Consultation Questions – Tyndall National Institute

Q: Do you agree with the suggested areas of strength for the three regions as set out above? Are there other areas of strength in the three regions to be highlighted?

The document provides a very comprehensive list of the areas of strength for the three regions. Multinational-dominated exports of pharmaceuticals, medical goods and ICT products and services are continuing to grow despite the pandemic. With continuing pressure on global food production showing no sign of easing, as well as the growing environmental crisis, the demand for agritech products and services will continue to grow in the years to come across the globe. Ireland is in a good position to play a leading role in this sector. There are strong enterprises for each strength area of the three regions. These are supported by a regional research and innovation ecosystem and the higher education sector in each of the three regions, providing innovation supports and a pipeline of talent for jobs on demand. An assessment of the innovation potential which distinguishes between pure capacity and distinctive capability for each regional strength would be useful to further realise S3 and boost regional innovation.

Q: What, in your opinion, are the key sectors in your region? What are the skills, assets and capabilities within your region?

As outlined in the document, the Southern region is strong in a broad range of sectors. ICT, Agritech, Medtech, Marine/Maritime, Advanced Manufacturing and Renewable Energy are all sectors that have a strong presence in Ireland and are particularly flourishing in the Southern Region. Besides the establishment of top multinationals, the Southern Region has the highest employment in SMEs many of which are well established players in the regional strengths. The Southern Region has the highest ICT research capacity and infrastructure to support the digitalisation of manufacturing, energy, transport and more traditional sectors such as agriculture and health. Research performing organizations in the region have developed specialised expertise and engage actively with companies from these sectors to bring new digital technologies and enhanced products in the market as well as deploying innovations based on communication interfaces, data analytics and artificial intelligence.

Q: Which sectors could achieve critical mass in Ireland over the next seven years? Where are the opportunities and what needs to be done to unlock these opportunities?

One major opportunity lying ahead concerns the transformation of the major economic sectors thanks to the introduction of new digital technologies and associated business models. This is driven by both the availability of solutions based on the Internet of Things and their impact on societal challenges. For example, farming is recognised as an essential industry in Ireland and across the world and its digital transformation from food production and processing machinery to cold chain management and distribution services underpins food safety and security. Areas which be unlocked by the deployment and commoditisation of intelligent and secure trustable systems include smart mobility and transport, energy production, distribution and use, food systems from farm-to-fork, manufacturing and distribution, water management, financial and healthcare services, environmental protection and biodiversity restoration. To support economic growth along these lines and achieve the twin digital and green transition, it is important to maintain strong research and innovation in integrating novel smart materials, smart sensors and communication networks, cybersecurity and artificial intelligence. Developing the necessary technical and business support services across the full value chain is also key to on-board companies independent of their digital maturity.

Another major opportunity relates to the emerging area of Quantum Technologies. Commercialisation of quantum technologies and services for computation, defence and telecommunication has already started. Based on Ireland's strategically important position in ICT and the presence of global qutech players, the development of a competitive global hub for next generation information processing and communication

based on quantum engineering needs to be an integral part of Ireland's innovation strategy and regional development. Ireland has a significant level of expertise thanks to long-term investments in materials and engineering science for digital technologies and the strong footprint of technology giants with significant investments in the field. Nevertheless, despite the strong willingness to collaborate across academia, government, and industry to promote Ireland as a hub for quantum technology, we are significantly outmatched in terms of resources and investments even by many smaller advanced economies such as Finland, Sweden and Denmark. The establishment of the Quantum Computer Engineering Centre (QCEC) is a significant step in trying to achieve this goal as mentioned in the document. This effort needs further coordination and synergetic national engagement with actions supported by the Government and its agencies, including the establishment of quantum research as a priority; development of on-chip quantum computing; commitment of infrastructure for quantum technologies; and investment in the education of quantum scientists and engineers.

Q: Is digitalisation impacting your sector or region? How?

