting of the bilateral commission in 2011, held in Delhi within the framework of the Bilateral Summit on Science and Technology, two specific agreements were signed in biotechnology and renewable energies that are still operational. During the meeting held in 2013, also in Delhi following Spain's participation in BioAsia in Hyderabad, a new agreement was signed to promote the multi-sectoral technological cooperation that is still in force. The third meeting was held in Madrid in 2017, during which both countries defined a roadmap, the delegation visited the Research



Spanish team of biological researchers in a project of genetically modified vegetable seeds.

Centre for Energy, Environment and Technology (CIEMAT) and the IMDEA Water Institute, and carried out a technical visit to the Roque de los Muchachos astronomical observatory in the Canary Islands.

This bilateral dialogue has transcended beyond the formal sphere to become an efficient political meeting for the implementation of scientific and technological initiatives between both countries. Cooperation in the field of science, technology and innovation has been one of the most successful areas in our bilateral relations. The Indo-Spanish alliance in innovation and technology has managed to promote business technological cooperation between Spanish and Indian organisations in projects of technological development, innovation and technology transfer, generating economic and social benefits for both Spain and India, as well as promoting

the competitiveness of their companies and research centres and the internationalisation and integration of Spanish R&D in India (see Case 10).

A series of bilateral agreements have been signed as an operational development of this framework agreement for cooperation in science and technology between Spain and India, constituting the Indo-Spanish Innovation Programme –ISIP. The goal of ISIP is to promote and finance joint technological development and innovation projects between Spanish and Indian companies and organisations. Within the framework of this Programme, two sectoral initiatives are currently being implemented in Biotechnology –between the CDTI and the Indian Department of Biotechnology (DBT)– and in Renewable Energies –between the CDTI and the Ministry of New and Renewable Energies of India (MNRE)–, as well as the initiative with multi-sectoral reach

between the CDTI and the Department of Science and Technology (DST) of India and the Global Innovation and Technology Alliance agency (GITA), the latter being a public-private alliance between the DST and the Confederation of Indian Industry (CII).

As a result of the implementation of the ISIP programme, including the initiative with the Technology Development Board (TDB), an agency of the Department of Science and Technology in force between 2006 and 2013, a total of 40 joint technological cooperation projects have been certified between Spanish companies and Indian entities, amounting to 32.5 million euros. This in turn represents a direct financial commitment of CDTI of 17.68 million euros by means of soft loans and non-refundable instalments or with grants, through the Innoglobal programme in the 2016-2018 period (see Illustration 40).

With the aim of creating solid networks of scientific cooperation and exchange, the bilateral Scientific Cooperation Programme launched two joint calls participated by the Ministry of Science and Innovation of Spain and the DST between 2009 and 2011. A total of 230 joint proposals were submitted, of which 43 were selected with a total budget of euros 3.6 million. Within the framework of this programme, three bilateral scientific workshops were also organised in the fields of ICT (Bangalore, 2010), renewable energies (Seville, 2011) and health and medical research (Delhi, 2011).

Science and technology diplomacy is essential both to increase mutual knowledge and to explore collaborations at the academic and institutional level between two innovation fabrics with extensive room for increased interrelation. As a result of the coordination between the Ministry of Science and Innovation and the Ministry of Foreign Affairs of Spain during the 2019-2020 period, the CDTI Delegation in India has developed different actions in collaboration with the Spanish Agency

for International Cooperation and Development (AECID, by its Spanish acronym) and with the support of the Embassy of Spain in New Delhi.

The Ministry of Science and Innovation and the Ministry of Foreign Affairs of Spain have co-organised several activities of science diplomacy, establishing an innovative institutional coordination and co-financing model between the CDTI and AECID. These activities include, in 2019, the participation of two experts in biosimilars in the BioAsia forum and of two other experts in sustainability in the CII Sustainable Summit, and in 2020 the participation of the CDTI in different virtual conferences such as the one organised by the European Union on the role of research and innovation in tackling and fighting COVID-19; the one organised by the IIC on innovative solutions to tackle the pandemic on the occasion of the National Technology Day in India, in which three Spanish companies and a technology centre also participated; or the Spain-India Dialogue on Wind Power Technology organised by the CDTI with the Global Wind Energy Council (GWEC) and the Wind Energy Association (AEE).

In the field of science diplomacy, bilateral visits are a clear asset to increase institutional and academic interaction and to promote mutual knowledge. As an example, the visit of an Indian delegation in 2017 to the Roque de Los Muchachos Observatory in La Palma and the Gran Telescopio Canarias was essential to laying the foundations for increased collaboration between India and Spain in the field of astrophysics, resulting in a recently-signed cooperation agreement. These initiatives for 2020 have had to be postponed due to the COVID-19 pandemic, like the March 2020 strategic action on wind power, with the participation of a Spanish delegation of twelve members in a workshop at the National Institute of Wind Power (NIWE) in Chennai, which has finally been organised virtually, and a round of meetings in both Chennai and New Delhi.

ILLUSTRATION 40 / Cooperation in science, technology and innovation between Spain and India					
Framework agreement on cooperation in the field of science and technology between Spain and India					
Year	Spanish counterpart	Indian counterpart	Number of meetings		
2007	Ministry of Science and Innovation	Ministry of Science and Technology	3		
Meetings of the bilateral joint commission on Science, Technology and Innovation					
Year	Agreements signed		City		
2011	-Biotechnology -Renewable energies		Delhi		
2013	Multi-sectoral technological cooperation		Delhi		
2017	Roadmap in science and technology		Madrid		
The Indo-Spanish Innovation Programme (ISIP): funding of bilateral projects within the framework of the agreement on cooperation in science and technology between Spain and India					
Spanish counterpart	Indian counterpart	Thematic areas	Number of projects	Budget, in million euros	Status
CDTI	Technology Development Board (TDB)	Information technologies, security systems, textile technologies, machine tools, electric transmission systems, hospital textiles based on hot-melt technologies, lifting systems	9	11.73	Finished. In force between 2006 and 2013
CDTI	Ministry of New and Renewable Energies (MNRE)	Measurement and prediction of the wind resource, auscultation system of the energy receiving elements in thermosolar plants	3	3.63	Pending reactivation. In force between 2012 and 2015
CDTI	Department of Biotechnology (DBT)	Nutraceuticals, natural products based on traditional medicine, biosensors for the detection of toxins, application of enzymes to the food industry, biostimulants and biopesticides, valuation of resources and bioeconomy, biosensors for the detection of diseases, use of the zebrafish as animal model for the study of cancer	14	7.38	In force since 2012
CDTI	Department of Science and Technology (DST) –Global Innovation and Technology Alliance (GITA)	Management of smart public transport, e-health platform, formulation and implementation of nanomaterials, unmanned vehicles, remote communication technologies, implementation of the internet of things to the industry of oil refinement, neural networks to control in real time the water pollution of effluents, system for the monitoring and control in real time of the public lighting, production of bio-pesticides from algae and advanced production of solar photovoltaic panels	13	8.6	In force since 2014
Unilateral –CDTI funding instrument		Production of renewable biogas from biomass for cooking gas and micro-generation	1	0.63	-
Source: CDTI					

