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European Cluster Collaboration Preparatory Briefing on the United States of America

SPI, ECCP

Abstract: The preparatory briefing on the United States of America is the result of the collection of relevant cluster information in the country, including business and sector trends, cluster policies and programmes, as well as a cluster mapping. It concentrates on the so-called industrial complexes. This document is intended to provide a good overview of the country's opportunities for European cluster organisations and SMEs.

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1. USA Economy: focus on sectoral trends

2.1. Overview

The United States of America (USA) is a stable and democratic country and one of the world's largest economies with a GDP per capita of \$55,798¹ (€50,004²) for 2015. Being one of the most influential nations, the USA holds membership in several relevant international organisations such as the International Monetary Fund (IMF), the World Bank (WB) and the United Nations (UN).

The country has a predictable business environment strengthened by a stable political context. The USA's Political Risk Index (PRI) scored an 84 in 2015³, which places the USA among the first 30 countries with the lowest regional political risk in the world.

The diplomatic relationship between the European Union (EU) and the USA, which can be traced to 1953, was formalised with the Transatlantic Declaration in 1990 and the New Transatlantic Agenda (NTA) in 1995. It was further strengthened during the following years through new treaties and initiatives that boosted the transatlantic cooperation. The areas for joint action between the EU and USA include the commitment to promote development, to address global challenges and to contribute to the liberalisation and expansion of world trade.

As a consequence of these efforts, the EU-USA bilateral trade relationship is the most integrated economic relationship in the world.⁴ The Transatlantic Trade and Investment Partnership (TTIP), the free trade agreement that is being currently negotiated between the USA and EU, would represent the culmination of this long-term association.

2.2. Opportunities for Europe – investment, trade and Science, Technology & Innovation cooperation

The relationship between the EU and the USA defines the shape of the global economy as a whole: either the EU or the USA are the largest trade and investment partners for almost all other regions and countries of the world. In fact, the EU and the USA economies together account for one third of the entire world GDP. Even though the EU and the USA accounted together for only 27% of global exports and 31% of global imports in 2015, they represented 66% of the outward position and 57% of the inward position of global Foreign Direct Investment (FDI) in the same year⁵.

¹ <https://data.oecd.org/united-states.htm>

² Oanda, USD 1 = EUR 0,89616, 5th of September 2016

³ <https://www.prsgroup.com/category/risk-index>

⁴ <http://ec.europa.eu/trade/policy/countries-and-regions/countries/united-states/>

⁵ <http://www.amchameu.eu/publications/transatlantic-economy-2017>

After its eighth consecutive year of expansion, the economy of the USA is expected to continue growing steady at a rate of 2.5% in 2017⁶. Due to its large population and stable political situation, the USA is one of the most competitive markets in the world. Besides that, the country has also an open economy and is one of the countries with the fewest political and security risks for businesses and their workers.

In regards to FDI, the USA invested an estimated €220 billion in 2016 in the EU which represents 70% of total USA FDI outflows globally. At the same time, the USA is one of the world's leading destinations of foreign investment mostly because the barriers put on foreign investment are low. In 2016, the EU accounted for 72% of global FDI inflows to the USA representing \$385 billion⁷.

The EU and the USA are each other's largest trading partners. The EU-USA merchandise trade totalled roughly \$687 billion during 2016, almost double the level at the start of the new century. In 2015, the USA was a leading trading partner with the EU, accounting for 18% of the total trade in 2015⁸. The EU was the second largest trade partner of the USA both in terms of its exports (17%) and imports (18%) and the USA was the first destination for EU exports (16%) and the third country in terms of EU imports (12%)⁹.

In regard to the TTIP, the future seems uncertain. The negotiations are heavily dependent on the changing political climate and the difficulty to reach compromises in certain points, especially the non – tariff barriers originating from the diverging regulatory systems and other non- tariff measures related to aspects of security and consumer protection¹⁰. However, there are a wide range of ongoing dialogues in the Transatlantic Economic Council (TEC)¹¹, which support the continuity of the efforts dedicated to expand the bilateral cooperation (e.g. investment agreement practices between the EU and USA and in third countries, resource efficiency, SME cooperation, ICT trade principles or innovation action partnership).¹²

According to the European Commission, Directorate General for Trade, over the 2013 – 2014 period, the USA was the most active country in the world to embrace procurement-related trade restrictions, especially at state level. The current monitoring period has revealed a growing trend in the country's states imposing their own domestic content requirements, among which stand the “Buy American” type amendments.¹³

In terms of technology, the USA is believed to be the most powerful country in the world. The American firms are at or near the forefront in technological advances, especially in computers, pharmaceuticals, medical, aerospace, and military equipment¹⁴. In this sense, the USA spent about 2.7 % of its GDP in 2013 (Gross Domestic Expenditures on Research and Development

⁶ <http://www.imf.org/external/pubs/ft/scr/2016/cr16226.pdf>

⁷ http://www.amchameu.eu/sites/default/files/publications/files/170227_full-book.pdf

⁸ European Union, Trade in goods with USA; key figures, page 2;

http://trade.ec.europa.eu/doclib/docs/2006/september/tradoc_113465.pdf

⁹ <http://stat.wto.org/CountryProfile/WSDBCountryPFView.aspx?Language=E&Country=US,E28>

¹⁰ <http://ec.europa.eu/trade/policy/countries-and-regions/countries/unite>

¹¹ <http://www.euintheus.org/what-we-do/how-eu-us-relations-work/>

¹² http://trade.ec.europa.eu/doclib/docs/2011/december/tradoc_148391.pdf

¹³ http://trade.ec.europa.eu/doclib/docs/2014/november/tradoc_152872.pdf

¹⁴ <https://www.cia.gov/library/publications/resources/the-world-factbook/geos/us.html>

(GERD) as a percentage of GDP) **Erreur ! Signet non défini.** on research and development (R&D). This has been encouraging the EU to cooperate with the USA in several initiatives in research, development and innovation (RDI) through cooperation agreements.

Concerning RDI, the cooperation between the EU and the USA is governed by the "Agreement for Scientific and Technological Cooperation", which was signed in 1998 and renewed since then (now valid until October 2018). The priority areas for EU-US cooperation in Science, Technology and Innovation are: Health, Marine and Arctic Sciences, Nanotechnologies, Advanced Materials and Processes (NMP), and Transport. Following the EU – US Summit in 2014, the EU and USA underlined the commitment "to expand cooperation in research, innovation and new emerging technologies, and protection of intellectual property rights as strong drivers for increased trade and future economic growth". They specifically referred to space cooperation, climate change and energy¹⁵. The Bilateral Coordination project for the Enhancement and Development of S&T Partnerships between the EU and USA (BILAT USA 4.0)¹⁶, funded by Horizon 2020 programme, supports the cooperation and policy dialogue in this field¹⁷, as well as other sectoral projects such as PICASSO¹⁸ (also funded by H2020) in the ICT sector. There are also many other EU – USA agreements in place (e.g., the EU – US Task Force on Biotechnology research¹⁹), which offer a very well constituted framework to establish further collaboration and, therefore, enhance the attractiveness of the country for business. In October 2016 the European Commission and the US Department of Commerce signed the [Implementing Arrangement](#) which already facilitates collaboration under H2020.²⁰

2.3. Sectoral strengths

As stated previously, the USA is the world's most technological advanced country and has one of the largest economies in the world. As a result, the country enjoys a forefront position in many key sectors whose potential for development has overshadowed those more traditional. As a matter of fact, even though the agricultural and manufacturing sectors remain strong and have the greatest contribution to the American GDP, there are other fields in the service sector that have a prospective growth that make them attractive for foreign investment.

Although there is a variety of sectors that present countless market opportunities for the EU, some of them offer more potential gains due to their current expansion, status of innovation, attention from consumers, and relevant agreements between the EU and USA. Based on these criteria, **the water, energy, aerospace, biotechnology and information and communication technology (ICT) industrial sectors** would be strategic industrial sectors for the EU regarding the USA²¹.

¹⁵ <http://ec.europa.eu/research/iscp/index.cfm?amp;pg=usa#policydialogue>

¹⁶ <http://www.euussciencetechnology.eu/>

¹⁷ <http://www.euussciencetechnology.eu/about/project>

¹⁸ <http://www.picasso-project.eu/>

¹⁹ https://ec.europa.eu/research/biotechnology/eu-us-task-force/index_en.cfm

²⁰ <http://ec.europa.eu/research/iscp/index.cfm?pg=usa>

²¹ http://ec.europa.eu/eurostat/statistics-explained/index.php/USA-EU_-_international_trade_and_investment_statistics

Water sector

The water industry in the USA is growing rapidly, offering opportunities in different related sectors such as equipment and oil and gas. The water technology market is starting to be more convergent, meaning that communication between the different actors is increasing. Specific questions or problems are addressed by efforts of actors working together in the network, for example participating in public-private partnerships. Because the different actors in the USA water sector related to technologies are collaborating and communicating more, the technology-economic network is a strong network^{22,23,24,25}.

Within the USA water sector, there are several potential technological opportunities for EU companies, including the need for:

- Rehabilitation of drinking water and wastewater infrastructures which require investments in maintenance as well as cost effective assessments (e.g. leak detection, prediction models of condition systems, asset management models);
- Technologies and approaches that foster substantially greater water reuse, or sewer mining, which in turn can reduce pollution and conserve energy;
- Desalination solutions, particularly in the arid coastal regions, to overcome challenges as brine disposal, pre-treatment optimisation, energy conservation and overall productivity of membrane systems;
- Technologies that address non-point sources of pollution, since there is a demand for storm water control mechanisms and green infrastructure (e.g. recharge basins, rapid infiltration beds, bioretention systems);
- Emerging technologies for treating and recovering nutrients in a more efficient way from water and wastewater, driven by the need to reduce nutrient pollution (e.g. more stringent regulations) in surface water and drinking water supplies (for instance caused by nitrogen and phosphorous);
- Changes in treatment processes to avoid noncompliance with new disinfection byproduct (DBP) rules;
- Smart water grid techniques (e.g. smart water meters, electromagnetic and acoustic sensors, basic data management software, real-time data analytics and modelling software) to address non-revenue water, to increase energy efficiency and reduce costs;
- Monitoring and removal of emerging contaminants (e.g. pharmaceuticals, nanomaterial), since EPA implemented stricter drinking water limits on numerous contaminants^{26,27}.

