Summary Report 3rd GLORIA Workshop on:

Corporate R&I towards Europe's Green Deal: An opportunity for new business and prosperity?

Virtual workshop, 1 and 2 July 2020

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INTRODUCTION AND BACKGROUND

This workshop is part of the **Global Research & Innovation Analyses[3]** (GLORIA) project undertaken jointly between the Commission's Joint Research Centre and the Directorate General for Research & Innovation (R&I). **GLORIA workshops** are held in order to discuss policy-relevant issues addressed in our research surrounding the EU R&D Scoreboard[4] and obtain feedback from different stakeholders from academics, policymaking, and industry about the relevant results and analysis obtained in the GLORIA activities and their policy implications. Up to now, eleven workshops have been held.[5]

The European Green Deal[6] and the Sustainable Europe Investment Plan[7] will support €1 trillion of investment over the next decade together with a more ambitious European Union's emission reduction target for 2030 towards 55%, on the way towards climate neutrality 2050. As such, the Green Deal will have a significant impact on the R&I activities of European industry. This edition of the GLORIA workshop focusses on the opportunities that the Green Deal offers for corporate Research, Development and Innovation of EU industry, its impact on competitiveness, possible barriers that companies might encounter and the role of policymaking to ensure a successful implementation. A detailed concept note and agenda can be found in the Annex, together with the profiles of the presenters.

For convenience the main discussion topics will be summarised here:

- What could be mapped and identified as main European industry contribution to the European Green Deal in terms of: emission shares, potential in green and clean technology and solutions, investments, markets, the role of different players?

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[2] The views expressed are purely those of the authors and may not in any circumstances be regarded as stating an official position of the European Commission

[3] See: http://iri.jrc.ec.europa.eu/home/. The activity is undertaken jointly by the Directorate General for Research and Innovation (DG RTD.F; see: http://ec.europa.eu/research/index.cfm?lg=en) and the Joint Research Centre, Directorate B Growth & Innovation (JRC-B; see: https://ec.europa.eu/jrc/en/science-area/innovation-and-growth).

[4] See: https://iri.jrc.ec.europa.eu/scoreboard/2019-eu-industrial-rd-investment-scoreboard

[5] See: https://iri.jrc.ec.europa.eu/events?field_contenttype_target_id=6&field_startdate_value=All

[7] See https://ec.europa.eu/commission/presscorner/detail/en/fs_20_48

- How we can define competitiveness in the context of Europe's policy agenda (decarbonisation of energy-intensive industries, meeting the goals of climate-neutral and circular European economy)?

- What are the main industry issues and trends in addressing competitive challenges while leveraging the transition towards sustainability? (This can refer, for instance, to building on EU scientific and technological knowledge to develop solutions for green and inclusive growth and their applications)

- What can be new advantages in the European Green Deal context? Can these serve as an incentive for investments to meet sustainability objectives? What are the obstacles to be overcome?

- Identify the implications of the new policy agenda (requiring new technologies and business models) for current and future strategic value chains (and GVCs) and for the development of Innovation Networks at the local and global levels?

- How can policy better account for the heterogeneous needs and weaknesses of regions and firms with respect to the European Green Deal?

- Assessment and policy recommendations oriented towards Green Deal priorities and policy needs (beyond the 2019 Industrial R&I Investment Scoreboard analysis) How to further develop the Scoreboard in the light of decision makers' data and information ('business intelligence') needs?

Opening session: EVIDENCE FROM THE GLORIA PROJECT AND KEYNOTE SPEECH

DG R&I and the JRC introduced the workshop outlining the need for re-launching the economy, combined with the need for green and digital transformation as main policy objectives, and a wider support of EU technological leadership, strategic autonomy and foresight perspectives.

After an opening by Peter Dröll (Director Prosperity, DG R&I) and Alessandro Rainoldi (Head of Unit of Territorial Development, JRC.B3), Héctor Hernández from JRC.B3 presented evidence on large R&D investors and green technologies based on the Commission's EU Industrial R&D Investment Scoreboards.[8] Regarding the green technologies, Scoreboard companies own around half of all green patents, which in turn are only 9% of the total patents filed in the EPO and USPTO offices from 2012 to 2015. In this subsample, EU companies show comparative advantages in most green technologies, with the exception of ICT applications in the energy sector. In the automotive sector, EU companies are well represented, but their position is increasingly challenged by competitors from software, IT hardware, electronics and chemicals sectors. This is particularly challenging since emerging

[8] https://iri.jrc.ec.europa.eu/rd_monitoring

technologies are taking a higher proportion of the value added in this sector with the advent of electric cars.