CASE 10

Cooperation in science, technology and innovation as a success model in our bilateral alliance

The bilateral alliance in science, innovation and technology is a success model in our bilateral relations thanks to shared interests based on mutual growth and a solid and well-structured cooperation structure. In the field of government relations, the only pillar of the 2017 APCI that has had a specific follow-up has been innovation. That same year it was supplemented with a specific roadmap by the joint bilateral commission on science and innovation. Science and innovation maintain the momentum of the signing of agreements beyond high-level visits, even during COVID-19 times, as shown by the recent signing of the collaboration agreement in astrophysics. The joint proposals that arise from this alliance are bidirectional and of joint commitment, such as projects to create a virtual oncology research centre or a biotechnology corridor. Lastly, the CDTI Delegation in India acts as a science and technology sectoral office at the Embassy of Spain in India, offering follow-up and support for the implementation of

government and institutional relationship frameworks.

In the private sphere, the results of this alliance are helping to weave a bilateral network in science and innovation that was previously non-existent. The ISIP is achieving the capillarity of its initiatives, creating new spaces of collaboration between public institutions and private organisations in both countries, and promoting the generation of initiatives from the private sphere that have a rising impact on the public sphere.

The factors that have allowed this success include:

- There is a real interest of both countries in cooperating in the sector of science and technology, where they have non-competitive complementarities and synergies that allow them to contribute to mutual growth and benefit.

- Within the framework of the 2007 MoU on cooperation in the field of science and technology, a political dialogue was established with three meetings held to date on the sidelines of official visits. This political dialogue, which maintains the momentum and government commitment beyond the change of governments, has a technical follow-up for the implementation of the established roadmap.

- The bilateral cooperation framework is reflected in specific joint initiatives defined within the ISIP and in the promotion of Spain's participation in the EU's science, innovation and technology programmes in India.

- The identification of the technical counterparts that develop the ISIP is well defined. The Spanish side includes the Centre for Industrial Technological Development (CDTI) and the Indian side, depending on the sector in which the project is focused, includes the Technological Development Council (TBD), the Ministry of New and Renewable Energies (MNRE), the Department of Biotechnology (DBT), or the Global Innovation and Technology Alliance of the Department of Science and Technology (DST-GITA).

- The identification of initiatives is carried out in areas of mutual interest, in this case, the fields of information technology, renewable energies, biotechnology and multi-sectoral innovation. The work of the technical counterparts on the field is essential to identify areas with real interest in both business and research fabrics.

- There is a budgetary commitment of both governments for the financing of the associated projects,



Renewable energies represent a field of mutual interest. In the image a research project in an Indian village.

unlike other sectors of bilateral cooperation. In the case of the CDTI, 16.7 million euros have been earmarked to finance these projects.

- The Spanish technical counterpart, the CDTI, has an office in India to maintain a direct dialogue with its counterparts, a joint identification of initiatives and a follow-up of the projects approved. The CDTI delegate is a key player given his knowledge and network of contacts,

providing continuity and a follow-up to the relationship and reducing the impact of the learning curve. The consolidated professional relationship between those responsible for both countries favours an effective dialogue without misunderstandings between the counterparts.

- There is interest from the business fabric of both countries to participate in these initiatives. More than 100 organisations have taken

interest in submitting proposals to these programmes, which have translated into 40 approved projects.

- These programmes have strengthened the mutual knowledge of a new critical mass of organisations, institutions and companies that maintain the momentum of the bilateral scientific and technological cooperation from the civil society, generating bottom-up initiatives and projects.



College of Engineering of the Guru Gobind Singh Indraprastha University in New Delhi.

5.3.

The European funding window for collaboration and mobility between Spain and India.

The ability to mobilise and obtain European resources to promote scientific mobility and collaboration in R&D with India within the framework of Horizon 2020 (H2020) of the European Union represents a funding opportunity for Spanish institutions and companies in India. H2020 is the EU programme that finances research and innovation projects in several thematic areas with a budget of almost euros 80 billion for the 2014-2020 period. Among the tenders awarded during the 2014-2019 period, Spanish organisations and companies were awarded 4,761.6 million euros to undertake research and innovation activities, reaching a return on investment of 10.1% in the EU-28 and consolidating Spain as the fourth country attracting the most subsidies, only behind Germany, the United Kingdom and France.

One of H2020's priority countries is India. More than 54 collaboration initiatives with India have been approved to date by the European Union within the H2020 framework (see Illustration 41). H2020 financing is an opportunity for Spanish companies

to participate in the Indian economy with their R&D and to collaborate in joint technological development projects. The active promotion, monitoring and support to Spanish companies and organisations interested in specific opportunities with India within the H2020 framework has been essential to explain the high participation of Spain in initiatives such as the 2018 EU-India Flagship Calls on Water or the 2019 MSCA programme (see In Detail 13).

Within the working group formed by the Delegation of the European Union for the Strategic Alliance with India in Innovation, in which Spain is participating through the CDTI delegation in India, a window of collaboration and exchange has opened between the Spanish and Indian stakeholders of the systems of science, technology and innovation. The European initiatives with India, which Spain has joined, include the Eranet Inno-Indigo or Globalstars calls within the EUREKA programme framework; and European grant instruments, like the INNOWIDE programme for the internationalisation of technologies of European SMEs in third markets. In this regard, India ranks second among the countries attracting the most projects, ahead of China or Brazil and only behind the US. These include feasibility studies for the Spanish SMEs **Hilaturas Arnau** and **Innomaq21**. The CDTI monthly newsletter has become a

useful instrument for the dissemination of these financing and exchange opportunities between Spanish technological SMEs and research centres (Newsletter No. 30, July 2020, CDTI).

Through the CDTI, Spain also plays an active role in the European initiative EU-India Innovation Partnership, which involves the Indian incubators C-CAMP (Bangalore) and T-HUB (Hyderabad). This initiative seeks to establish a European Innovation Zone in India (EIZI) –a landing platform for startups and technology SMEs– that allows exploring the Indian ecosystem and the business opportunities associated with technology for bilateral companies.