In summary, the aging water infrastructures in the USA and consequent need for rehabilitation offers a promising opportunity for European businesses in the water sector. Because of concerns

²² http://www.weiserllp.com/pdfs/WeiserMazars_2014_US_Water_Industry_Outlook.pdf

²³ <http://bv.com/docs/reports-studies/sdr-water-industry.pdf>

²⁴ http://www.ev.com/Publication/vwLUAssets/Cleantech_Water_Whitepaper/%24FILE/Cleantech-Water-Whitepaper.pdf

²⁵ <https://www.rvo.nl/sites/default/files/2013/10/The%20water%20technology%20sector%20in%20the%20US.pdf>

²⁶ http://www.weiserllp.com/pdfs/WeiserMazars_2014_US_Water_Industry_Outlook.pdf

²⁷ <https://www.rvo.nl/sites/default/files/2013/10/The%20water%20technology%20sector%20in%20the%20US.pdf>

over sustainability and water safety, opportunities particularly exist for European businesses that provide alternative water supply strategies and advanced purification technologies.

Energy sector

The USA is one of the world's largest energy consumers. The country has only 4.6% of the world's population, but uses 25% of the world's oil, gas and electricity²⁸. The USA is also a leader in the production and supply of energy. USA energy companies produce oil, natural gas, coal, renewable fuels, as well as electricity from clean energy sources such as wind, solar, and nuclear power. US energy companies further transmit, distribute, and store energy through complex infrastructure networks that are supported by emerging products and services such as smart grid technologies. As a result, the USA is one of the world's most attractive markets with total investment in the US energy sector at \$280 billion in 2015.

The energy sector offers several opportunities in the following energy industrial sub-sectors:

- **Renewable Energy:** The USA is home to a thriving renewable energy industry, with globally competitive firms in all technology subsectors, including the wind, solar, geothermal, hydropower, biomass, and biofuels sectors. The USA already had the second highest investment in the world in 2015, with nearly 16GW of new renewable energy capacity and \$91 billion in clean energy transactions according to Bloomberg New Energy Finance. In 2015, while clean energy investments slumped in Europe and Brazil, the USA increased by 8% and accounted for 17% of the world's total new renewable energy investment.
- **Renewable Fuels:** With access to abundant natural resources, the pellet and ethanol industries are also increasing their capacity, particularly to serve overseas markets. The USA ethanol industry is the largest and most efficient in the world, incorporating technological innovations to produce nearly 15 billion gallons of ethanol annually. Investment opportunities also exist for the development of advanced biofuels utilising new technologies and feedstocks, particularly in the aviation sector. In 2015, over 4.5 million metric tons were exported and new pellet mills have been brought online to meet the growing demand.
- **Nuclear Energy:** The USA operates the most nuclear reactors, has the largest installed nuclear power capacity, and generates the most nuclear power in the world. Nearly 20% of USA electricity is produced at 99 nuclear reactors in 31 states. By 2021, four new nuclear reactors are expected to come online, and license applications exist for 20 additional new reactors. Subsectors of the civil nuclear industry are represented by companies that produce nuclear components, nuclear fuel, nuclear engineering and construction, and nuclear advisory services. The international civil nuclear marketplace is estimated at more than \$500-740 billion over the next decade and has the potential to generate more than \$100 billion in USA exports and thousands of new jobs.
- **Smart Grid:** The USA is an international leader in the development and deployment of smart grid technologies and services. The smart grid subsector is defined by the electric grid equipment and services required for the modernisation of distribution and transmission systems, as well as the ICTs that support a fully networked grid and enable

²⁸ <http://www.energyjustice.net/solutions/factsheet>

two-way communications and electric flows. This sector is gaining a renewed focus on investment. Reasons for increased investment include reliability enhancement, connecting to renewables, demand shifts, cost increases, and market reforms that create more options for independent generators and as such require new connections to transmission systems. This includes a strong interest from USA utilities to address the potential effects of distributed energy resources. Since 2009, investment in the modernisation of America's electricity infrastructure has increased dramatically, in large part due to the nearly \$8 billion in 99 public-private Smart Grid Investment Grant (SGIG) projects involving more than 200 electric utilities. These projects have helped push the deployment of smart meters to more than 40% of the country's 144 million electricity consumers. In addition to public-private programmes like the SGIG, investor-owned utility investment in grid modernisation continues to rise. For example, since 2001 investor-owned utility transmission system investment grew at a compound annual growth rate of over 20% reaching almost \$20 billion²⁹.

In summary, the high and growing demand for energy in the USA combined with a competitive workforce and supply chain capable of building, installing, and servicing all energy technologies makes the USA one of the world's most attractive energy markets for EU businesses in the energy sector.

Finally, the growing demand for clean and sustainable energies due to environment concerns, while maintaining a reduction in costs, offers an opportunity for EU businesses providing alternative and sustainable ways to produce, store and service energy.

Aerospace sector

In terms of revenues, the aerospace industry of the USA is the most important in the world, accounting for about 60% of the total revenues worldwide (2015). The country leads both segments of the sector - commercial and defence. Profiting from being the largest market in the world, having extensive distribution systems, a skilled workforce and strong support at local and national level for policy and promotion. The aerospace industry in the USA is mature and competitive enough to host any highly innovative company from the EU³⁰.

The global aerospace industry is expected to grow at 5% until 2030, as a consequence of the steady growth rate in the commercial sector and the increasing defence budget in key nations such as USA, UK, France, Japan and several Middle Eastern countries³¹. In 2015, the USA export revenues reached \$131.1 billion (37.2% of total aerospace exports)³² with commercial aircraft leading the way, representing one third of all USA industry sales³³.

²⁹ <https://www.selectusa.gov>

³⁰ Pastor Cornejo, M. (2015) « El mercado Aeronáutico en EE.UU » ICEX - Oficina Económica y Comercial de la Embajada de España en Los Ángeles

³¹ <http://www2.deloitte.com/global/en/pages/manufacturing/articles/global-a-and-d-outlook.html>

³² <http://www.worldstopexports.com/aerospace-exports-by-country/>

³³ http://laedc.org/wp-content/uploads/2016/03/LAEDC_Aerospace_FINAL_20160331b.pdf



FIGURE 1 - USA AEROSPACE AND DEFENCE EXPORT COMPETITIVENESS³⁴

President Obama's National Exports Initiative (NEI) aims at creating jobs by doubling USA exports. In this regard, the aerospace industry accounted for the highest trade surplus of any manufacturing industry with a positive trade balance of \$82.5 billion. Washington, California and Connecticut were the top three states for Aerospace & Defence (A&D) exports for the same period³⁵, but Texas and Kansas also shows an important specialisation in the sector and Arizona is gaining more presence³⁶.

The most promising subsectors in the industry are Unmanned Aircraft Systems (UAS or drones) and the Airport Infrastructure & Aviation Security. Given the rapid growth of military and civil governmental UAS operations, there is tremendous potential in the sector. In the case of the first sub-sector, the USA Government has shown its commitment through initiatives like the creation of the FAA's Center of Excellence for UAS and the partnership with industry through the Focus Area Pathfinder initiative. With respect to the second subsector, Airport Infrastructure & Aviation Security, markets continue to grow both in the United States and abroad. As air traffic management moves to greater reliance on data communications, the focus in aviation security has shifted from countermeasures to physical threats to contain and mitigate cybersecurity threats. The growing presence of unmanned aircraft systems has helped to increase the importance of cybersecurity measures, given the dangers of loss of control and pirated data³⁷.

³⁴ <https://americansecuritytoday.com/aerospace-defense-largest-contributor-us-exports/>

³⁵ <http://www2.deloitte.com/global/en/pages/manufacturing/articles/global-a-and-d-outlook.html>

³⁶ http://www.clustermapping.us/cluster/aerospace_vehicles_and_defense

³⁷ <https://www.selectusa.gov/aerospace-industry-united-states>

Aeronautics is one of the EU's key high-tech sectors on the global market³⁸. Despite the existence of a 3.4% gap (as the EU exports reach €17 billion but it imports €26 billion³⁹), European aerospace and defence sector, led by France and United Kingdom, is eclipsing the USA in revenue growth, likely due to increased market competitiveness, increased defence spending and continued growth in commercial aircraft production. This could allow the EU to access markets abroad and, more specifically, to take advantage of the good conditions of the USA Aerospace sector.

As seen in other sectors, the USA and the EU signed in 2011 a Memorandum of Understanding (MoU) concerning the aerospace: Single European Sky ATM Research Programme (SESAR) and Next Generation Air Transportation System (NextGen). This joint collaboration aims at harmonising the modernisation and advances in air navigation systems worldwide to support cooperation, clear communication, seamless operations and optimal safe practices. Two of the most relevant areas addressed in the MoU are Cybersecurity and Remotely Piloted Aircraft Systems (RPAS)⁴⁰.

In summary, travel demand, new technologies and security threats are fuelling increases in aircraft production, defence budgets and the global supply chain. The prospective growth of the aerospace industry is very positive and the available budget for R&D seems to be increasing each year, which will help to develop new fields with huge potential. This includes space; a priority both for the EU (H2020)⁴¹ and the USA⁴².