The keynote speech by Kirsten Dunlop, CEO of Climate-KIC, provided an overview of what, in qualitative terms, R&I investment means in the context of climate objectives, addressing the directionality R&I and the implications for businesses of a large scale change. This does not only comprise the green and digital transformation, but also the covid-19 crisis. This combination has led to a huge debt creation in order to stem these challenges, which needs to be paid off by later generations and at the same time ensure a successful transformation. Evolution is "no choice", but an opportunity via a new strategic approach to change. Europe should have the ambition to take leadership on this. The risk that is embedded in this transformation towards sustainability requires strategic resilience where R&I should serve as a risk management strategy for this extreme inflection as contrary to the more evolutionary changes during the last decades. Europe's leadership is needed for R&I directionality, especially in the global context in order to tackle the transformation with renewal and resilience. The current situation has wiped off billions in the balance sheets of businesses, for which a new way of stewardship and entrepreneurship is necessary. R&I will need to ensure evolution as well as disruptive innovation to manage options and strategic risks, where the strategic options can flatten the volatility in business model renewal. In this context, a new and more adequate way of assessing R&I investments would be to consider the R&I effort as a ratio of the total cost of risk of a company, as if it were an insurance premium. Thus, R&I is at the core of capabilities that help to deal with change and resilience. How can R&I investment be reformed towards a directionality of value at risk, based on core-capabilities and in the volatile environment?

In the context of the Green Deal, companies have now a much more stable framework. When going into an end-to-end view, current decisions are not made in a strategic manner, nor bringing together all the stakeholders, so investment is too scattered and needs frameworks to combine and create multi-sided effects. The climate KIC presents seeds of solutions to cross boundaries between industry and policy. The policy context should further incentivise cross-sectoral collaboration, by crossing structural borders and create sandboxes. Financial rulemaking, risk and compliance should provide the right framework of rules, and a framework that rewardsin the long-term. The importance about the framing is the narrative, e.g. the R&D/net sales or R&D/operating profit ratios over several decades. This could identify those companies that are renewing and changing the business model as a resilient course, which is better than a unicorn profile. The total cost of risk, value at risk, market capitalisation or biological indicators in relation to R&D investment can also provide new longer-term indicators. Natural laws pulled into standards we set for ourselves can also help. Europe is big and diverse enough to achieve it if the other global competitors do not join. Where Europe is most at risk, a deliberate policy decision can create new financial and business models, which in turn creates leadership dynamics, e.g. Gunther Pauli.

In the Q&A, part of the keynote, a question about the critical mass of KIC climate funding compared to the challenge was raised. Here, the importance of incremental change was outlined, but also the need to increase funding for breakthrough innovation, step-up overall investment and reorient the KIC organisation towards the critical value chains and vulnerable areas.

Session I: THE COMPETITIVENESS OF CORPORATE R&I TOWARDS EUROPE'S GREEN DEAL

Norbert Malanowski from VDI Technologiezentrum presented the results of an ongoing study (together with IDEA Consult on Global Innovation Networks and ecosystems for the Green Deal: Current state of the literature, analytical approach and analysis. The study started from the policy questions around the Green Deal with the aim to fileknowledge gaps and identify main actors, challenges and barriers, at the same time developing a methodological approach which could be transferred. The qualitative and quantitative approach is applied to ten Global Innovation Networks (GINs) and analyses patents, publications, micro- and macro-data analysis combined with expert interviews and data mining. For the expert interviews, 8 large and 2 small companies from the EU and no-EU countries were selected based on different selection criteria. **The patent and publication analysis already shows relevant actors investing in green knowledge, and an example of text mining analysis shows a certain commitment towards SDG 13[9].** The next steps are interviews and further case studies to complement the information from the analysis of the quantitative data.