One of the major bilateral challenges that remain is the promotion of Spain as an attractive destination for research and scientific mobility. The EURAXESS India Researchers in Motion initiative has been an essential asset for the creation of spaces for European promotion which, thanks to the work of the Spanish Foundation for Science and Technology (FECYT) –the Spanish coordinator of EURAXESS– has served to showcase the strengths of the Spanish R&D&I system in India and the funding opportunities, followed by an exercise of supporting and monitoring from Spain the exchanges between researchers. The still low research mobility has found a great opportunity in the Marie Skłodowska-Curie Actions programme to take the research exchanges between Spain and India further. One of its success stories is the president of the Indian chapter of the Marie Curie Alumni Association (MCAA), Praveen Kumar, a Marie Curie researcher at the Polytechnic University of Madrid. Unlike other Asian countries such as Japan, China, Australia or, recently, the United Arab Emirates, India does not have a Spanish research fabric and, consequently, does not have an association of Spanish scientists either.

More and more Spanish engineering, architecture or technology schools establish exchange agreements with Erasmus + funding with the

ILLUSTRATION 41 / European funding for science and innovation projects and scholarships with India

Number of H2020 projects with India by main thematic priorities

MSCA – Marie Skłodowska-Curie Actions	23
ENV – climate action, environment, resource efficiency and raw materials	14
HEALTH – health, demographic transition and well-being	7
LEIT-SPACE – Space	5
ERC – European Research Council	5

Number of H2020 projects with India by top topics

EU-India Cooperation on Water	7
Integrated local energy systems (energy islands)	3
Innovative training networks	3
Marie-Curie Research and Innovation Staff Exchange (RISE)	3
Towards a next-generation flu vaccine to protect the citizens of the world – an EU-India collaboration	3

Source: European Union

highly renowned Indian Institutes of Technology (IIT), National Institutes of Technology (NIT), Indian Institutes of Science (IIS), Indian Institutes of Education Science and Research (ISER) or the Indian Institutes of Information Technology (IIIT). The very positive academic and personal experience of five students from the School of Engineering of the University of Seville in the IIT of Madras during the 2019-20 academic year, while other exchange agreements between Indian and Spanish universities remain deserted, reflects the importance of information campaigns to promote mobility between India and Spain, also at the university scientific and technological level.

New opportunities of Spanish participation are presented in the new EU-INDIA Green Deal H2020 agreement, a co-financing mechanism between the European Union and the Department of Biotechnology of the Government of India,

within the European Green Deal. Within the framework of this co-financing mechanism, priority has been given to the areas of carbon neutral agriculture, renewable energies, farm to fork, recovery of biodiversity, bioeconomy, ecosystems, and systematic zero pollution for the protection of health. Likewise, the EU has enabled a matchmaking tool to put in contact the different stakeholders interested in forming consortia to register their expressions of interest or project ideas. The agreement reached in October 2020 between the European Commission and the Indian Council of Social Science Research (ICSSR) establishes a new opportunity for Indian researchers to complete research stays in European social science groups financed by the European Research Centre.



Indian agronomist supervising data from a farm.

IN DETAIL 13

Spain's participation in the H2020 programme with India

Within the framework of the Horizon 2020 European programme for the 2018-2020 period, three coordinated calls have been published between the EU and India for R&D cooperation projects by European consortia in collaboration with Indian organisations. These calls have entailed a co-financing commitment by the EU and the Government of India amounting to 78 million euros. Three sectors of mutual interest have been identified for cooperation in science, technological

development and innovation, including water technologies, the development of vaccines for the influenza virus and local energy islands.

Spanish organisations have played a leading part in the calls for water technology projects with India. With a total of ten organisations in four of the seven projects approved for funding, Spain ranked first EU Member State by number of organisations participating in selected projects. The call for demonstration projects in local energy islands is currently in the evaluation phase.

In the field of mobility of researchers through the

Excellent Science pillar of the H2020, MSCA Programme, according to the latest results provided by the EU, India ranked third country of international cooperation receiving the most MSCA grants for the third consecutive year with 1,475 scholarships, followed by China –83 scholarships– and the United States –44 scholarships. Spain ranked second country chosen by Indian researchers to carry out their post-doc stays in the 2019 programme, only after the United Kingdom.

5.4.

The global importance of health and pharmaceutical cooperation and research against COVID 19

The COVID-19 pandemic has placed science and innovation in the spotlight at an international level. This pandemic has generated an unprecedented exchange of knowledge between governments, researchers and companies at international level. Following a telephone conversation between Prime Minister Modi and the Spanish President, Pedro Sánchez, the export of up to 2,500 kilos of hydroxychloroquine was unblocked for the Spanish government to treat patients hospitalised for COVID-19, when it was still considered an effective treatment. India and Spain also participated in a multi-conference with another thirteen countries to pool efforts being carried out and information on the scientific projects regarding COVID-19, and to make a statement to boost access to all the information published about the coronavirus pandemic. According to the OECD, Spain and India have been among the countries with the most scientific contributions on COVID-19 in the world in 2020 (see Illustration 42).

The current emergency has allowed giving a dimension about the importance of pharmaceutical and vaccine R&D. Twelve Spanish projects have received an initial funding of eight million euros from the Ministry of Science and Innovation of Spain, as well as from private contributions (Ministry of Science and Innovation, 2020). There are several companies developing vaccines against COVID-19 in India and three of them, Bharat Biotech, Serum Institute of India and **Zydus Cadila** –present in Spain since 2008 after the acquisition by Laboratorios Combix–, are in phase 2 of clinical trials. Moreover, India will play a leading role in the commercialisation of the vaccine as it

accounts for 50% of the global production of vaccines, with a significantly lower cost and a proven capacity in R&D&I, making it a highly competitive market (IBEF, 2020).

India is weaving an extensive international network for the scaling and production of vaccines. It is worth highlighting the agreement of the Serum Institute, one of the largest producers of vaccines at an international level, for the production of 1 billion doses of the Oxford-AstraZeneca vaccine, considered one of the most advanced in the race for COVID-19 vaccines (The Guardian, 2020). The Serum Institute has also made a deal for the production and commercialisation of the Novavax vaccine candidate and a new collaboration with GAVI (Global Alliance for Vaccines) to manufacture and supply 100 million doses of vaccines to COVAX (Vaccine Global Access Facility) for their distribution in low and middle income countries in 2021. The Biological E has also made a deal to produce Hanssen Pharmaceutical's candidate vaccine (Johnson & Johnson).