In terms of legislation, the policy environment is favourable too. In spite of some disputes regarding the state protection in the industry settled in the World Trade Organisation (WTO), there are already many joint initiatives between the EU and the USA (more information is provided in the document "Discussion paper on the United States of America" from the ECCP).

Biotechnology sector

The biotechnology sector comprises a wide range of fields such as pharmacy, food, agriculture, environment, medicine and energy. Being all of them very profitable, biotechnology as a whole offers a safe place for investment in the USA. The country emerged as a leader in biotechnology in the 1970's due to the synergies among universities, financing, health policies, regulation of the intellectual property and the free market economy.

The USA is responsible for 70% of the global research and innovation done in biotechnology and 86% of the financing (2015), which reflects the strong business network formed by 2,459 companies that reached \$108,773 m benefits in 2015.⁴³ These numbers place the USA very far ahead of its closest competitors. In fact, the country triplicates the volume of the European industry, led by France, United Kingdom and Germany.

³⁸ https://ec.europa.eu/growth/sectors/aeronautics_en

³⁹ http://madb.europa.eu/madb/statistical_form.htm

⁴⁰ <http://www.sesarju.eu/sites/default/files/documents/reports/State-of-Harmonisation.pdf>

⁴¹ <https://ec.europa.eu/programmes/horizon2020/en/h2020-section/space>

⁴² https://www.whitehouse.gov/sites/default/files/microsites/ostp/fy_17_ostp_slide_deck.pdf

⁴³ http://www.biocat.cat/sites/default/files/estudio_de_mercado_de_bioteecnologia_en_eeuu_2016.pdf

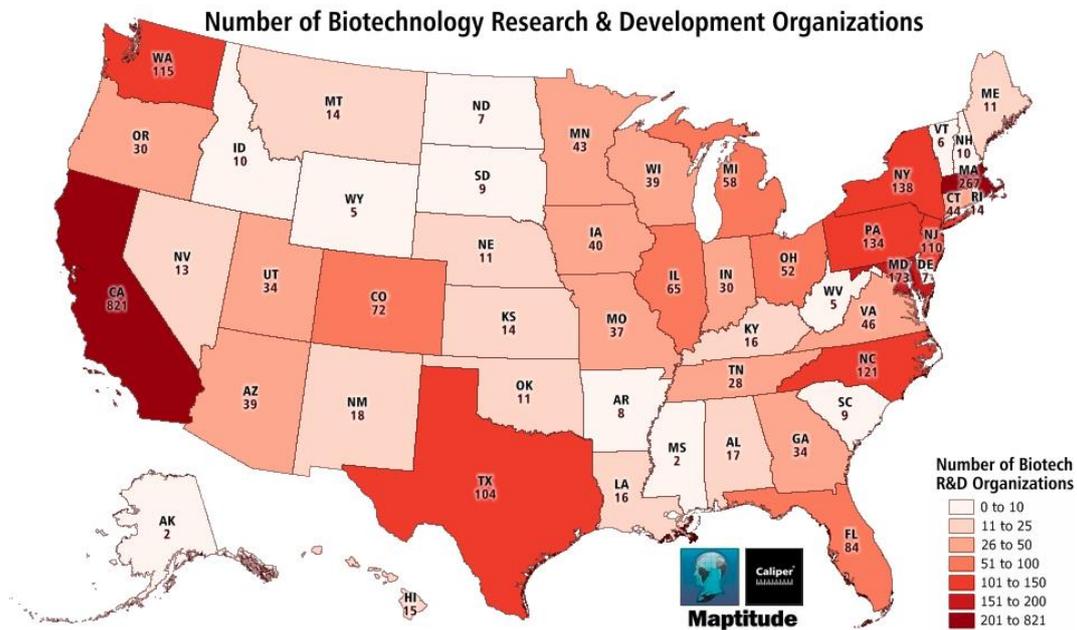


FIGURE 2 - R&D BIOTECH ORGANISATIONS ACROSS USA IN 2014 (SOURCE: MAPTITUDE)

Around 70% of the biotechnology companies are located in 10 states, with North Carolina, Massachusetts and California being the most prominent. California is the most powerful among them, representing 50% of the industry in the country. Companies in California are concentrated around the San Francisco (Bay Area), San Diego and Los Angeles clusters.

Although there are already some initiatives in the research field, the cooperation between the EU and the USA in this matter is yet to be improved. The EU – US Task Force on Biotechnology Research, established by the European Commission and the White House Office of Science and Technology in 1990, has been coordinating transatlantic efforts to promote research on biotechnology and its applications for the benefit of society. Through sponsoring activities, this Task Force brings together the scientific communities from Europe and the USA to forecast research challenges and opportunities. The current working groups are dedicated to environmental biotechnology, bio-based products, plant and animal biotechnology and bioinformatics⁴⁴.

The TTIP can modify the current situation. However, given the different regulatory systems, it might be difficult to reach an agreement between the members. There are many restrictions in this regard and a strong opposition from the European people and governments.

In summary, the trend in the biotechnology sector is promising with benefits growing each year, particularly in health, which represents 68% of the gains in the sector. In fact, the USA biotechnology sector revenue is estimated to have grown on average >10% per year over the

⁴⁴ ec.europa.eu/research/biotechnology/eu-us-task-force/index_en.cfm

past decade⁴⁵ and its contribution to the GDP in 2015 amounted to \$133 billion⁴⁶. The budget planned by the government for 2017 offers a strong support for R&D⁴² in biotechnology.

It is also worth mentioning, 52% of the capital raised in 2015 in the biotechnology sector was captured by SMEs (IBIS world). As a result of the booming stock market, historic amounts of innovation capital are available to the smaller players in the industry, which remain the wellspring of future breakthroughs.⁴⁷

Information and Communication Technologies (ICT) sector

The ICT is an umbrella term that comprises computers, chips, software, networking, telecommunications, programming and information systems technologies, and the Internet. According to the research consultancy IDC, the global information technology industry market, encompassing hardware, software, services, and telecommunications, is expected to reach \$3.8 trillion in 2016⁴⁸. The USA market represents about 28% of the worldwide total (2016)⁴⁹, which makes it the largest ICT market globally. The sector's spending is forecasted by the President Obama Administration to reach about \$774 billion in 2018.

With a vibrant culture of technological innovation and entrepreneurial activity, the USA technology sector is home to many leading and innovative hardware, software and tech service providers such as Google, Apple, Microsoft, Cisco, Hewlett-Packard, Dell, Oracle and Symantec. As a matter of fact, the country is the world leader in start-up hubs with Silicon Valley, New York City, Los Angeles, Boston, Chicago and Seattle consistently ranked as the world's top 10 start-up ecosystems.

These technological hubs enjoy great resources: top universities, leading tech companies, innovative multinational companies and active venture capital firms. This favours a competitive and dynamic market, where small and new companies often outrun the bigger players offering a better service, more innovative products, lower prices, and the ability to respond flexibly to changing customer habits and preferences⁵⁰.

⁴⁵ <http://www.nature.com/nbt/journal/v34/n3/full/nbt.3491.html>

⁴⁶ <https://www.statista.com/topics/1634/biotechnology-industry/>

⁴⁷ [http://www.ey.com/Publication/vwLUAssets/EY-beyond-borders-2015/\\$FILE/EY-beyond-borders-2015.pdf](http://www.ey.com/Publication/vwLUAssets/EY-beyond-borders-2015/$FILE/EY-beyond-borders-2015.pdf)

⁴⁸ <https://www.comptia.org/resources/it-industry-outlook-2016-final>

⁴⁹ <https://www.statista.com/statistics/263801/global-market-share-held-by-selected-countries-in-the-ict-market/>

⁵⁰ <http://www.strategyand.pwc.com/perspectives/2016-technology-industry-trends>

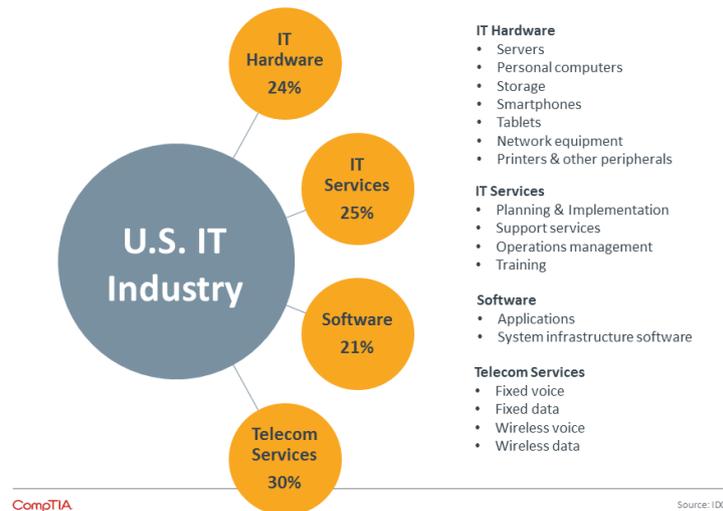


FIGURE 3 - KEY SEGMENTS OF THE USA ICT MARKET (SOURCE: COMPTIA)

Besides the American private industry, which finances roughly 60% of the total R&D⁵¹ investment, the US Government supports the ICT sector not only through funding but by creating a policy environment that fosters technological innovation⁵². The USA invests 2.7% of its GDP in R&D, a higher percentage than the 1.9% invested by the EU for the same period (2015)⁵¹, and puts great effort in implementing initiatives devoted to enhance the impact of the ICT.