Antoine Dechezleprêtre, Senior Economist from the OECD's Directorate for Science, Technology and Innovation, presented a showcase for the innovation and competitiveness' effects of green transition policies[10]. Europe has historically been a leader in sustainable technologies and has a good potential in terms of R&I capacity and preparedness to meet the challenges of the decarbonisation. However, despite European technological leadership, industrial capacities lost ground, such as in the case of solar photovoltaics (PVs). For tackling the Green Deal challenges, massive investments in innovation are necessary. The past decades have shown that investments in sustainable innovation, however, are related to the oil-price. The recent oil-price decline has led to lower sustainability investment, and therefore there is a key role for policy to overcome market imperfections. Measures such as carbon pricing via the EU's Emission Trading System (ETS)[11] has a positive effect on green patenting, can be used to fund R&D for low-carbon technologies, and can be effective without measurable negative impact on employment, although it has not always proven successful when prices went too low. Increased public R&D spending can lead to the development of breakthrough technologies such as hydrogen and fusion and the uptake of low-carbon technologies. The IEA recommended to five-fold increase public R&D spending across OECD countries. Technology push for enabling technologies for e.g. storage and

[9] Climate action, see https://sdgs.un.org/goals/goal13

logistics and process integration have shown to produce significant cost reductions. Also, the wider economic effects of environmental policies on companies need to be considered. While studies found that evidence on measurable positive economic effects is unclear, there are large positive spillover effects from clean technologies, without showing negative economic effects, and possible policy synergies between R&D and deployment support.[12] The Green Deal has additional instruments going into this direction. **Policy action should consider the possible negative effects of the green transition on further regional divergence due to different levels of ambition, as is the case of solar PVs where offshoring of R&D and production to China led to EU losing leadership.** Positive spillovers from clean cars or AI should however be acknowledged. Globally, the divergence between climate change, ambition and implementation will lead to further divergence between the actors. In the case of the French carbon tax on industry, the impact on emissions has been clearly positive with minor positive results on employment and competitiveness. Thus, **European ambitions have to consider setting realistic targets and address the potential threat of regional divergence.** The green and digital transition does not only have transitory costs, but will need to provide policy support to tackle the challenges of the companies in difficulty to transform effectively. The regional divergence will produce both winners and losers, which calls for dedicated policies to mitigate regional and local effects compared to the overall economic impact. This implies different policy granularities and complementarities, e.g. the Just Transition Fund in the Green Deal context.

The presentation by Matei Negrescu – Head of Area Development North Sea for the New Energy Solutions at Equinor (formerly Statoil) – addressed the EU Green Deal and the opportunities for the Renewables Industry from the perspective of the company. Equinor has been developing investments based on its offshore experience of five decades into greener, non-oil technologies, especially offshore wind. The company fully supports the strategy set by the Green Deal and plans to invest a significant share of its capital expenditures in the coming years in line with it. The company's own scenario setting reveals the need for strong growth trajectories in green energy, requiring a deep phasing out of coal and acceleration of deployment of renewable energy combined with an ambitious timeline (currently 2050). Analysts predict that up to 20 times more offshore wind can be generated than now, especially in the North and Baltic Sea. The company will thus invest into regional offshore wind clusters in Europe and also the US coasts and East Asia, combined with investing in other renewable technologies in selected markets. By 2035, Equinor plans to increase its installed renewables capacity thirty-fold. Key technologies are offshore wind energy, solar PV, together with energy storage technologies and green and blue hydrogen. Offshore floating wind is a key technology for which Equinor is an industry leader and foresees that decreasing costs will make it competitive with bottom-fixed wind in the medium- to long-term. Hywind Tampen was presented as a floating offshore wind farm supporting oil and gas activities, reducing significantly emissions. Europe's potential in

[12] See Zachmann, Georg. and Peruzzi, Michele and Serwaah, Amma (2014) When and how to support renewables? Letting the data speak. Bruegel Working Paper 2014/01, February 2014. [Working Paper]

renewables should be released by certainty on volume and ambition, hybrid projects, financial support, together with coordination of markets and infrastructure to allow longer-term planning horizons enabling global leadership in the sector.