India also controls a large part of the global production of the drugs that have become possible treatments for COVID-19 with more or less success, including hydroxychloroquine or remdesivir. Hosting the main global pharmaceutical fair CPhI Worldwide (Pharmaceuticals) in Madrid in 2015 and 2018 and in Barcelona in 2016 became an opportunity to connect the Indian pharmaceutical companies with Spain. These have progressively established their subsidiaries in Spain, including the major Indian pharmaceutical groups that are also present in Spain, like the aforementioned **Zydus Cadilla**, **Sun Pharmaceuticals**, **Dr. Reddy's Laboratories**, **Aurobindo Pharma** or **Hetero Labs**, the latter being manufacturer of remdesivir, present in Spain through its European subsidiary Amaro Limited. In India, **Chemo Group**, part of the Spanish multinational Insud Pharma, has a



production centre and an R&D laboratory in Hyderabad, and the company from Madrid **Biotoools Biotechnological and Biotechnical Laboratories** established a joint venture in 2011 with Kilpest India, giving rise to 3B BlackBio Biotech India, for the design, development, manufacturing and commercialisation of molecular diagnostic kits based on PCRs, enzymes and reagents for PCRs. 3B BlackBio Biotech has been the second Indian company to produce COVID-19 testing kits.

The COVID-19 health crisis has fostered an increase of exchanges in the field of science and innovation between Spain and India. Signs

of interest have been detected and contacts have been made to explore opportunities for collaboration in areas such as clinical trials for the assessment of effectiveness, drug repositioning, scaling and production of vaccines. Through the CDTI, Spain has collaborated with various Indian organisations in the exchange of good practices and innovative solutions to address the pandemic within the framework of events including the RE-START, “Reboot the Economy through Science, Technology and Research Translations”, involving several Spanish companies and technology centres, as well as the Director General of the CDTI, Javier Ponce; or the round table organised

by the European Union, “EU’s action on research and Innovation to combat COVID-19”, in which the Delegate of the CDTI in India, Adrián Gutiérrez, participated as speaker to share the Spanish experience.

This bilateral collaboration in research and exchange of good practices in the health field has also been further strengthened in recent years. In 2017, the National Transplant Organisation of the Ministry of Health, Social Services and Equality of Spain and the General Directorate of Health Services of the Ministry of Health and Family Welfare of India signed a MoU for cooperation in the field of transplant services and organ donation, followed by the visit of a delegation from the National Organ and Tissue Transplant Organisation (NOTTO) of India to Spain in 2019. Spain is an international leader in this field and its model is considered a benchmark by the World Health Organisation. There are also interesting cases of collaboration at a private level between both countries, such as the robotics technology da Vinci XI, of the **Hospital Clinic in Barcelona**, for kidney transplants, which has been used in India for more than five years, or the agreement between the Spanish foundation **TPM-DTI** and the Indian Medical Association (IMA), Goa Chapter, for the collaboration for in-hospital training in the field of organ donation from corpses.

The current pandemic has also opened a new door for collaboration in the field of digital medicine. India and Spain collaborate on multilateral initiatives and platforms in the biosanitary field, including Infect-ERA for infectious diseases and EMBO for molecular biology. In 2020, ICEX organised two virtual direct missions to India in the field of technologies and health needs generated by COVID-19. Within its active position to promote bilateral collaborations, the CDTI has launched a new search for Spanish partners interested in collaborating with the

ILLUSTRATION 42 / Research on COVID-19 by country

Registered COVID-19 vaccine studies by country	Registered COVID-19 drug studies by country
1 United States	1 United States
2 China	2 France
3 United Kingdom	3 Spain
4 Italy	4 Brazil
5 India	5 United Kingdom
6 Spain	6 Mexico
7 Canada	7 China
8 France	8 Italy
9 Germany	9 Egypt
10 Australia	10 Canada

Source: OECD

Indian company **AyuGen Biosciences** to develop a platform for the diagnosis of cervical cancer based on matrix examination and simultaneous genotype.

5.5.

Collaboration in innovation as a pillar of bilateral technological and industrial development

Within the ISIP, the multi-sectoral initiative resulting from the agreement between the CDTI and the DST, in force since 2014 with seven editions, reached 13 certified projects in its first six calls, with a total budget of 8.6 million euros. These projects include the ones developed by the successful alliances between **Embeblue** and **Aewinfra** and between **INVIZA** and **PlenarTech** (see In Detail 14). The GITA agency is the Indian counterpart in charge of the specific implementation of the programme, along with the CDTI, allowing greater engagement of

technology companies and a better connection with the business fabric of both countries.

This success of the joint projects shows that there is strong complementarity in the value chain between Spanish and Indian companies, facilitating the creation of a bilateral technological alliance in the business area. India and Spain are among the ten leading countries in the development and application of advanced digital production technologies (UNIDO, 2020). Four out of ten Spanish companies already have artificial intelligence processes to improve productivity and Spain ranks fourth in Europe in the sale of robots (Atómico, 2020). This complementarity offers a win-win scenario for companies from both countries –it adds competitive auxiliary products and innovation to the Indian value chain and supports the international expansion of the Spanish companies.

These technological synergies are an opportunity for the participation of Spanish companies in the innovation processes of the Indian value chain. Numerous examples of these technological complementarities include Spanish companies that offer auxiliary technological products and solutions, such as **Jeanologia**, present in India since 2004 with a 90% market share in the field of sustainable technologies for garment finishing; **Zahonero**, which from its factory in Noida provides the Indian industry with technological solutions for footwear comfort; or **Torreid**, a company from Castellón in the ceramics and glass sector, with a creative design workshop in Mumbai and a centre for innovation and advanced development at its factory in Savli. Spanish technological companies are entering the Indian market by acquiring a local partner. An example of this is the purchase of the Indian company Bygging by the Spanish **Global Dominion**, to provide multi-technical services and specialised engineering solutions in India.

There are many innovative Spanish companies that are contributing their technology to the Indian economy through agreements with local companies. An example of these synergies in Indo-Spanish companies is the Spanish company **Macsa ID**, specialised in laser coding and marking. It has created a joint venture with the Indian multinational Forbes to produce and commercialise its laser equipment for coding and marking, becoming the only company in India with the capacity to produce laser equipment of this kind. Other Spanish technology companies form strategic alliances with Indian companies, including the agreement between the Spanish **Sisteplant** and the Indian Indovision Services for the distribution of its solution package for 4.0 industry; or between **Loramendi** and AquaSub –the largest producer of pumps in India– for the development of a new project in the engineering plant of the Indian company.

The technological contribution to the Indian value chain is also providing synergies between Spanish companies, like **Digiproces** and **ITEL**, which established a joint venture in India –forming the company INDIC– for electronic production services. They currently have a plant in Bangalore, their only production centre outside Spain. This plant exceeds its headquarters in size of its facilities (8,000m²) and number of workers (500), as well as in manufacturing volume (three million of daily components).

Within the opportunities that have not been sufficiently explored, there are variants of bilateral business collaboration in the field of patents and of public-private collaboration. On the one hand, Spanish SMEs with a technology patent could collaborate with large Indian companies in incorporating this technology to the Indian market. On the other hand, large Spanish companies in the field of innovation can contribute their technology to strategic sectors in India. An example of these alliances between



Indra air traffic control radar station.