Digitalisation is affecting all sectors and all regions. Since the start of the pandemic, digitalisation is no longer an option, it is a necessity. Any companies that could do so, switched to a remote working environment. Partly as a result of greater reliance on these virtual working arrangements and as the risk and possible impact of operational incidents caused by people, failed processes and systems has increased, we have seen a spike in cyber threats, like ransomware attacks and phishing. This was most evident by the attack on the HSE in June. This is just one of the impacts of digitalisation that is faced by the region. Also, as outlined previously the digital transformation drive of all major economic sectors creates further demand on deep-tech innovation of new digital technologies, a significant economic activity in the Southern region. This includes the ubiquitous use of smart sensors and systems with the associated cybersecurity issues, the deployment of increasingly intelligent robots and machines as well as increased computing power at lower cost and the development of big data and at-the-edge analytics enhanced with machine learning and Artificial Intelligence.

Q: How can we improve the alignment of the country’s ICT and digitalisation expertise, initiatives and investments?

The Digital Innovation Hubs initiative under the EU Digital Europe Programme is a major initiative that can be used as a vehicle to align the ICT and digitalisation experience of Research and Innovation Organizations in the Southern region to boost the digital transformation of companies. A Digital Innovation Hub in the Southern region would bring together the largest constellation of ICT innovation expertise, capacity and infrastructure to address the digital gap with companies, in particular SMEs and start-ups. Such an entity could act as regional and national broker of all necessary technical, business, financial, investment and training support services across the full value chain, to create a platform that will enable companies in any region to access expertise both in Ireland and if unavailable here, through our network of hubs in Europe, and boost global competitiveness.

Other programmes that can be used in the same direction are the Disruptive Technology Innovation Fund scheme and the Important Projects of Common European Interest particularly in the areas of microelectronics and energy.

Q: What opportunities can you see as arising from Green Transformation for your sector or region?

Because of the scale of the problem and the effort required there will be huge economic opportunities for businesses. At the heart of the green transformation is innovation and innovation is a key driver for economic growth. The innovation required is wide ranging taking in everything from agriculture and the marine, energy, waste management, transportation and buildings. In addition, there are the technologies that enable

innovations in this sector and these include AI, blockchain and IOT, with research organizations such as Tyndall playing a key role in developing these technologies.

Q: What challenges exist for enterprises trying to reduce emissions or introduce sustainable practices?

Many enterprises lack the knowledge and expertise required to implement effective carbon-reduction strategies and are focused on their core business. Clearly the introduction of sustainability practises affects all aspects of business. A big obstacle for enterprises is knowing where to start and how to prioritise the activities by tackling the most effective ones first.

There can also be challenges for enterprises in determining how to measure their carbon footprint, how to overcome cost barriers in the shift towards greener, cleaner practices.

Q: How could government or enterprise agencies assist you in meeting those challenges?

Financial incentives for companies will play a big part in changing behaviour of enterpises. This may involve funding partnerships with energy research groups such as IERC in Cork to determine how to analyse data on their emissions or offering technology solutions to assist the companies in their green transition.

Q: What are the barriers for innovation diffusion in Ireland? How can these barriers be broken down? Are their regional differences in these barriers?

Many businesses have not made the digital transformation necessary to be competitive on a local, national or international scale. This lack of digital savvy SMEs across Ireland and Europe has also meant that they could not compete at the most basic of levels during the lockdowns of the COVID-19 pandemic, in some cases adding to the crippling effect on urban, rural and costal economies. One way to address this is the Digital Innovation Hubs initiative. Tyndall is leading a consortium that will mobilise a critical mass of partners, business support networks, knowledge and infrastructure investments to create awareness of the digital transformation opportunities that are available to SMEs and energise them to investigate the enabling power of the digital technologies offered by the Hub to enhance and transform their products and processes.

Q: What channels for diffusion are used by your business or sector?