After these presentations, the first session closed with a Q&A part. Questions regarding policy support highlighted that the deployment targets are highly ambitious but **need further support and stability for realisation**, as seen recently during COVID-19 pandemic where the lower oil prices disincentivise the energy transition . Less mature technologies would need different support than more mature ones. In order to drive costs down, substantial support for scaling-up technology implementation is necessary. Also, renewables can be combined with non-renewable processes to leverage the transition, and as such creating the potential for revising traditional energy production processes with renewables. In this regard, complexity of the technological solution for manufacturing is key to achieve competitiveness, and global competitors' progress quickly, so the EU has to consider leadership in the offshore wind GINs and the strategy currently under discussion. In that domain, the EU has the North Sea as a key asset whereas China has a huge market. A discussion on the necessary policy framework highlighted the need of the demand side. It was also outlined that, in turn to finding adequate types of policy support, industry commitment and long-term partnership is necessary.

With regard to data gaps and measurement issues, green patents are only a partial proxy of Green Deal investments and many relevant actors are outside the Scoreboard. Further work on the green patent classification has the potential to improve the characterisation towards green policy objectives. However, there are methodological limits and the whole production and life-cycle aspects have to be considered: if hydrogen is produced by burning coal, it is no longer a green resource. There is currently no methodological solution to provide comprehensive data for measuring Green Deal realisation, and the implied gaps and investment needs.

Session II: SUSTAINABLE CORPORATE R&I MONITORING AND REPORTING AND LINKS TO WIDER ISSUES

Gwen Yu – Head of Engagement Transformation at BNP Paribas – presented issues of R&I in sustainable finance, providing some insights on the directionality of financial investments. Sustainable finance is finance with purpose, with impact, take. It requires framework creating overarching goals – with minimum standards and measurable goals, setting the path to the transition. For individuals, carbon trackers are already available. For institutional investors, transition bonds can incentivize more sustainable investments. Investors can also direct investments in natural resources, or low emission investments. The risk of greenwashing[13] can appear as problematic without a general framework or minimum standards for sustainable investment. The EU Taxonomy is an example of a

[13] Greenwashing is a form of communication deceptively used by organizations to persuade the public that an organization's products, processes and/or services are environmentally friendly.

framework to support alignment with the SDGs and the Paris agreement targets. This type of frameworks provide a common setting and provide orientation, dependencies, impact. Impact and measurement, however need to be developed with aggregation of indicators incl. beyond classic financial indicators such as revenue or interest. Measurement of biodiversity or the total life-cycle impact on nature needs to be demystified and its complexity reduced to increase its comparability. Carbon pricing is the most developed indicator, within a framework of minimum standards, measurable goals and clear targets, but there is no standard yet for many other indicators. Such standards would need a data framework with sufficient coverage, but also openness to provide for diversity. A case study of the seafood sector showed issues of comparability within and among sectors, as well as difficulties in measuring different business models in different environments. **Data will need to be further harmonised and contextualised, and should be open-source at the global level, e.g. a data platform hosted by an international organisation to ensure integrity and reliability of data.** Some tools, e.g. based on blockchain technology, are already very accurate and include third-party monitoring, but are limited to certain sectors. Scaling-up for sustainable finance solutions is key to bring sustainable finance beyond the niche market, and knowledge-sharing, co-creation and involvement of all stakeholders (financial and non-financial companies, policymakers, NGOs, local communities) needs to be assured. Issues with reporting according to the EU taxonomy were experienced mainly by SMEs, and not so much by larger sector specific companies. Some sectors are not covered yet within the EU taxonomy. Some complexity also seen in companies operating in diversified sectors. The de-risking of sustainability investment can be addressed by sequencing and mixing a number of different financial instruments, for which a number of ideas were discussed.