Spanish companies and Indian public bodies are **INDRA's** technological solutions, essential for the Indian Ministry of Defence or the Airports Authority of India (AAI) (See Case 11).

5.6.

The bilateral alliance in biotechnology and renewable technologies for sustainable growth

At the 2017 APCI, Spain and India agreed to develop synergies to successfully address

the sustainable development agendas of both countries. Technological innovation is at the centre of these synergies, in which Spain and India have already shown their complementarities, both at public and private level, and their contribution to sustainable growth. The six joint initiatives in biotechnology that have been implemented since 2012 between the CDTI and the DBT have managed to certify 14 projects with a total budget of euros 7.4 million. This biotechnological collaboration has meant a milestone in the exchange between Spanish and Indian research centres, universities and companies, which have created new networks of bilateral alliances through these programmes.

The success of multi-sectoral collaboration in projects financed by the ISIP: The cases of Embeblue and Aewinfra, and INVIZA and PlenarTech

Within the pioneering projects certified in the multi-sectoral call of the ISIP we can find innovative themes such as management of intelligent public transport; formulation and implementation of nanomaterials; unmanned vehicles, implementation of the internet of things to the oil refining industry; systems for the monitoring and real-time control of public lighting; production of biopesticides from algae or neural networks to control water pollution from tributaries in real time. The bidirectionality of this technological co-development and the benefit of these synergies in innovation for both countries can be observed in the projects implemented by Embeblue and Aewinfra, and INVIZA and PlenarTech.

The project between the Spanish company **Embeblue** and the Indian company **Aewinfra** is an example of technological collaboration from Spain to India that generates knowledge and mutual benefits. The Indian company detected the need to incorporate into the products it manufactured Narrowband technology for the internet of things (NB-IoT), encompassed

in the 5G. Spain has been one of the pioneer countries in NB-IoT coverage and Embeblue has been an innovative company in the development of a module and a device for generic use of NB-IoT.

This project represents a success model due to its collaboration approach. The Indian side obtains an innovative solution for a technological need it has identified, while the Spanish side internationalises its innovative solution while creating an alliance with a component supplier at a very competitive price. The technical cooperation between both companies has also led to synergies in the transmission of knowledge, which will be exploited by both companies.

Another successful model, in which this technological co-development occurs inversely, is the SmartHealth platform developed by the Indian company **PlenarTech**, in collaboration with the Spanish company **INVIZA-Clínica la Asunción** and the **Vicomtech** technology centre. The project aimed at developing and validating a platform for remote monitoring and clinical follow-up of the health of chronic

patients to efficiently monitor the evolution of a large number of patients. The platform has a monitoring application for the patient that shows the care plan to be carried out daily in a personalised manner.

SmartHealth has been successfully validated, by both the patients and the clinical team, in a pilot programme for the remote monitoring of the rehabilitation of a population of patients operated on for knee replacements. As a next step they are considering a widespread use of SmartHealth for the rest of the rehabilitation and follow-up processes of all chronic patients. Thanks to this state-of-the-art platform developed by PlenarTech to address a need for remote care identified by INVIZA, the Spanish company has positioned itself as an international R&D&I agent in the field of telemedicine and as an emerging commercial stakeholder for the commercial development of the platform, under the brand name DocToDoor.com, at a time when the COVID-19 pandemic has generated new telemedicine needs.

CASE 11

Indra, partner in innovation and technological solutions for the growth of India

Indra, one of the **leading global technology and consulting companies**, is the world's leading provider of proprietary solutions in specific segments of the Transport and Defence markets, and a pioneer in digital transformation and information technology consulting through its subsidiary Minsait. Its comprehensive offer of in-house products is based on advanced technological solutions, with an end-to-end approach of high added value and a high degree of innovation. In 2019, Indra had more than 49,000 employees, local presence in 46 countries and business operations in more than 140 countries.

Indra entered India in 2007 with the design and co-production of an electronic defence system for the Indian Navy. In 2009, Indra established its headquarters in New Delhi, expanding its presence both throughout the Indian territory, with projects in 30 cities, and among its priority sectors, including air traffic management, transports or security and defence. Indra's human

resources in India amount to 100 employees, the majority of which are Indian professionals and engineers. Indra has created a network of collaborators within the Indian business fabric, including Indian multinationals like BEL, Tata Power and ECIL, and institutions such as the Conference of Indian Industries, with whom it signed an MoU in 2015 to promote lines of collaboration that allow designing a common offer of solutions and technologies in the field of smart cities. In all these years, Indra has proven to be a **partner in innovation and technological solutions for the growth of India**.

In the field of civil air navigation, **around 80% of the sky in India is monitored with Indra radars** and 38 airports use its air control systems and instrument landing systems. The Indra Air Automation system has been chosen as the ideal technology to facilitate the control of the more than 40,000 aircraft movements of the airport of Delhi, as well as in Chennai, Bangalore and Kolkata.

Within the area of security and defence technological solutions, Indra has supplied sensors of different types to both the Indian Army and the Indian Navy, as well as **satellite**

communication systems.

In 2020, Indra has signed a contract for the supply of navigation aid systems for 37 air bases of the Indian Ministry of Defence. The technological and innovation solutions provided by the company include 24 new instrument landing systems (ILS) and 29 guidance systems (DVOR). These contracts have been executed within the framework of industrial collaborations with Indian technology companies.

In the mobility and transport sectors, Indra has carried out numerous projects to modernise control centres and implement its **ticketing systems (AFC)**, including mobile payment solutions, in the metro and the Airport Express line in Delhi, and in the Metro of Mumbai and of Kolkata. In addition, it has deployed both toll systems, in the states of Karnataka and Andhra Pradesh, and traffic management systems for highways in the state of Rajasthan. The control centre of the tunnel of Chenani, the longest one in South Asia and Southeast Asia, is equipped with the comprehensive Traffic Management System from its Mova Traffic line of solutions.

Examples of these include the collaborations in the fields of agriculture and food between **Agro2Agri**, **Jay Biotech** and **AINIA**, and **SEIPASA** and **IARI** (see In Detail 15). In the biosanitary field, the case of **ZeClinics** and **Dr. Reddy's Institute of Life Sciences** also shows the potential of research synergies (see In Detail 16).

In the field of sustainability, the alliance between Spain and India in the field of renewable technologies has been very successful. The National Institute of Wind Energy (NIWE) and the Spanish National Centre for Renewable Energies (CENER, by its Spanish acronym) signed an agreement on research and development cooperation in 2016. Within the framework of the CDTI initiative with the Ministry of New and Renewable Energies (MNRE) of India, which has had active calls between 2012 and 2015 and is currently awaiting reactivation, it has shown the complementarity between the technologies of the innovative Spanish companies in the renewable energies sector. Within the framework of this initiative, three projects were certified with a total budget of 3.6 million euros, such as the successful collaboration between **Vortex** and the **NIWE** (see In Detail 17).