The EU and the USA enjoy a privileged position in the ICT sector. Both countries together account for roughly 50% of the worldwide market. The European Union and the United States have jointly developed a set of trade related principles for the ICT services sector in the EU-USA Trade Principles for ICT Services. This initiative tackles areas such as the protection of intellectual property or the protection of privacy and of the confidentiality of personal and commercial data. It includes references to the local infrastructure or the foreign ownership, stating the need to ensure the equality for foreign and national suppliers of ICT services. In the research and innovation domain, the project PICASSO - ICT Policy, Research and Innovation for a Smart Society,⁵³ funded under the European Union Horizon 2020 programme, aims at reinforcing EU-US ICT collaboration in pre-competitive research in key enabling technologies related to societal challenges of common interest (e.g. 5G Networks, Big Data, Internet of Things and Cyber Physical Systems).

In summary, the potential of the ICT sector in the USA is unquestionable and the market conditions are optimal for European companies to benefit from making business in the country. This can be applied in general terms but more particularly to the current trend in the ICT disrupting in other sectors such as automotive, health or education – opens promising growth opportunities. Innovations such as wearables, 3D printing, virtual reality and drones should also be taken into account as they are expected to be the main drivers of growth; while smartphones

⁵¹ <http://www.oecd.org/centrodemexico/estadisticas/>

⁵² <https://www.whitehouse.gov/administration/eop/ostp/divisions/technology>

⁵³ <http://www.picasso-project.eu/project/>

remain the secondary revenue driver and automotive electronics and audio systems are likely to benefit from higher utilisation of 4G technologies during the next years⁵⁴.

Finally, the continued advancements towards a more harmonized transatlantic market would also have a positive effect on market growth. The TTIP negotiations can enhance market access⁵⁵ in the near future making it easier to harness the full power and potential of this collaboration for the companies and governments on both sides of the Atlantic.

2. Cluster community in USA

In the USA, the cluster community has been a catalyst for economic growth for over a century. The USA clusters for industrial sectors as well as for the entertainment industry emerged at the beginning of the twentieth century. Hollywood, for example, started in the city of Los Angeles in the early 1900s⁵⁶ and the largest USA automotive cluster in the region of Detroit in the 1910s⁵⁷. The high technology-oriented clusters have however emerged in the USA much later. Silicon Valley, for example, arose in the 1970s after the establishment of the Homebrew Computer Club, an informal club constituted of electronic engineers and technically minded hobbyists who had frequent meetings to trade parts and circuits as well as to share information regarding the construction of computing devices⁵⁸.

According to the Cluster Mapping Project⁵⁹ developed by Harvard Business School and the US Economic Development Association, there are:

- **US traded clusters** (national and international) in 51 different sectors. Traded clusters are those that concentrate in particular regions that provide competitive advantages but sell products or services across regions and countries. Examples of traded clusters include financial services in New York City, information technology in Silicon Valley, and video production and distribution in Los Angeles. Traded clusters usually represent a mix of companies of various sizes that by definition go international.
- **US local clusters** in 16 different sectors. Local clusters sell products and services primarily for the local market. The local clusters represent a wide range of sectors such as: local entertainment including video rental services and movie theatres; local health services including drug stores and hospitals; and local commercial services including drycleaners.

Despite their importance, the cluster organisations in the USA are not as institutionalised as in the EU. Nevertheless, there are numerous clusters that are represented by a formal cluster organisation and tend to be supported by local Economic Development Agencies (EDA's), whereas some others are part of public and/or private organisations (e.g. Federal Agencies, Industry Associations, etc.) that aim to promote competitiveness and innovation in the sector.

⁵⁴ <https://atradius.se/reports/market-monitor---ict-industry---united-states.html>

⁵⁵ http://www.digitaleurope.org/DesktopModules/Bring2mind/DMX/Download.aspx?Command=Core_Download&EntryId=518&language=en-US&PortalId=0&TabId=353

⁵⁶ <http://www.u-s-history.com/pages/h3871.html>

⁵⁷ <https://www.gilderlehrman.org/history-by-era/politics-reform/essays/motor-city-story-detroit>

⁵⁸ http://www.atariarchives.org/deli/homebrew_and_how_the_apple.php

⁵⁹ <http://www.clustermapping.us/>

These cluster organisations are mostly composed of businesses or focussed on businesses. Some clusters, such as the Advanced Power Cluster or the Huntsville Defence Cluster, aim at supporting high-technology businesses and connecting them with R&D organisations, such as the National Aeronautics and Space Administration (NASA).

Regarding the establishment of clusters, many traded clusters have been created over the recent years, especially in the business services sector and distribution and electronic commerce sector⁶⁰. On the other hand, some traded clusters have disappeared in recent years, such as in the construction and insurance services sectors.

The USA is embracing the system of a label or guarantee of quality from national programmes such as the European Secretariat for Cluster Analysis (ESCA) certification based on a bronze, silver, or gold label. Although, such as system is new to the USA since the country does not define cluster organisations similar to the EU. There is currently one bronze-labelled cluster in the USA – the New England Water Innovation Network (NEWIN)⁶¹.

3.1. Cluster Mapping

The US Cluster Mapping Project aggregates all the US clusters providing valuable insights on business environment, demographics and performance of the clusters. The platform can be considered as a formal US cluster connector and can, to a certain extent, be considered as a cluster macro-association.

The US Department of Commerce aims at linking the US Cluster Mapping Project with the Cluster Mapping initiatives in several countries and regions, including: Canada, EU, Mexico and South Korea. Recommendations for cooperation between the US Cluster Mapping project and the ECCP are included in the Discussion paper on the USA developed by the ECCP.

3.2. Clusters in Water, Energy, Aerospace, Biotechnology and ICT

The water, energy, aerospace, biotechnology and ICT sectors offer the most promising opportunities for the EU. This section identifies and provides information on key clusters in the aforementioned sectors.

Water clusters

The Confluence Water Technology Innovation Cluster (CWTIC)

In January 2011, the Confluence Water Technology Innovation Cluster (CWTIC) was initiated in Dayton, Cincinnati, northern Kentucky and southeast Indiana by the US Small Business Administration (SBA) and the US Environmental Protection Agency (EPA). The goal of clustering public and private entities in the Ohio River Valley Region is to develop and commercialise innovative water technologies. About 250 water-related companies are located in this region.

⁶⁰ *Establishments Time series by Traded Cluster 1998-2013*, U.S. Cluster Mapping Project, Institute for Strategy and Competitiveness, Harvard Business School. Data Sources; www.clustermapping.us/cluster#timeline

⁶¹ ESCA, Jan 2017. <http://cluster-analysis.org/benchmarked-clusters/?country=6a7389f0dba345fab09a30cd321b3d23>

CWTIC is a non-profit organization consisting of a network of public and private companies (small or large) and supporting public organisations (local government, economic development agencies, universities, investors and others) that work together to promote economic growth and technological innovation. The Board Members represent all the organisations from across the geographic Ohio River Valley Region that collaborate within CWTIC⁶².

Milwaukee Water Council

The Water Council in Milwaukee, Wisconsin, was created by leaders in business and education in 2007 to bring the region's water technology companies and universities together. The goal of the Milwaukee Water Council is to build cross-sector and global research and business partnerships, develop training programmes and solve the local and global water challenges with newly developed and deployed innovative water technologies. It is established from a more business point of view and its goal is to become a water technology hub and attract businesses. More than 130 water technology companies are located in the Milwaukee area. These businesses manufacture equipment (e.g. pumps, valves and meters), solve water purification problems, address wastewater treatment problems and support the reuse of water.

In March 2013, the Milwaukee Water Council and the Wisconsin Economic Development Corp. announced The Global Freshwater Seed Accelerator (GFSA) that will focus on start-ups that address global challenges in freshwater. Six of the world's best early stage water technology start-ups will participate in the 6-month state-subsidised accelerator programme for entrepreneurs. This programme will be accommodated in the new Global Water Center. The center will also house water-related research facilities for universities, established water-related companies, and start-up companies. The Milwaukee Water Council wants to serve as a hub for water R&D activities. They have \$83.5 million in public and private money budgeted over the next years to support water-related businesses and research⁶³.

Northeast Ohio Water Technologies Cluster

NorTech, a regional non-profit technology-based economic development organisation, and a workgroup of industrial participants, researchers, economic development entities and government participants, developed a roadmap to form a new water technology cluster: the Northeast Ohio Water Technologies Cluster. The scope of this cluster is industrial water treatment and delivery, as well as storm water management (CSOs).

The goal of NorTech is to revitalise the region's economy, in emerging industries. Therefore, research is conducted to determine which assets (companies, universities, innovative capacity) the Cleveland region possess in emerging industries in relationship to the global demand. The strengths of the water technology sector in northeast Ohio are automation and controls, sorbents and water infrastructure corrosion protection. Two examples of innovative companies within this cluster are ABS Materials and MAR Systems. Their different versions of sorbents (OsorbTM, SorbsterTM) are capable of capturing different kinds of contaminants (e.g., oil, pesticides, metals and pharmaceutical products)⁶⁴.

⁶² <https://www.watercluster.org/>

⁶³ <http://thewatercouncil.com/>

⁶⁴ <http://www.nor-tech.com/company-info/>

Water Economy Network

In southwestern Pennsylvania businesses (e.g. CalgonCarbon, URS), academia (e.g. Carnegie Mellon University) and non-governmental organisations (e.g. Innovation Works) are linked together in the Water Economy Network (WEN) that was initiated by Sustainable Pittsburgh and the Pittsburgh Regional Alliance in September 2012. The formation of the Water Economy Network is the first step in building a water-related industry cluster in the greater Pittsburgh region and to becoming a water innovation hub in the United States. The objective of WEN is to support regional water stakeholders to access new business opportunities, encourage new company formation through innovative technology development and deployment, and attract both national and international water-related industry.

Energy clusters

The Colorado Clean Energy Cluster (CCEC)

The Colorado Clean Energy Cluster (CCEC) is an “enterprise to attract, incubate and grow clean energy enterprises”. CCEC is a project-driven non-profit economic development organisation aimed at growing primary jobs in Colorado in the area of clean energy through formal partnerships between clean energy companies, the public sector and higher education.