The example of hydrogen and the Green Deal was presented by Claudia Conrad – Senior Expert Climate Affairs at ThyssenKrupp Steel Europe AG. The company generates the majority of sales in Germany and Central Europe. The steel industry is highly energy and plant intensive with long investment cycles. ThyssenKrupp aims at becoming carbon-neutral by 2050 following the Paris Agreement, via both CO_2 avoidance and CO_2 utilization. The CO_2avoidance path will rely heavily on hydrogen, with a clear technological path defined, planning to reduce CO_2 emission as a result of steel-production by 2030. The use of hydrogen instead of coal in the blasting process has been started in 2019, but will need further technological development in order to achieve even more CO_2 reduction and fulfil the ThyssenKrupp´s internal CO_2 reduction targets. A capital expenditure of around €10bn is foreseen for this in the future, given the very large investments needed to transform the steel plant infrastructure. The priority will be to use green hydrogen, but other types of hydrogen might be needed in case green hydrogen is not sufficiently available. The current project foresees that, under the CO_2 avoidance path, hydrogen will be used for CO_2-reduction of the blast furnace operations. This hydrogen injection project has been awarded public support from the Germany Real Labor initiative. There are two main projects to realise this: a partnership with Air-Liquide for an additional pipeline connection to connect to its hydrogen pipeline grid and a medium and longer-term procurement of green

hydrogen with other partners is being explored in several projects. While the Green Deal has support, the company considers that some framework conditions still need to be clarified and coordinated with the respective Member States' strategies. Examples are: a competitive hydrogen supply for the transformation, stable steel production conditions to provide an economic basis for the necessary investments, to limit the burden of the EU ETS[14], to ensure international competitiveness and to stop unfair imports in such trade-intensive sectors at global scale. Market creation for green steel will also be a highly relevant incentive for such ambitious transformations.

Enric Fuster – Senior Consultant at SIRIS Academic – presented a methodology for automated identification and classification of SDG-related science and innovation activities by means of expert-driven machine learning. This approach provides an alternative to tounderstand how R&D&I activities relate to the SDGs and Agenda 2030, especially with regard tothe STI for SDG roadmaps and in terms of benchmarking. The semantic mapping techniques were presented as a solution to analyse individual records, such as patents or publications, analyse information with respect to actual questions (beyond classifications) and understand information within the given context. The company presented its approach of a controlled vocabulary related to the SDGs with 3500 words, identifying about 20% of Scopus and 40% of H2020 text as SDG-related. The imitations are the still missing link to the geographical location, need for improving meaningfulness regarding origin from different sources, and issues for technical documentation related to wider SDG goals. Three practical applications of the SDG vocabulary were shown: aligning the Catalan STI regional priorities (as an input indicator for funding decisions), an analysis of main trends and actors in the automotive sector (regarding electrification and autonomous driving, based on patents and publications) and a JRC-pilot project for mapping STI roadmaps for SDGs (at the example of Serbia). The application of the vocabulary revealed a good potential for better understanding the directionality of R&I activities and the SDG/societal impact.

Pierre Barthelemy – Executive Director of Research and Innovation at CEFIC – presented the "ways towards the Green Deal" for R&I in the chemical industry, which has 29 000 companies in the EU, of which 97% SME, and 1.2 million employees. The chemical sector provides value-added to almost all European Value Chains and is therefore considered as a key sector. The concern is that the market share of EU chemicals on the global market has been reduced to half (albeit growing nominally) given competition from Asia and in particular China. While most CEFIC members are SMEs, most R&I within the EU is performed by the multinational members. A significant R&I share of competitors headquartered in China is probably underreported. R&I investment is key for the transformation of the industry, for which the Green Deal sets the ambition and direction. CEFIC supports and understands this, given the links of the industry to clean energy, new materials and CO2 reduction processes, and aims to be part of the dialogue. The industry foresees further global competition (coupled with fragmentation) which, however benefits all global actors, with a high degree of circularity and collaboration between the different

[14] Europe's Emission Trading System

stakeholders, integrating sectors, stakeholders and society. R&I in the sector can be classified along the main strands: advanced materials and industrial (low emission) processes, with the digital transformation as crosscutting trend. The sector integrates these strands into the wider objectives of the Green Deal and the SDGs/sustainability where innovation is key, as well as further necessary clarification of safe and sustainable by design chemicals, incl. methodological development and enforcement of the Reach directive. The Spire Public Private Partnership[15] (PPP) was presented as an example connecting to other process industries. Many chemical companies have developed their own sustainability assessment and use it also for evaluation and merger and acquisitions, but further harmonisation of the different approaches is necessary. Here, the EU Taxonomy can become important, but possible concerns were raised about technological flexibility and its application to different TRLs[16] where more freedom for lower TRL scales is necessary to avoid hindering innovation. Chemical plastic recycling was highlighted in the last report of the EU taxonomy Technical Expert Group and reviewed by the sector as a technology with potential interest in the future, incl. substantial activities of companies therein. Regarding the substitution of chemicals, the REACH[17] agenda was mentioned, but this discussion is based on hazard rather than innovation or sustainability. A more holistic approach to substitution would be desirable.