In the private sphere, leading Spanish companies in sustainable technology participate with their innovative solutions in the growth and development of the renewable energy sector in India. Flagship examples include **Nordex**, an innovative company owned by ACCIONA that will supply the largest wind turbines installed in India to date, or **Siemens Gamesa**, which will develop the first hybrid wind-solar project in India on a commercial scale.

Other Spanish companies also provide their technologies to the Indian value chain in the sector of renewable energies. Some have done it through joint ventures with local companies, like **IED Greenpower**, born from the alliance



Engineers supervising a wind turbine in Spain.

between the company from Navarra IED Electronics and the Indian company Sumelec, for the supply of lighting and electronics to the wind sector. Others by collaborating with Indian public bodies, like the company from Aragón **Kintech Ingeniería**, which in 2019 was awarded a contract by the NIWE for the supply of data acquisition systems and monitoring software for wind resource assessment. And others have managed it with Indian private companies, like the company from the Basque Country **Mondragon Assembly**, which in 2017 provided a 200MW line for the production of solar panels to the Indian company Bharat Heavy Electricals Limited (BHEL), the largest manufacturer of power generation equipment in the country. In the field of thermal energy, in 2020 the public company West Bengal Power Development Corporation awarded the company from Seville **Inerco** and its Indian partner Unicon a project for the implementation of its combustion optimisation and emission reduction technology for one of its boilers in the Bandel thermal power plant (West Bengal), which marked the entry of Inerco into the South Asian country.

During the digital meeting held in July, 2020, on “India-Spain Wind Energy Tech Dialogue”, organised by the CDTI, AECID and the Global Wind Energy Council in collaboration with the Spanish Wind Energy Association (AEE), the opportunities for technological collaboration

The success of the collaboration in biotechnological projects in the fields of agriculture and food financed by the ISIP: The cases of collaboration between Agro2Agri, Jay Biotech and AINIA, and SEIPASA and IARI

ISIP's biotechnology projects in the fields of agriculture and food have promoted innovation in ground-breaking areas such as nutraceuticals, the application of enzymes to the food industry or biostimulants and biopesticides. One of such success stories is the project implemented by the Spanish company Agro2Agri of **Dadelos Agrosolutions**, with the collaboration of the Indian company **Jay Biotech** and the Spanish institute **AINIA**, regarding biostimulants and biomedical products based on the combination of microorganisms with stabilised organic products. The goal of the project was to develop a new line of high-tech products, based on the encapsulation of beneficial microorganisms and biostimulating plant extracts.

One of the determining factors in this success was the optimal identification of counterparts and opportunities. First of all, by participating in the Spanish business and institutional missions –promoted by the CDTI and ICEX– to attend the main fairs and sectoral summits in India, to visit potential local bodies with potential complementarities to

set up a consortium. Second, once the appropriate bodies had been identified, by creating a climate of trust among the partners and by collaborating in the preparation of technical reports to identify opportunities for collaboration.

The collaboration and integration of synergies between the three organisations was another of the determining factors of success. Agro2Agri contributed its knowledge and technology on biostimulants, the result of its 25 years of experience in the sector. From its R&D&I centre in Pune, Jay Biotech contributed its know-how on microorganisms and field tests throughout different areas of India. And as a subcontractor, AINIA developed all the phases related to the encapsulation process. The great experience of the participants at a human and cultural level confirms the great personal affinity in the Indo-Spanish projects.

In the phytosanitary field, the Spanish company **SEIPASA**, in collaboration with the **Indian Agricultural Research Institute (IARI)**, developed a product based on natural extracts and

oils including garlic, karanja, capsaicin or sesame. The main goal of the design of this biopesticide of botanical origin was to obtain a high-quality product that could meet the applicable requirements to consider its use in organic farming.

The synergies and complementarities between the two organisations were essential to develop the project. The IARI provided the necessary raw materials, technology and knowledge to develop an analysis methodology focused on the characterisation of active secondary metabolites in the active starting materials. SEIPASA was in charge of the creation of prototypes to subsequently select the commercialisation formula, and collaborated in the tasks performed by the IARI and was responsible for the planning and coordination of the project development.

The technical collaboration between SEIPASA and the IARI made it possible to successfully evaluate the phytosanitary potential of the botanical materials described. As a result of this collaboration, SEIPASA established commercial relationships with different Indian companies, mainly with raw material suppliers.

The success of the collaboration in biotechnological projects in the health sector, financed by the ISIP: The case of ZeClinics and Dr. Reddy's Institute of Life Sciences

The ISIP's projects in biotechnology in the fields of health and biomedicine have promoted innovation in ground-breaking areas including natural products based on traditional medicine, biosensors for the detection of diseases or the generation of transgenic zebrafish that express mutations of human tyrosine kinase for use as human models of gliomas – a type of brain tumours. The latter was the result of the collaboration between the Spanish company **ZeClinics**

and Dr. Reddy's Institute of **Life Sciences** of Hyderabad.

Since one of the main problems in cancer research is the need to have adequate models that can mimic the disease and allow evaluating treatments to determine their effectiveness, and zebrafish is an emerging and innovative model organism in the development of new therapies to fight against human diseases, the aim of this project is precisely to model the glioma or brain cancer in zebrafish in order to study various treatments focused on eradicating the disease. ZeClinics has been in charge of generating the mutants, while from Dr. Reddy's Institute of Life Sciences (DRILS) in Hyderabad they will test the treatments to observe any changes in the generated model. The technological result will allow ZeClinics to have a perfect tool to

assess pathologies within the spectrum of oncology.

This project is offering knowledge and innovation synergies and major opportunities at a technological, commercial, corporate and social level. At the corporate level, if the treatment applied by DRILS is successful, it would strategically position ZeClinics in the field of oncology. In the field of business development, these models are likely to become a part of the company's own portfolio and be marketed as a tool for screening or efficacy of molecules. At a social level, taking into account that 80% of all malignant brain tumours correspond to gliomas, obtaining an effective treatment will represent hope for thousands of patients.

were highlighted in the areas of hybridisation, network integration or storage, in which Spanish technology holds a leading position, such as **ACCIONA**, a pioneer in the development of hybrid plants of power storage in integrated batteries in Spain.

5.7.

The digital and information technology opportunity in the post-COVID 19 context

India's commitment to becoming a global digital power through the digitisation of its economy, its society and its government, is reflected in a series of initiatives taken in the last few years, including the digital identification of citizens through the Aadhaar programme, or



Wind farm in Muppandal (India).