As a unique state-wide organisation fostering market transformation for clean energy, the CCEC is focused on innovative and entrepreneurial ways to grow the clean energy sector through actionable projects and initiatives that directly benefit Colorado clean energy companies⁶⁵.

The Research Triangle Cleantech Cluster (RTCC)

The Research Triangle Region of North Carolina is a global leader in the cleantech sector. They are home to hundreds of companies and thousands of employees focused on developing technologies in smart grid, smart transportation, and smart water. The Research Triangle Cleantech Cluster (RTCC) was created to build upon the region's success and serve as a catalyst for future development.

RTCC is an industry-led, industry-funded programme of the Research Triangle Regional Partnership focused on accelerating the growth of the Research Triangle Region's cleantech economy. RTCC works to ensure the region is recognised globally for its leadership in research, innovation and market growth in the clean technology sector. RTCC creates competitive advantage for both companies and the region by strategically focusing business, government, non-profit and academic partners and resources on a single vision and plan to promote cleantech innovation and company growth⁶⁶.

The San Diego Regional Energy Innovation Cluster

The San Diego Regional Energy Innovation Cluster identifies innovative entrepreneurs that are developing solutions to the region's priority energy needs and provides them with a customised plan that includes access to advisory support, technology commercialisation services, and proof-

⁶⁵ <http://www.coloradocleanenergy.com/>

⁶⁶ <http://www.researchtriangle.org/clusters/rtcc>

of-concept and pilot testing. Selected entrepreneurs also have opportunities to connect with investors and companies that can assist in product commercialisation and adoption. The cluster takes advantage of a five-year, \$5 million California Energy Commission grant awarded to Cleantech San Diego in 2016 to further advance the San Diego region's energy innovation industry⁶⁷.

Aerospace clusters

Seattle, Washington

The main aerospace cluster in the world is located in Seattle, Washington State, and is the home of recognised companies such as Boeing. The industry employs approximately 135,000 people in 175 firms directly related with aerospace manufactures and more than 1,350 encompassing establishments. According to the Washington State Department of Commerce, aerospace accounted for 49% of all state exports in 2015 and generated \$76 billion⁶⁸.

Washington State produces 1,400 aircrafts and UAS annually. It built 95% of the commercial aircrafts in North America in 2014⁶⁹ and it is vital in the global supply chain for aircraft manufacturers around the world. As a matter of fact, the state is second only to California in hosting US companies that supply parts to Airbus – Europe's largest aerospace company.⁷⁰

These numbers are expected to raise over the coming years as production of aircraft ramps up to meet the increasing demand for travel. In this respect, the Washington Aerospace Industry Strategy aims at growing and diversifying the aerospace cluster, cultivating an aerospace workforce, fostering a culture of aerospace innovation and strengthening Washington's aerospace.⁷¹

The State offers a long experience, strong R&D orientation, a favourable business climate and an advanced manufacturing infrastructure to continue at the forefront of the aerospace industry. Equally important, the cluster has a skilled workforce with the highest concentration of aerospace engineers in the world, which resulted in the high number of aerospace related patents produced (389 since 1998).

The University of Washington (Seattle) has become one of the leading public research universities in the USA in regards to new aerospace technologies. The Washington Aerospace & Advanced Materials Manufacturing Workforce Pipeline Committee⁷² ensures all the training programmes around the state meet the needs of the industry.

Besides commercial airplanes, the aerospace sector in Washington State also comprises Unmanned Aerial Vehicles/Systems, Maintenance, Repair & Overhaul (MRO), space exploration, military airplanes and rotorcraft, air travel and cargo aviation biofuel.⁶⁸

⁶⁷ <http://cleantechsandiego.org/san-diego-regional-energy-innovation-cluster/>

⁶⁸ <http://www.commerce.wa.gov/growing-the-economy/key-sectors/aerospace/>

⁶⁹ <http://choosewashingtonstate.com/why-washington/our-key-sectors/aerospace/aerospace-exports/>

⁷⁰ <http://www.edc-seaking.org/catalog/industry-clusters/aerospace-and-defense>

⁷¹ http://www.governor.wa.gov/sites/default/files/documents/Industry_Strategy.pdf

⁷² <http://www.sbctc.edu/404-file-not-found.aspx?aspxerrorpath=/college/e-workforce-aerospace-pipeline.aspx>

There are four specialised regions: the Puget Sound for efficient product delivery using just-in-time and lean manufacturing processes; the northwest part of the state which includes a manufacturing cluster producing next-generation composites and materials; the southwest of the state which is the centre of UAS manufacturing, avionics, engineering and a supply chain cluster that supports the aerospace industry with metal finishing, plastics and electronics; and the eastern region which offers low-cost, renewable energy, an established and growing cluster of suppliers and pre-permitted industrial sites that are ideally suited to aerospace companies.

Efforts to support the sector include Aerospace Futures Alliance of Washington, a state-wide association launched to raise the visibility of the aerospace industry and to support policies conducive to future growth⁷³ such as the Washington Aerospace Partnership⁷⁴: a collaboration of business, labour and government working together to ensure Washington State continues to be a thriving global leader in aerospace excellence; and the Joint Centre for Aerospace Technology Innovation (JCATI)⁷⁵, a partnership between industry and universities that facilitates the development of new technologies to keep Washington in the forefront of the aerospace industry.

Los Angeles, California

Los Angeles (LA) and the Southern California region (SoCal) are known for distinct comparative advantages in aerospace and related industries. The SoCal's rich, deep and strong ecosystem of large and small companies, research and educational partners, and an active defence sector, makes it one of the world's most competitive regions for aerospace innovation.

This is reflected in the figures: the industry represents 2.4% of the total state GDP and 85,500 jobs (not including the defence personnel)⁷⁶. The total value of all products shipped by the aerospace industry in Southern California was \$39.9 billion, of which aircraft accounted for almost on third of all output reaching \$12.0 billion. In terms of specialisation, Southern California is becoming a powerhouse for guided missiles, space vehicles and parts⁷⁷.

The region is also home to numerous educational institutions that offer targeted programmes and training for aerospace-related work such as University of California Los Angeles and University of California San Diego. The academic offer includes bachelor and graduate degrees in aerospace, mechanic engineering, aviation safety and security programmes, aircraft fabrication and assembly, and aeronautics. This ensures an ongoing pipeline of skilled workers in the sector.

In 2014, there were over 300 aerospace related businesses and research entities in LA County⁷⁸. Among them, it is worthy to mention: the Jet Propulsion Laboratory in Pasadena, which conducts planetary and space science including robotic missions to Mars; and the NASA Armstrong Flight Research Center in Palmdale, serving as NASA's key centre for atmospheric flight research and

⁷³ <http://www.edc-seaking.org/catalog/industry-clusters/aerospace-and-defense>

⁷⁴ <http://washington-aerospace.com/>

⁷⁵ <http://www.jcati.org/>

⁷⁶ http://laedc.org/wp-content/uploads/2016/03/LAEDC_Aerospace_FINAL_20160331b.pdf

⁷⁷ <http://laedc.org/wp-content/uploads/2016/02/LAEDC-Aerospace-OneSheet-0229B.pdf>

⁷⁸ The following link contains map showing the distribution of the aerospace industry in LA County:
<http://priceus.maps.arcgis.com/apps/MapSeries/index.html?appid=a7f41839fd0f4490bae3bd467d2b4672>

operations. The Space and Missile Systems Center, credited with development and operation of GPS and the constellation of GPS satellites that have become essential to many technologies worldwide, is also in LA County at the Los Angeles Air Force Base.

After the deep cuts in the defence budget, Los Angeles' declining aerospace industry needed to take another perspective on the sector. Committed to innovation, experts predict a growing trend behind a new generation of entrepreneurial private space companies.⁷⁹ For example, SpaceX, Elon Musk's company, established its headquarters in the area.

With offices representing all the well-known aerospace related companies located in the area, the County is one of the leaders in commercial spacecraft, which now accounts for one third of sales in the aerospace industry and in the drone industry⁸⁰. Other key market segments include aircraft manufacturing such as aircraft, engines, parts, search detection and navigation instruments, UAS and Cybersecurity.

Together with Los Angeles, San Diego is emerging as a new point of reference for the aerospace industry in Southern California⁸¹. Home to some of the world's largest aerospace, aircraft, and research and development companies, San Diego gathers enough brainpower, expertise and innovation to become one of the most relevant hubs in aerospace with a special focus in UAS/UAV.⁸² As a matter of fact, the patent growth reached almost 10%.⁸³

Some of the organisations within the aerospace cluster are in the Southern California Aerospace Council⁸⁴, the Advanced Manufacturing Partnership for Southern California (AMP SoCal),⁸⁵ and the Los Angeles Economic Development Council (LAEDC), which collaborate with organizations in both public and private sectors, across government, academia and industry, to strengthen the region's aerospace and defence manufacturing economy.

Biotechnology clusters

San Francisco Bay Area, California

Led by Silicon Valley and San Francisco, the Bay Area is home of one of the largest biotech hubs in the USA. It houses nearly 850 companies, employing more than 47,000 people, representing almost one third of the state's biomedical jobs (2013)⁸⁶ and an average of 30 companies are founded there each year⁸⁷.