[15] https://www.spire2030.eu/

[16] Technology Readiness Level – a lower level refers to more fundamental and basic research

[17] European Regulation on Registration, Evaluation, Authorisation and Restriction of Chemicals: https://ec.europa.eu/growth/sectors/chemicals/reach_en

Closing session: POLICY ROUNDTABLE AND CONCLUSIONS

This section summarises the discussions of the policy roundtable and extracts policy conclusions. The discussion centred around implications, knowledge gaps and policy options in Corporate R&I towards the EU Green Deal. The participants in this roundtable discussion were: Seán O'Reagain (Deputy Head of Unit "Sustainable Industry Systems", DG R&I), Muriel Attané (Secretary General EARTO), Els van der Velde (Senior Expert, IDEA Consult).

Seán O'Reagain (DG R&I) underlined the role of PPPs such as SPIRE2030 to achieve the ambitious Green Deal targets. Here, the direct and indirect value chains need to be distinguished, together with digitalisation going in hand with the green transformation. Effective access to data and data sharing are essential here. Clean energy is a main enabler of the green transformation. A partnership with the industry and the energy carries can provide i.e. the necessary for the adaptation of the existing networks. ,. Synergies with stakeholders, programmes and investors are necessary and can be achieved via mechanisms like the European Battery Alliance. Regulation needs to provide the necessary framework and account for flexibility and blending of funding and investments.

Muriel Attané (EARTO) outlined the key role of research associations in the green transformation, and especially regarding the broader societal impact. Targets of Green Deal's objectives in the national R&D&I roadmaps should be envisaged. Linkages among the different policy instruments, to the Industrial Strategy, and building strategic industrial alliances and Horizon partnerships should be fostered. The governance of this process is key to success.

Els van der Velde (IDEA Consult) shared industrial insight from an ongoing study for the JRC. In the field of hydrogen, for example, the increasing importance of breaking sectoral barriers and a system thinking was outlined, together with the importance of strategic value chains, strategic alliances, PPPs and Horizon partnerships. Creation of multi-stakeholder consortia, also at the global level, are necessary and also enable success in higher TRL stages.

The subsequent discussion was led by Doris Schröcker (DG R&I) and elaborated on the existing policy instruments and scope. The main links to the regions could be further expanded and integrated on the national and EU level to account for the bottom-up character of innovation and regional ecosystems. Further mainstreaming of technology- and value-chain based initiatives should be considered. Concerning the monitoring of activities, the importance of measuring several aspects beyond patents and publications was underlined, as well as leaving sufficient leeway not to constrain investments only to the measured parameters. Such more complex monitoring needs common ground for indicators, and transversal/composite indicators will require to improve the skills to integrate and analyse complexity.

Policy can also help to integrate sectors, especially in areas with a common interest, e.g. in waste management or emissions trading. Financial engineering and new forms of

financial evaluation are also very necessary for realising the green targets, both in public and private organisations.

The lack of green startups was addressed. Despite the small numbers, Europe is leading. More investment or startups may however not be the only solution to the challenges. There could be other means, i.e. looking at technologies needed for 2050 and checking where are the technological development gaps; the EU positioning compared to global competitors, and deriving development paths for European GINs. However, it needs to be considered that the huge amounts of investment necessary for a transition delivering results in 2050 will need to be mobilised much in advance. The current time window needs key technologies to be identified and to be proved viable at demonstration scale by 2030.

Data availability (instead of funds) as the new main bottleneck resource was addressed, showcasing the need for monetising data towards all parts of the value chain, and especially the smaller actors. In the chemical industry, the larger companies connect proactively to startups to tap into the pools of knowledge. Some examples show that this critical issue will need to remain a concern for the future.