IN DETAIL 17

The success of the collaboration in renewable energy projects financed by the ISIP: The case of Vortex FDC and NIWE

The ISIP's projects in renewable energies have promoted innovation in ground-breaking areas including the auscultation system of energy reception elements in thermosolar plants or the estimation of wind and energy production for wind farms in the region of Tamil Nadu, India. The latter was developed by **Vortex FDC** and the **National Institute of Wind Energy (NIWE)**.

This project consisted in the development of a computer interface for estimating energy production so that the estimates are as close to reality as

possible. Since wind farms are often required to make short-term production estimates for companies in charge of managing the electricity grid, these estimates usually have to be made within 24 hours and several times throughout the day. However, in the event of an error, wind power promoters are penalised by the company in charge of managing the network.

The project developed by VORTEX FDC together with NIWE was very beneficial for both of them from different points of view. In the field

of innovation, it allowed the development of technology – power and weather forecasting – that was essential for the Indian wind farm ecosystem, which VORTEX FDC has subsequently commercialised in other markets. At a corporate level, NIWE met its goal of innovating and developing wind technology in India, and VORTEX FDC gained recognition that allowed it to identify potential clients in the Indian market. Finally, in the field of business development, the close relationship established between both companies allowed NIWE and VORTEX FDC to carry out other projects in parallel, like a Wind Resource Map for the entire country.

the strategies for the digital transformation of the administration, artificial intelligence (AI), blockchain and cloud computing. With Big Data as its major economic asset, India is excellently positioned to become the world's leading centre for data management and analysis. The construction of a digital ecosystem in India with large multinationals like Tata Consultancy Services, Infosys, HCL Technologies, or Wipro, together with startups in services related to artificial intelligence, the internet of things, software or digital technology, are becoming essential for its transformation into a global digital power. Its geographical position also offers it a centrality in submarine telecommunications cables. Chennai is one of the most important landing points of Asia, including the South East Asia–Middle East–Western Europe 4 (SEA-ME-WE 4), a submarine fibre optic cable between Europe and the Persian Gulf with the Southeast Asia; the i2i of Bharti Airtel and Tata's TIISCS of, both for the direct connection of India with Singapore, or the Bay of Bengal Gateway, connecting the Arabian peninsula with Malaysia.

India has one of the largest digital markets, both in absolute numbers and growth rate. It had 560 million internet users in 2018, second only to China, and an average monthly mobile data consumption per user of 8.3 gigabits (GB), compared to China's 5.5 GB (McKinsey Global Institute, 2019). Although China has emerged as the world leader in fintech –its financial technology companies account for approximately 70% of the world's total value– and in e-commerce, with more than 40% of global digital transactions (IMF, 2019), the implementation of 5G, and the possible exclusion of Huawei for the benefit of Ericsson and Nokia, which have shown their intention of manufacturing the 5G components in India, represent a new frontier in digital economy for the current disputes between China and India.

India has experienced a revolution in its technological startups in the last few years. Supporting the incubation of technology-based companies in India with institutions like Sine-IIT Bombay, the IIT Madras Incubation Cell, the Centre for Cellular and Molecular Platforms or the Venture Centre of Pune is becoming essential for the increase in the number of technological startups in recent years. In turn, Spain has managed to position itself more solidly as an ecosystem for technological startups in areas like fintech or e-commerce (see Illustration 43).

The complementarity of both ecosystems allows progress in their interconnection and cooperation. In the webinar “Accelerating digital transformation: Synergies between Spain and India”, organised in November 2020 by the Indo-Spanish Chamber of Commerce in collaboration with the Spain-India Council Foundation, these opportunities for collaboration have come to light. This alliance has already been shown at a practical level in the numerous projects of the ISIP in the field of digital transformation, including areas like intelligent transport systems, unmanned air vehicles for agricultural and fire control uses, the implementation of the internet of the things to the oil industry, smart urban lighting or neural networks to monitor water pollution.

In the business area, these synergies offer new channels for business collaboration in digital economy, including the internet of things, information technologies or digital health, as well as possibilities to explore digital entrepreneurship in joint applications that seek to meet common or complementary needs in both markets. As an example of the participation of Spanish companies in the Indian digital economy, **Lleida.net**, an innovative company that offers certification solutions to electronic notification and procurement processes, has operated for years in India, where it has patents

ILLUSTRATION 43 / Growth of the ecosystem of startups in Spain and India

Main emerging startup ecosystems in the world in 2020		European hubs per number of startups in 2018	
1	Mumbai	1	London 8,974
2	Jakarta	2	Paris 2,750
3	Zurich	3	Berlin 2,330
4	Greater Helsinki	4	Amsterdam 1,542
5	Guangzhou	5	Madrid 1,235
6	Barcelona	6	Barcelona 1,197
7	Madrid	7	Stockholm 1,150
8	Philadelphia	8	Dublin 1,032
9	Manchester-Liverpool	9	Helsinki 761
10	Research Triangle	10	Copenhagen 667
Source: Startup Genome		Source: Mobile World Capital Barcelona	
Rate of entrepreneurial activity * in Asia in 2019 (%)		Countries with the most unicorns in the world in 2020	
1	India 15%	1	United States 233
2	South Korea 14.9%	2	China 227
3	China 8.7%	3	United Kingdom 24
4	Taiwan 8.4%	4	India 21
5	Japan 5.4%	5	South Korea 11
*The rate of entrepreneurial activity measures all the entrepreneurial initiatives of less than three and a half years that exist in a market. Source: Global Entrepreneurship Monitor		Source: Hurun Research Institute	
Main Indian unicorns in 2020	HQ	Sector	Value, in billion dollars
1	Paytm	Noida	FinTech 16
2	OYO Rooms	Gurgaon	E-commerce 8
3	BYJU's	Bangalore	EdTech 8
4	OLA Cabs	Bangalore	Shared economy 6
5	Swiggy	Bangalore	On-demand delivery 3.5
6	Zomato	Gurgaon	On-demand delivery 3.5
Source: Hurun Research Institute			



India has experienced a revolution in its tech startups.

for its innovations in the field of procurement and digital notification. It has recently also obtained the license for the brands Openum and Blockchain, strengthening the company's positioning in India.

At an institutional level, it represents an opportunity to connect two countries that still lack optimal mutual knowledge in the field of the digital economy. The Mobile World Congress (MWC) is the ideal platform to promote this dialogue and exchange. On the one hand, the main Indian authorities of the sector go to Barcelona within the framework of the MWC, including the presence of the Minister of Telecommunications Manoj Sinha in 2018. The Digital Future Society, a global programme promoted by the Ministry of Economic Affairs and Digital Transformation of Spain, in collaboration with Mobile World Capital, to address the ethical, social and economic challenges of digital transformation, is the ideal space to maintain this bilateral digital dialogue at an institutional and civil society level. On the other hand, the main Indian technology companies and startups attend the congress annually, except for the year 2020, which was cancelled due to the COVID-19 pandemic. The 4YFN Barcelona, held in the sidelines of the MWC

and attended by the main Indian startups, is the appropriate space to promote this exchange between startups from both countries.