For the Bay Area, the life sciences and biotech sector generated \$95 billion of economic activity, nearly \$30 billion in income and captured \$839 million in venture capital investment. As of 2016, a total of 25 venture backed biotech companies⁸⁸ are established here and by 2015, more than

⁷⁹ <http://www.latimes.com/business/la-fi-socal-aerospace-20160723-snap-story.html>

⁸⁰ <http://www.dailybreeze.com/business/20160917/space-race-redux-despite-spacex-setback-a-wave-of-southern-california-rocket-makers-capitalize-on-new-economy>

⁸¹ San Diego and Los Angeles account together for 1031 patents

⁸² <http://www.sandiegobusiness.org/industry/aerospace>

⁸³ http://www.clustermapping.us/cluster/aerospace_vehicles_and_defense

⁸⁴ <http://laedc.org/our-services/socal-aerospace-council/>

⁸⁵ <http://ampsocal.usc.edu/>

⁸⁶ http://www.calmis.ca.gov/SpecialReports/Biotechnology_in_CA_2013.pdf#page=10

⁸⁷ <http://sfced.org/case-for-business/sectors/life-sciences-biotech/>

⁸⁸ <http://www.us.jll.com/united-states/en-us/Research/US-SF-Bay-Life-Sciences-Outlook-2016-JLL.pdf>

10 incubators (such as Indie Bio) have given rise to nearly 100 early stage companies (mostly SMEs).

One of the bigger drives of this success is the bond between industry and universities. There are biotech programmes at three major research universities, Stanford University, UC Berkeley, UC San Francisco, which receive nearly a quarter of all NIH funding in California. This joint effort aims at training a high skilled workforce that fulfils the needs of the biotechnology market in the area. The industry and university cooperation is a strong contributor to the biotech industry in the Bay Area producing approximately 385 patents in 2012⁸⁹.

In order to maintain its competitive position, the government has made strong efforts to support the industry. The state enacted several laws to strengthen the life sciences competitive position that targeted investments.

The key segments within the biotech area are therapeutics, R&D services and biopharma⁹⁰. Bioinformatics and computational biology, nanobiotechnology, personal genomics, and human health are emerging technologies in the sector. Among all the institutions existing in the Bay Area, San Francisco Economic Development Center and California Life Sciences Institute are two major players in the biotech sector.

Boston, Massachusetts

Boston is emerging incredibly fast to become the biggest, most connected, leading innovation biotech cluster in the world. The cluster comprises roughly 594 active companies⁹¹ that employ more than 7,400 people within the pharmaceutical, medical device and biotechnology industries (mostly start-ups).⁹² The Boston metropolitan area has also become a global hub for biotech investments. In 2015, Massachusetts absorbed \$2.1 billion in venture capital (28% of the total venture capital in biotech in the USA).⁹³

The key of this success is the connectivity. The city has become a thriving ecosystem for biotech due to the easy access to a very well connected network of renowned universities such as Harvard, MIT and Boston University, research hospitals and institutions and world class service providers. This proximity has helped to foster a collaborative approach in the cluster with a high skilled workforce and companies sharing ideas and innovations⁹⁴.

Boston is also the principal recipient of National Institution of Health (NIH) funding in the USA. The funding is shared between research institutions, universities and research hospitals that lead the global market in biotechnology research. As a logical consequence, the biotechnology related to medical sciences is the most prominent sector, being *gene editing* the current hot area.

⁸⁹ http://sfced.org/wp-content/uploads/2013/02/San-Francisco-Largest-Biotech-Patent-Recipients-in-the-Greater-Bay-Area_OC_6.05.2012.pdf

⁹⁰ <http://resourcecenter.venturevaluation.com/wp-content/uploads/2012/01/Biotech-Cluster-Bay-Area-and-Switzerland.pdf>

⁹¹ Source: Massachusetts Biotechnology Council.

⁹² <http://www.liftstream.com/boston-biotech-cluster.html#.WBHf3Pp97IU>

⁹³ <https://www.massbio.org/why-massachusetts>

⁹⁴ <http://www.cjrs-rcsr.org/archives/28-2/4-Breznitz-Anderson.pdf>

In addition, there is a wide range of economic development programmes devoted to support large and small biotechnology companies. For example, the Life Sciences Initiative, valuing \$1 billion, includes financial investments in life sciences research, development and commercialisation for public and private institutions⁹³.

Due to the increasing number of biotech companies relocating in the Boston area, biotech R&D employment grew by 5.3% in 2015⁹⁵. As a result, the Massachusetts Biotechnology Council (MassBio) has developed the initiative Bioready Communities⁹⁶. The goal of this initiative is rating communities to help companies find the location that best suits them. In this sense, it is important to note that the actual centre of the biotechnology and biopharmaceuticals within the cluster is the city of Cambridge (it belongs to the Boston metropolitan area)⁹⁷. MassBio also has available a list of biotechnology companies and incubators.

Information and Communication Technologies (ICT) clusters

Silicon Valley, California

Worldwide known, Silicon Valley (San Francisco Bay Area) is the most important high tech hub of the world. Led by the ICT cluster, it enjoys a highly skilled pool of talent, a strong entrepreneurial culture, proximity to savvy costumers and access to capital, especially for the start-ups that are the driver of the region's economy.⁹⁸

The success of the ICT cluster resides in the continuous innovation of software and hardware applications. The academia and industry work together to keep this ecosystem evolving according with the new trends in the sector. Stanford University, the University of California Berkeley and many other institutions educate workers to meet the demands of an industry, which in 2016 employed 387,739 people⁹⁹.

In fact, employment in innovation industries represents 25% of the total, with software (8%) and ICT product and component manufacturing (7%) leading the way.¹⁰⁰ In 2013, the R&D expenditures reached \$2.84 billion and Silicon Valley was granted 7,300 patents just in Computers, Data Processing and Information Storage technologies (2014) - almost half of the total patents in California¹⁰⁰¹⁰¹. It also hosts the biggest number of billionaire companies in the world that include Apple, HP and EA.

Other advantages of the cluster is the easy access to venture capital. In 2015, Silicon Valley received more than \$11 billion in venture investment and together with San Francisco account for 41% of all US total investment¹⁰². Six out of the 10 companies in the top venture capital deals were in the software industry.

⁹⁵ <http://files.massbio.org/file/2016-MassBio-Industry-Snapshot.pdf>

⁹⁶ Consult Bioready Communities in the following link: <https://www.massbio.org/why-massachusetts/supercluster/bioready-communities>

⁹⁷ <http://news.mit.edu/2004/massimpact>

⁹⁸ http://www.work2future.biz/images/documents/TechStudyFullReport_03.pdf

⁹⁹ <http://siliconvalleyindicators.org/data/economy/employment/silicon-valley-major-areas-of-economic-activity/>

¹⁰⁰ http://svcip.com/files/SVCIP_2016.pdf

¹⁰¹ <https://www.jointventure.org/images/stories/pdf/index2015.pdf>

¹⁰² <http://siliconvalleyindicators.org/data/economy/innovation-entrepreneurship/venture-capital-investment/>

The European Institute of Innovation & Technology (EIT) opened a hub in Silicon Valley with the objective to build a bridge between Europe and the San Francisco Bay Area in the ICT sector¹⁰³.

Seattle, Washington

Enjoying the greater concentration of technology-based companies, including big names such as Microsoft and Amazon, Washington (more particularly Seattle) is consistently ranked among the best places for the technology industrial sector. The available digital infrastructure, a high skilled workforce and the access to venture capital makes ICT one of the largest clusters in Washington, supporting over 176,000 jobs and producing revenue of \$36.9 billion.¹⁰⁴

The forefront area in the sector is software publishing, which represents 41% of the employment. Other important ICT areas include the development of software, interactive media, radio-frequency identification (RFID) and, wireless technologies and applications. The Puget Sound region is for instance increasingly recognised as the reference hub for interactive media development. This area includes devices (mobile, game consoles, laptops and television platforms) content that ranges from entertainment to educational and training applications and communication networks, such as social media outlets.¹⁰⁵

In 2013, 8,610 ICT establishments were located in Washington State and more than 90% of those could be considered SMEs. Nearly every company was also less than 20 years old, making the State an ecosystem of start-ups where the constant innovation is a requirement for the business survival. Despite the competition, this ecosystem is relying on support organisations, entrepreneurial assistance and tech incubators. The financial support was particularly strong with nearly \$70 million in 60 seed investments and nearly \$700 million in 140 venture capital investments¹⁰⁶. As a result, the sector has been a pioneer in the most successful new products and services including online retail, online gaming, cloud computing, and music and video streaming.

3. Cluster policies and programmes in the USA

4.1. Historic evolution of the cluster policy

The President Obama Administration had stepped up its efforts in order to boost regional economic clusters across the country through different cluster policy measures. The administration budget supported growth strategies based on stronger regional clusters of innovation through funding from the Department of Commerce (DoC), Economic Development Administration (EDA), the Small Business Administration (SBA), the Department of Labour, the Department of Education, and the Department of Energy¹⁰⁷. Furthermore, one of the pillars that

¹⁰³ <http://www.eitdigital.eu/about-us/overview/>

¹⁰⁴ <http://www.edc-seaking.org/catalog/industry-clusters/information-and-communications-technology>

¹⁰⁵ <http://www.edc-seaking.org/uploads/pdf/CAI.IM-Industry-Assessment.2014-1114.pdf>

¹⁰⁶ <http://washingtontechnology.org/wp-content/uploads/2015/04/ICT-Economic-Report.pdf>

¹⁰⁷ Farrell, Diana, and Thomas Kalil. "Innovation Policy around the World: United States: A Strategy for Innovation." *Issues in Science and Technology* 26, no. 3 (Spring 2010). <http://issues.org/26-3/farrell-2/>

President Obama established through the “*Strategy for American Innovation*” (2009)¹⁰⁸ is the creation of the right environment for private-sector investment and competitive markets, which includes internationalisation and promotion of regional innovation clusters¹⁰⁹.