PRESENTERS

Muriel Attané

Muriel Attané has been EARTO Secretary General since July 2013. Before joining EARTO, she was Secretary General of EARPA, the European association of automotive R&D organisations for seven years. In parallel, she worked as EU affairs manager for more than 10 years for TNO (Netherlands Organisation for Applied Scientific Research), the largest Dutch RTO. There, she gained extensive hands-on experience on EU Research & Innovation Policies & Funding Programmes.

Pierre Barthelemy

Dr Pierre Barthélemy is Executive Director of Research and Innovation at CEFIC since January 2015. He obtained his PhD in Chemistry from the University of Liège, Belgium, in 1987, in the field of lanthanide coordination chemistry, followed by one year of postdoctoral research at Florida State University. He joined Solvay in 1988 in Brussels, Belgium, and moved to various R&D, management and senior leadership roles. He has previous experience in the field of fluorocarbons, in the field of peptide pharmaceutical ingredients and in the field of materials for the emerging market of organic electronics, leading Solvay's corporate R&I platform on Organic Electronics until mid-2014.

Claudia Conrads

Dr Claudia Conrads holds a PhD in Political Science (Bonn and Paris) and an MBA from Brussels and Ho-Chi-Minh City. She has been working ThyssenKrupp since November 2019 as a Senior Expert in Climate Affairs and Governmental Affairs. Before this, she gained

more than 15 years working experience in Brussels, specifically at the European Parliament, EnBW AG and the German Steel Federation as Head of the Brussels Office.

Antoine Dechezleprêtre

Antoine Dechezleprêtre is a Senior Economist in the Productivity, Innovation and Entrepreneurship Division, Directorate for Science, Technology and Innovation, OECD where he leads the work on innovation and technology diffusion for the green transition. Prior to joining STI, he headed the joint Green Growth work stream of the Economics Department and the Environment Directorate and was previously an Associate Professorial Research Fellow at the London School of Economics. His research has been published in international scientific journals in the fields of applied microeconomics, environmental economics and energy economics. He holds a PhD in economics from Ecole des Mines de Paris (France).

Peter Dröll

Dr Peter Dröll is Director of Prosperity, Directorate-General Research and Innovation. Peter works in the Directorate-General for Research and Innovation and innovation since 2008, first in charge of innovation, since 2016 for Industrial Technologies. Previous positions in the Commission include financial control, environment policy and enlargement policy. From 2004-2008 he was Head of Cabinet of the Science and Research Commissioner Janez Potočnik. Peter is a lawyer by training with a doctorate degree in German constitutional law and European law.

Kirsten Dunlop

Dr Kirsten Dunlop joined EIT Climate-KIC in January 2017, from Suncorp Australia, where she was Executive General Manager Strategic Innovation. At Suncorp Kirsten founded and led a bespoke division focused on managing and responding to strategic risk through innovation, transforming core business and industry models from within. Prior to roles in Second Road, KPMG and Suncorp, Kirsten worked in the UK and Italy for 15 years.

Enric Fuster

Dr Enric Fuster is a Senior Consultant at SIRIS Academic, Barcelona, specialising in science and innovation policy. He has been involved in higher education, regional development and smart specialisation strategies and projects across Europe and, with colleagues at SIRIS Academic, he is developing new uses of open data, data analysis, natural language processing and data visualisation to support science and innovation policy design, monitoring and communication.

Héctor Hernandez

Dr Héctor Hernández is an engineer and holds a PhD dree in analysis of industrial processes and chemical engineering from the University of Compiègne (France). He is currently a

senior research analyst at Directorate B of the Growth and Innovation unit within the JRC., dealing with prospective techno-economic studies concerning industrial, research and innovation policies.

Norbert Malanowski

Dr. Norbert Malanowski is working for VDI TZ in Düsseldorf as a senior consultant and project leader in the field of innovation and industrial policy and on socio-economic aspects of emerging technologies since 1999. In addition, he has been a senior lecturer for innovation and labour policy at the University of Witten-Herdecke since 2009. He has a PhD in Political Science/Political Economy (focus on "Tripartite Forms of Co-operation in Industrial Policy"). From 2005–2007, he worked as Senior Scientist at IPTS of the European Commission in Seville, focusing on Information and Communication Technologies for Active Ageing in Europe.