COVID-19 has sped up the digital transformation that global society was already experiencing. This digital impact also has repercussions at a bilateral level, offering an opportunity to virtually institutionalise relations between two countries that still lack an optimal mutual understanding. Political commissions, thematic conferences, meetings between the civil societies, sectoral dialogues or trade missions have opted for their virtual form, thereby enabling an increase in the frequency of exchanges, their cost efficiency and a greater dissemination. Social networks offer a window to multiply the impact of bilateral promotion and mutual knowledge through public diplomacy. In the post-COVID-19 scenario, the use of hybrid exchange systems, which combine preparatory and follow-up digital meetings with face-to-face visits and meetings, could become the necessary asset to increase the up-until-now scarce exchanges between both countries and to connect their civil societies.

Ideas and proposals for the revitalisation of relationships in science, technology and innovation.

Joint initiatives in science, innovation and technology are undoubtedly a success of bilateral cooperation. The pillars of our relationship, based on a mutual interest in scientific and technological development, and on a joint benefit for both parties without being direct competitors, are robust and allow Spain to position itself in India at a high level of public and private dialogue. This sometimes occurs over other countries that have a more solid and cohesive historical corporate and institutional presence. The keys to this success are a government relationship framework in which all interested ministries are represented on the Indian side; the existence of a specific articulation mechanism (the ISIP), the bilateral commitment through its financing by both parties, the ongoing work of the offices in charge of their promotion, tracing and follow up (the CDTI, the GITA and the DBT), and the connection networks between the professionals in charge, established after more than 10 years of joint management of the programmes.

Both in the EU initiatives in India in the fields of science, innovation and technology –in which Spain has shown great capacity for participation, well beyond other European countries–, and in the specific ISIP programme, the budget and available funding are being used with high efficiency. The work of institutions such as the CDTI has been essential in identifying projects of mutual interest, disseminating joint collaboration opportunities, the matchmaking of counterparts and the assistance and monitoring of projects. The structure of our bilateral cooperation is strong enough to further our alliance to a new level of strategic partnership in innovation.

The measures compiled in this process of joint reflection, which could continue to boost our

alliance in science, technology and innovation towards new challenges, include:

1. Furthering the relationship in science, innovation and technology to a **new level of strategic partnership, with a higher degree of stability and commitment, that seeks the institutional integration of its networks and ecosystems**, and promotes the regular holding of the bilateral commission beyond the framework of official visits. Projects that are already in the analysis phase, like the virtual oncology research centre or the biotechnology corridor, are examples of how this integration can be carried out. Within this path of collaboration, the creation of other hybrid research centres, first virtually and then face-to-face with exchanges, teams and joint projects, could be carried out in areas that are still unexplored, including agricultural research, nanotechnology or chemistry.
2. For the development of this institutional integration, **new bilateral structures could be created to finance cooperation in technological and industrial development with India**, which could include projects of larger financial scale and a joint fund. Examples of these bilateral funding structures with India include France, through the Indo-French Centre for the Promotion of Advanced Research (CEFIPRA, in French); Germany, through the Indo-German Science and Technology Centre; or Israel, through the India-Israel Industrial R&D and Technological Innovation Fund (I4F).
3. The recent collaboration agreement in astrophysics, signed during the COVID-19 pandemic, shows that there is still a bilateral interest in these strategic areas. It would be convenient to continue promoting **cooperation agreements in fields that offer opportunities for bilateral collaboration**,

including cancer research, digital medicine, pharmaceutical innovation, electric mobility or digital economy, which promote synergies between public institutions and centres from both countries.

4. Science, technology and innovation, as an asset of common understanding and mutual commitment, must be a **cross-cutting central point in the MoUs, dialogues and official visits** between both countries. Bilateral agendas, agreements and projects should always have an innovative perspective, even in areas such as tourism, education or gastronomy, from where joint projects are generated in the field of technological and digital innovation.
5. **Continuing to develop and promote the ISIP**, reactivating specific calls in clean and renewable energies to promote hybridisation, network integration and storage projects, creating digital matchmaking platforms and facilitating the uniformity of deadlines for both parties of the project, preventing projects from having two different speeds that complicate joint coordination.
6. **Increasing the presence of Spanish science and technology in India through science diplomacy plans**, coordinated by the Ministry of Science and Innovation and the Ministry of Foreign Affairs of Spain. Promoting the participation in programmes and activities by Spanish experts and researchers that generate attraction and interest in the Indian scientific community, including the involvement of networks like SOMMA (Alliance of Severo Ochoa Centres and María de Maeztu Units of Excellence).
7. Furthering a sectoral approach strategy in **science and technology beyond Delhi**, by promoting new actions in the field of pharmaceutical innovation and biotechnology in Hyderabad, in artificial intelligence in Bangalore, in renewable energies in Chennai or in chemistry in Mumbai.
8. Continuing to promote **scientific mobility** between Spain and India, in coordinated actions between EURAXESS India and the FECYT, through digital information campaigns on exchange programmes and making mobility success stories visible, creating cooperation and exchange networks between institutions, researchers and students, and disseminating bilateral and European funding programmes.
9. Continuing to promote the **collaboration between Spanish and Indian business fabrics** in still unexplored areas of innovation through personalised dissemination of financing channels, digital fora that promote collaboration opportunities and hybrid platforms that favour a matchmaking of organisations and projects. Exploring new opportunities for collaboration, like the one that can be established between Spanish companies with technology patents and large Indian companies, that allow incorporating Spanish technology to the Indian market.
10. Encouraging knowledge and exchange between **startup ecosystems, including the construction of a bilateral dialogue in the sidelines of the Mobile World Congress and the Spanish participation in the EU Innovation Zone in India**. Encouraging the generation of joint projects, both to identify common needs in the different digital markets and for start-ups to participate in existing projects that offer commercial development to multi-sectoral projects in the field of digital economy.

* The proposals and ideas contained in this document do not necessarily reflect the position of the Spain-India Council Foundation, nor that of its trustees, nor that of the Indo-Spanish Chamber of Commerce, nor that of any of the entities or individuals that have contributed to this exercise.

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This document has involved the essential participation of the CDTI and its delegate in India, Adrián Gutiérrez, whose contributions have been essential both to the implementation of the bilateral mapping and to developing the joint analysis. Additionally, we have collected the visions and anonymous considerations of 200 people and institutions interested in our bilateral relations through surveys and online forms, as well as from 80 bilateral stakeholders through customised virtual interviews.

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