The US SBA¹¹⁰ has been investing in the development of regional innovation clusters throughout the country. Besides its contribution to the development of the Cluster Mapping project, the SBA has also set up the Regional Innovation Cluster (RIC), an initiative launched in 2010 to promote and support ten clusters across the United States. Since 2010, the RIC has enhanced the ability of these ten clusters in responding to shifting needs of the regional and industry contexts. It also supported these clusters efforts to grow their membership, scale their provided services, and strengthen their engagement with small businesses. Currently, seven clusters are being supported by the RIC: the Advanced Power and Energy Cluster (St. Paul, Minnesota), the Geospatial Cluster (Bay St. Louis, Mississippi), FlexMatters (Cleveland, Ohio), TechRICH (Huntsville, Alabama), the Smart Grid (Chicago, Illinois), the Northeast Electrochemical Energy Storage Cluster (East Hartford, Connecticut), and the San Diego Regional Innovation Defence Cluster (San Diego, California). These participating clusters are improving their data-collection systems and exploring options for long-term sustainability as funding from SBA begins to decrease¹¹¹.

The EDA has established several initiatives to advance innovation throughout the country. Among these initiatives, the Jobs and Innovation Accelerator Challenge (JIAC), the Manufacturing Communities Partnership (IMCP) and the Regional Innovation Strategies (RIS) initiatives specifically aim to promote innovation within industrial clusters.

The JIAC initiative, launched in 2011, is an initiative consisting of multi-agency competitions designed to support the advancement of 20 high-growth, regional industry clusters. The initiative aims at bringing public and private sectors together to build on USA’s regional strengths and create local jobs in key emerging industries. Since 2011, several competitions have been launched under the JIAC initiative, namely: the Rural Jobs Accelerator Challenge to support rural partnerships and the Advanced Manufacturing Jobs and Innovation Accelerator Challenge to support initiatives that strengthen advanced manufacturing at the local level¹¹².

In parallel, the IMCP initiative¹¹³ encourages clusters to develop comprehensive economic development strategies that will strengthen their competitiveness. It was established in 2013 to incentivize and facilitate collaboration among private and public sector stakeholders of USA manufacturing clusters. To receive support from IMCP, the clusters must propose strategies to target investments and achieve measurable progress in the following six areas: workforce and training; research and innovation; infrastructure and site development; supply chain support; trade and international investment; and operational improvement and capital access. To date, there have been 24 clusters throughout the USA that have benefited from the IMCP initiative¹¹⁴.

¹⁰⁸ https://www.whitehouse.gov/sites/default/files/strategy_for_american_innovation_october_2015.pdf

¹⁰⁹ Ibid.

¹¹⁰ U.S. Small Business Association, www.sba.gov/

¹¹¹ https://www.sba.gov/sites/default/files/aboutsbaarticle/SBAClusters_Year3_Report.pdf

¹¹² <https://www.eda.gov/archives/2016/challenges/jobaccelerator/>

¹¹³ US EDA IMCP, www.eda.gov/challenges/imcp/

¹¹⁴ <https://www.eda.gov/imcp/>

Finally, The RIS initiative, launched in 2014, supports innovation-based and cluster-focused activities that seek to spur job creation and economic growth. It is comprised of two key programs: the i6 Challenge grant program, which supports the commercialization of promising ideas around technology and entrepreneurship, and the Seed Fund Support program, which provides early stage capital to start-ups. In just two years (2015 and 2016), the EDA estimates that RIS awardees have created nearly 1,000 jobs and leveraged \$1.30 for every federal dollar requested¹¹⁵.

To develop and promote cooperation between USA and EU clusters, the US DoC has signed an EU-USA Cooperation Arrangement on Clusters with the European Commission's Directorate-General for Internal Market, Industry, Entrepreneurship and SMEs (DG GROW) on the 22nd of April 2015. The objective of this agreement is to facilitate transatlantic linkages between clusters in the EU and the USA, and to help SMEs find strategic partners¹¹⁶. The USA involvement and interest in cooperating with the EU is a clear sign of mutual interest to work on common thematic areas, boost exchange of knowledge and increase the growth opportunities between clusters of the two regions. Furthermore, the DoC is very active in supporting cluster matchmaking missions and took an active part in the Washington cluster workshop in November 2015¹¹⁷ and in the EU-US Cluster to Cluster matchmaking mission organised by the ECCP in April 2016 in the context of the Hannover Messe¹¹⁸. The EU-USA Cluster matchmaking event (more information in section 4) was complemented by a high level cluster policy seminar on "Clusters in the EU and the USA: Opportunities for Collaboration and Growth". More information is provided in the document "Discussion Paper" from the ECCP.

Other EU DG's such as RTD have implemented BILAT projects with the USA and recognise the usefulness of using and channelling support through clusters to promote research, development and innovation international cooperation. The project BILAT USA 4.0 funded by the European Framework Programme Horizon 2020 was launched in February 2016 and will last three years with the aim to develop RDI cooperation between the EU and the USA, including industry and cluster cooperation.

4.2. Water policies and programmes

Within the US water sector several water initiatives have been identified that offer potential opportunities for collaboration to commercialise related technologies for the US market. The water technology initiatives are established to promote the development and commercialisation of new and innovative technologies. These initiatives include:

¹¹⁵ http://ssti.org/blog/positive-roi-regional-innovation-strategies?utm_source=SSTI+Weekly+Digest&utm_campaign=f705b60298-EMAIL_CAMPAIGN_2017_03_16&utm_medium=email&utm_term=0_ecf5992d4c-f705b60298-220200913

¹¹⁶ EC DG Grow, http://ec.europa.eu/growth/tools-databases/newsroom/cf/itemdetail.cfm?item_id=8240&lang=en&title=Cooperation-Arrangement-on-Clusters-signed-in-Washington-D%2EC%2E

¹¹⁷ More information about the event : <http://www.clustercollaboration.eu/news/united-states-european-union-workshop-cluster-mapping-and-cluster-based>

¹¹⁸ More information about the event: <http://www.clustercollaboration.eu/news/european-cluster-matchmaking-event-organised-context-hannover-messe-13th-14th-april-2015>

- The Akron Water Initiative - In their strategic plan 'The Akron Water Initiative', the City of Akron describes their goals to create binational innovative partnerships with several countries with leading global water technologies (e.g. The Netherlands). Akron wants to attract foreign innovative water technology companies to commercialise their products and technologies. The City of Akron is offering companies a soft-landing pad, finding funding and helps them validate their technology for the US market. Because the City of Akron is the sole owner of different industry parks, a technology accelerator, an extensive water and wastewater system (e.g., reservoirs, pipelines, treatment plants) and several square miles of land, they are able to provide a conducive environment for innovation to take place.
- The Green Jobs for Blue Water Initiative (GJBWI) – It was launched in 2009 by the Michigan Economic Development Corporation (MDEC) with the goal to establish a premier hub of water and wastewater technology. Therefore, the Michigan Water Technology Cluster focuses on becoming a centre of excellence for the development, advancement and commercialisation of needs-driven water technologies.
- Living Laboratory Indianapolis - The development of this initiative is mainly driven by the aging water infrastructure problems in the USA. In Indiana, routinely more than 20% of drinking water is lost through an aging network of leaking underground pipes, most of them installed in the early to mid-1900s. Moreover, the water landscape is fragmented, with hundreds of drinking water systems across Indiana. The systems lack smart water grid technology to monitor conditions and identify problems. The living laboratory concept has been developed in partnership with several local companies (e.g., Peerless Pumps, a Grundfos company) and Indiana University Purdue University at Indianapolis (IUPUI), in order to deploy, test and refine new solutions in real-conditions.
- The Safe Drinking Water Act¹¹⁹ and the Clean Water Acts¹²⁰ - The most important federal policy programmes within the American water sector. These programmes, coordinated by the Environmental Protection Agency (EPA), provide treatment and discharge regulations, and fund programmes and frameworks for operating and applying innovative water and wastewater treatment technologies.

4.3. Energy policies and programmes

Through a variety of cross-cutting initiatives, the Office of International Affairs (IA) of the Department of Energy (DOE) responds to the most pressing global energy challenges, ranging from energy security and market volatility to long-term efforts to reduce carbon pollution and the impacts of climate change. Initiatives under the responsibility of the IA of the DOE include:

- Climate Action Plan (CAP) launched in 2013 by the Department of Energy (DOE), which initiates and supports interagency efforts that cut carbon pollution, augment resilience and preparedness in the face of climate impacts, and strengthen international

¹¹⁹ <https://www.epa.gov/sdwa>

¹²⁰ <https://www.epa.gov/laws-regulations/summary-clean-water-act>

partnerships addressing the issue. IA seeks to strengthen existing international fora and initiatives such as the Clean Energy Ministerial (CEM).

- The Energy and Climate Partnership of the Americas (ECPA), which is a key multilateral mechanism to advance energy security, accelerate clean energy deployment, and reduce the climate change impacts of energy use in the Western Hemisphere. ECPA provides a platform for governments in the Western Hemisphere to lead multi-country or bilateral initiatives on a voluntary basis. For example, the US announced \$1.5 million in funding in September 2016 to sponsor two projects that will enhance the capacity of countries to capture Greenhouse Gas Emissions data and standardise energy efficiency regulations.

The USA-Canada Clean Energy Dialogue (CED), which was implemented in 2009 to encourage the development of clean energy technologies to reduce greenhouse gases and combat climate change in both countries. The CED is charged with: expanding clean energy research and development; developing and deploying clean energy technologies; and building a more efficient electric grid based on clean and renewable generation. The DOE leads the CED for the US and Canada's effort is led by Environment Canada, with participation by Natural Resources Canada (NRCan)¹²¹.

4.4. Aerospace policies and programmes

Aerospace is one of the priority sectors for the US Government, and therefore, several policies and programmes have been implemented in this sector. The National Space Policy (2010) proposes a series of initiatives and policies to boost the competitiveness of the aerospace industry. The initiatives are to energise competitive domestic industries, to expand international cooperation and to pursue human and robotics initiatives; while the policies are to set the guidelines for commercial, civil and national security aerospace areas¹²².