In addition to the initiatives mentioned such as DTIF, Innovation Partnerships, we encourage Irish companies to get involved in EU programmes with Tyndall. As well as providing additional funding for companies to perform research activities it can lead to further collaboration with partners throughout the EU and provides an arena for large companies to increase international cooperation along the value chain and for smaller companies can provide opportunities to establish or expand their international networks of partners or potential customers.

Q: How can we enhance collaboration between industry and the higher education sector?

One of the most effective knowledge transfer mechanisms is where companies come into the university and locate one or more of their team there. We have many such examples in Tyndall, which enables the company staff to upskill and to build the adsorptive capacity to be able to not only receive, but also use, the knowledge and IP from the university. We often find that these companies end up completing many more research projects with us, including EU funded projects, and therefore it results in increasing the industrial R&I activity in Ireland. Mechanisms to support this would be beneficial, such as funding to establish co-location innovation centres within RPOs, where companies can locate one or more staff. This would not only encourage greater engagement with the RPO, but would also stimulate R&I activities with other companies in the co-location space. This could be particularly beneficial for regional companies as it would help address the geographic gap between the company and the RPO, and also give them direct access to the best R&I

activities relevant to them. it could also provide a platform to enable the seamless transition of trainees into these companies.

Q: In what areas or sectors should we be concentrating our international research collaboration activity? What supports do these areas or sectors need to be competitive on a world stage?

Focus on specific areas means that others will lose out, therefore there is a risk that future important science or technology areas will not receive funding, for example who would have predicted the critical importance of vaccine research just 2 years ago? Our recommendation is that the level of funding in this area is balanced, and in addition to base funding, to ensure that the Irish research and innovation ecosystem is sufficiently robust and dynamic to meet future challenges. Ultimately, challenge-led funding should follow the best researchers with the most promising ideas and projects of potential, allowing them to focus on the right problems – a value driven approach. The structure and level of resources applied – Funding programmes designed to address specific challenges can often become short-term focused. Many of the ground-breaking technologies being deployed today took 5 to 10 years to develop, and therefore deploying programmes that expect challenges to be addressed within their timeframe will gravitate towards high TRL projects that deliver in the short-term, but may not be the most highly impactful towards addressing the challenge. It is important that the criteria applied is focused on projects with the potential to deliver the biggest impact, or contribution to addressing the challenge (including underpinning technologies). For example for electric vehicles to become ubiquitous requires a new generation of battery materials and therefore a call to address the challenge of delivering a decarbonised transport system, should be also open to fund projects on new battery materials as well as vehicle system level projects.

Q. How can Ireland's regions use Ireland's international links and memberships to support their strengths and emerging areas of future opportunity?

Ireland's continuing prosperity depends on our ability to sell our goods and services into international markets and having competitive companies to sustain this activity is essential. Companies generally achieve competitive advantage through innovation. Information plays a large role in the process of innovation and improvement. Partnerships with other companies and research institutes outside Ireland can provide huge benefits to Irish based companies. This has been successfully achieved through Horizon 2020 and should be extended in Horizon Europe. Membership of EU industry led bodies such as the European Technology Platforms can not only help Irish companies get insights into potential future emerging technologies but also foster networking opportunities and international cooperation in order to address cross-sectorial challenges.

Q: Which RD&I initiatives have been successful for your sector/region? Which programmes should continue? Which RD&I programmes for enterprise are not working?

The Disruptive Technology Innovation Fund programme has successfully brought SMEs, Multinationals and Research and Academia together to work on common projects. For example in the recently funded TRIDENT project, 5 SMEs, 1 multinational, 1 university & 1 RPO are working together to develop energy storage solutions.

Q: How do we target RD&I spend in a way which maximises impact for the economy and which addresses the market failure evident in low RD&I in the indigenous SME sector?

To maximise the impact for the economy links between multinational firms based in Ireland and indigenous Irish SMEs should be increased. There are a number of ways that this could be done, including involving these large firms in enterprise-led networks for innovation and skills development collaboration as well as providing incentives to large companies to undertake R&D in partnerships with SMEs and Irish RPOs.