Matei Negrescu

Matei Negrescu is Head of Area Development North Sea of the New Energy Solutions (NES) division of Equinor, an international energy company developing oil, gas, wind and solar energy in more than 30 countries worldwide. He joined the company 12 years ago after graduating with a Master of Science in Petroleum Engineering from Imperial College London. Matei has extensive leadership experience and has lived, studied and worked in 6 countries. He is fluent in 6 languages and is currently learning Mandarin at the London School of Economics and Political Science, where he is following the Chinese Language and Culture for Business programme.

Seán O'Reagain

Seán O'Reagain is Deputy Head of Unit, "Sustainable Industry Systems" at the European Commission's Directorate General for Research and Innovation. In this capacity, he implements policy and actions under the Horizon 2020 Framework Programme to promote sustainable industrial innovation by incorporating knowledge in high-value-added products and highly-efficient processes. In this regard, Mr. O'Reagain oversees the contractual Public-Private Partnerships on and the Sustainable Process Industry (SPIRE), Factories of the Future and Energy-Efficient Buildings. Mr. O'Reagain was previously responsible for the Joint Technology Initiatives with industry and the European Technology Platforms. Prior to that, he managed the benchmarking for competitiveness and innovation programme in the Commission's DG GROW

Alessandro Rainoldi

Alessandro Rainoldi is Head of the "Territorial Development" Unit within Directorate B – Growth and Innovation at the European Commission's Joint Research Centre in Seville, working mainly on regional, urban, innovation and industrial policies. In the same Unit he also specifically dealt with smart specialisation, territorial impact assessment and regional modelling. He worked extensively for the Commission's Directorate-General for Regional

and Urban Policy dealing with the negotiation and management of EU funding programmes in Italy, Malta and Romania and contributing to the policy agenda on issues related to governance, innovation, financial engineering and evaluation. He was part of the assessment committee of the European Energy Programme for Recovery. He previously worked at the study & research department of a leading Italian banking group and as a free-lance journalist. He teaches EU structural funds at the European College of Parma.

Doris Schröcker

Doris Schröcker is heading the Unit for Industrial R&I Agendas and Business Intelligence in Directorate General Research and Innovation in the European Commission. Her background is business administration with marketing and industrial management, and she has worked in different positions in EU R&I policy and programme management in the European Commission (mobility/transport and energy, industrial and key enabling technologies).

Alexander Tübke

Alexander Tübke was appointed Team Leader of the Industrial Research and Innovation team in 2016. He studied Industrial Engineering at the Universities of Karlsruhe (Germany), Lausanne (Switzerland) and Seville (Spain) and holds a European Doctorate of Industrial Engineering of the University of Seville. Alexander has working experience in several multinational companies in the field of marketing and audit. He joined the European Commission's JRC in 1999. Since then he was engaged in research projects in the area of Innovation & Competitiveness, Technology Assessment, Enlargement and Strategic Policy Intelligence.

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Dr Els Van de Velde is Senior Expert in the field of "Competitiveness and Innovation". She has extensive experience in key enabling technologies, smart specialisation strategies, and value chain analyses. As a project manager, she has led and participated in various European and regional projects for the European Commission, VLAIO, EWI, BELSPO, OECD (FR), and EPSRC (UK). Els has a PhD in Applied Economics, at the Ghent University. She holds a master's degree in civil engineering. She has advanced skills in qualitative and quantitative analysis, evaluation of European policies, survey set-up and implementation, and business development.

Gwen Yu

As Head of Engagement Transformation in BNP Paribas Group's Company Engagement team, Gwen leads transversal projects to accelerate business decision making based on the Group's sustainability commitments in line with UN SDGs by coordinating and assisting in positive banking business origination and employee engagement. Prior to this, Gwen worked in various parts of the BNP Paribas Group including Corporate and Institutional Banking and Retail Banking Services. She has been with BNP Paribas since 2010. Before joining BNP Paribas, she worked in Asia and North America providing market entry strategies,

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