In order to finance the aforementioned initiatives and policies, the White House Office of Science & Technology established a budget for 2017 which includes a Commercial Crew programme, Space Technology, and Advanced Exploration Systems to increase the capabilities of NASA, other government agencies, and commercial space activities as well as cybersecurity technologies⁴².

Currently, the Next Generation Air Transportation System (NextGen)¹²³ is one of the most ambitious programmes within the aerospace sector. It will be implemented from 2012 to 2025 across the United States. Its objective is to switch the air traffic control in the USA from a radar based-system to a satellite one. As a result, flights will shorten routes and therefore save fuel and time, as well as increase capacity and safety.

Finally, there are several organisations and agencies related to different aspects of the aerospace industry:

¹²¹ <https://energy.gov/ia/initiatives>

¹²² https://www.whitehouse.gov/sites/default/files/national_space_policy_6-28-10.pdf

¹²³ <https://www.faa.gov/nextgen/>

- Aerospace Industries Association (AIA)¹²⁴: is the most relevant trade association representing major aerospace and defence manufacturers and suppliers in the United States. It often offers advice services to the government.
- Federal Aviation Administration (FAA)¹²⁵: the federal agency in charge of regulating the aerospace system in order to ensure safety. It develops initiatives regarding several topics such as the integration of drones in the National Space System (NAS) and the implementation of NexGen. It is also responsible for the bilateral agreements concerning aerospace.
- National Aeronautics and Space Administration (NASA)¹²⁶: it is an independent agency of the federal government in the USA responsible for the civilian space programmes and aerospace research.
- International Trade Administration: contributes to US trade policy development, evaluates the impact of the policies, ensures the fairness in trade etc.

4.5. Biotechnology policies and programmes

The White House Office of Science and Technology Policy through the Domestic Policy Council Working Group on Biotechnology promoted the Coordinated Framework for the Regulation of Biotechnology¹²⁷ in 1986, which established the basic federal policy for regulating the development and introduction of products derived from biotechnology.

According to the Coordinated Framework for the Regulation of Biotechnology, there are the following Interagency Coordination Mechanisms:

- The Domestic Policy Council Working Group on Biotechnology has been responsible for this coordinated framework for the regulation of biotechnology; it also considers policy matters related to agency jurisdiction, commercialisation, and international biotechnology issues. The Working Group monitors developments in biotechnology and is ready to identify problems and make appropriate recommendations for their solution.
- The Biotechnology Science Coordinating Committee (BSCC) is responsible for coordination and consistency of scientific policy and scientific reviews.

To accomplish the Coordinated Framework for the Regulation of Biotechnology, three departments were designated (Health and Human Services, Agriculture and Labor) and the following agencies became responsible for the policies in the field:

- Food and Drug Administration Agency (FDA)¹²⁸ - Responsible for ensuring the safety and proper labelling of all plant-derived food and feed, including those developed through genetic engineering. Under the Federal Food, Drug, and Cosmetic Act, it is the responsibility of food and feed manufacturers to ensure the products they market are safe and properly labelled.

¹²⁴ <http://www.aia-aerospace.org/about-aia/>

¹²⁵ <http://www.faa.gov/>

¹²⁶ https://www.nasa.gov/about/highlights/what_does_nasa_do.html

¹²⁷ https://www.aphis.usda.gov/brs/fedregister/coordinated_framework.pdf

¹²⁸ www.fda.gov

- Environmental Protection Agency (EPA)¹²⁹ - EPA regulates the sale, distribution and use of pesticides in order to protect health, and the environment, regardless of how the pesticide was made or its mode of action. This includes regulation of those pesticides that are produced by an organism through techniques of modern biotechnology. The Biopesticides and Pollution Prevention Division of the Office of Pesticide Programs, under the Federal Insecticide, Fungicide and Rodenticide Act (FIFRA), regulates the distribution, sale, use and testing of pesticide substances produced in plants and microbes.
- United States Department of Agriculture (USDA) – Animal and Plant Health and Inspection Service (APHIS)¹³⁰ - This agency evaluates a variety of issues including the potential for plant pest risk; disease and pest susceptibilities; the expression of gene products, new enzymes, or changes to plant metabolism; weeding and impact on sexually compatible plants; agricultural or cultivation practices; effects on non-target organisms; and the potential for gene transfer to other types of organisms.
- Occupational Safety and Health Administration Agency (OSHA)¹³¹ - OSHA is responsible to inspect workplaces including laboratories and places of employment relating to biotechnology. OSHA provides an enforceable basis for protection of the safety and health of employees in the field of biotechnology.

4.6. ICT policies and programmes

President Obama's Administration identified technology as an essential ingredient for economic growth and job creation. Ensuring the USA has a 21st century digital infrastructure is critical for long-term prosperity and competitiveness. For that purpose, the US government has developed several policies and programmes regarding ICT, such as¹³²:

- Internet Policy Task Force – a task force which brings together industry, consumer groups and policy experts to identify ways of ensuring that the Internet remains a reliable and trustworthy resource for consumers and businesses.
- National Strategy for Trusted Identities in Cyberspace and the International Strategy for Cyberspace (2011) – a policy to promote the free flow of information, the security and privacy of data, and the integrity of the interconnected networks.
- America Invents Act (2011) - a patent reform law that helps companies and inventors avoid costly delays and unnecessary litigation. Many key industries in which the United States leads, such as biotechnology, medical devices, telecommunications, the Internet, and advanced manufacturing, depend on a strong and healthy intellectual property system. The US Patent Trade Office (USPTO) has also launched Track One that allows patent applications to be processed to completion in 12 months and offers small businesses a 50% discount on this option. The new law also harmonizes the American patent process with the rest of the world.

¹²⁹ www.epa.gov

¹³⁰ <https://www.aphis.usda.gov/aphis/ourfocus/biotechnology>

¹³¹ <https://www.osha.gov/>

¹³² All the information provided is displayed in the White House web www.whitehouse.gov/issues/technology

- 21st Century Digital Infrastructure – an initiative which aims at expanding available wireless, broadband access (Recovery Act) and smarter power grid for electricity delivery and energy reliability.
- Advanced Manufacturing Partnership (AMP, 2011) - a national initiative that brings efforts from industry, universities, and the Federal government to invest in the emerging technologies that will create high-quality manufacturing jobs and enhance our global competitiveness. The National Robotics Initiative is part of this effort. It focuses on developing robots that work with or beside people to extend or augment human capabilities, taking advantage of the different strengths of humans and robots for example, increasing the productivity of workers, assisting astronauts, improve food safety or accelerate the discovery of new drugs.
- Digital Promise (2011) - a national centre for advancing learning technologies that will harness the efforts of everyone from educators to entrepreneurs to spur the research, development, and adoption of breakthrough technologies that can help transform the way teachers teach and students learn.
- TechHire Initiative (2015) – a new campaign to work with communities to get more Americans rapidly trained for well-paying technology jobs.

There are several initiatives that directly affect the federal government such as a 25-Point Implementation Plan to reform the way the Federal government manages information technology projects or the Open Data Initiatives that seeks to “liberate” government data and voluntarily-contributed corporate data as fuel to spur entrepreneurship, create value, and create jobs.

4. Conclusions

Despite the changes in economy and trade in the global scene over the last years and the rise of emerging economies, the USA continues to be one of the most powerful economies in the world. As a matter of fact, the country is the leader in many sectors that are key for the future prosperity, such as the water, energy, aerospace, biotechnology and ICT sectors, covered in this report.

The ties between the EU and the USA continue to be strong. Both have built many joint initiatives in many areas and this collaboration is reinforced by their membership in the same international organisations. Furthermore, the guidelines for the future of the US and EU economy share a common interest for the sectors aforementioned, as well as the vision on how to achieve the set objectives.

The water, energy, aerospace, biotechnology and ICT industrial sectors are constantly evolving and increasing their long-term relevance for the future economy. This favours the appearance of an array of opportunities for US and European clusters regarding technology transfer, innovation and business cooperation that can already build on the well-established foundations between both actors.

Moreover, there are several examples of C2C collaboration between the USA and the EU such as the French ICT cluster “Systematic” that has a presence in the US through Hub Boston, or the EU Global Cleantech Cluster Association (more information on cluster cooperation is included in

the Discussion paper on the USA developed by the ECCP). In addition, there has been some events aiming at facilitate this C2C cooperation, creating an opportunity to learn from each other such as the EU – US Cluster Matchmaking Event in Milan 2015 and the Hannover Messe Matchmaking Event in 2016.

The ties between the EU and the USA, and several other positive factors such as the USA market opportunities, may be a reason for the strong interest of the European Strategic Cluster Partnerships - Going International (ESCP-4i) in the USA and the North American region.¹³³ According to a survey completed in late 2016, the USA is the ESCP-4i's preferred destination among 25 different countries around the world for future cooperation. Moreover, the USA, together with Colombia, is the top preferred destination for future cluster matchmaking missions.¹³⁴ ESCP-4i targeting the USA are acting in a broad range of sectors, including the sectors covered in this report: Energy in Water (EnW – in water-energy), SmartCityTech (Smart City solutions powered by ICT), Silicon Europe Worldwide (semiconductors, electronics), EACP Abroad (Aerospace), SPACE2ID (Space), REINA Plus (Renewable energy), etc.

Finally, the EU-US Cooperation Arrangement on Clusters was signed in Washington DC in 2015 between the US DoC and DG Growth of the European Commission, expressing the strong interest for both government bodies to collaborate in RDI and business initiatives.

¹³³ More information about the ESCP-4i projects: <http://www.clustercollaboration.eu/eu-cluster-partnerships>

¹³⁴ Analysis of consultation amongst the ESCP-4i partnerships. European Cluster Collaboration Platform. December 2016