

14-16 June 2023

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**Eu-SPRI Annual Conference 2023:  
Research with Impact**

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## Track titles

1. Digital automation technologies and the future of work Past impacts and emerging technologies' trends (Fabien Petit, Sugat Chaturvedi, Tommaso Ciarli, Yuchen Guo, Ekaterina Prytkova, Maria Savona)
2. Capacity for delivering transformative innovation (Susana Borrás, Karoline Rogge, Jakob Edler)
3. Tensions in sustainability-oriented innovation policy (Susanna Horn, Kirsi Hyytinen, Mika Nieminen, Matti Pihlajamaa, Nina Rilla, Hanna Salo)
4. The art and fiction of the societal impact of research (Joaquín M. Azagra-Caro, Caterina Benincasa, Elena Denia, Anabel Fernández-Mesa, Andrés Salas-Vallina, Ana Tur-Porcar)
5. Cities & Regions in transformation: anchoring the logic of transformative innovation policy in sub-national context (Mart Laatsit, Iryna Fil Kristensen, Lasse Bundgaard)
6. Prioritising science, technology, and innovation that address diverse societal challenges (Diego Chavarro, Tommaso Ciarli, Hugo Confraria, Ismael Rafols)
7. Struggling for Relevance: Investigating How Researchers Design and Conduct Transdisciplinary Research (Annemarie Horn, Lotte Krabbenborg)
8. Research that leads to endings: Reflections about Impacts of Destabilisation and Discontinuation Research (Peter Stegmaier, Lea Fünfschilling, Frédéric Goulet, Bruno Turnheim)
9. Governance and policy processes for transformative research and innovation: Towards an empirical comparative perspective (Taran M. Thune, Iris Wanzenböck, Matthijs Janssen, Mart Laatsit)
11. Advancing Networks of Power: carrying Large Technical Systems theory to the future (Katherine Lovell, Simone Vannuccini, David Eggleton, Aslı Ates, Marc Hudson)
12. Steering and evaluating impact of gender equality on research and innovation (Dr. Nina Rilla, Giovanna Sanchez Nieminen, Catarina Milhazes, Sarina Gursch, Dr.Gabriela Gomes Coelho Ferreira)
13. Learning to transform: Connecting urban experimentation and urban policy mixes better (Marc Dijk, Anique Hommels)
14. Handbook of Societal Impact of Academic Research (Magnus Gulbrandsen, Claire Donovan)
15. Science and Technology Policy for flourishing ecosystems (Klaus Kubeczko, Nikos Kastrinos, Philine Warnke, Matthias Weber, Juergen Wengel)

16. Making foresight effective for next-generation STI policy: Exploration –Orientation –Participation (Matthias Weber, Kerstin Cuhls, Radu Gheorghiu, Giovanna Giuffré, Nikos Kastrinos)
17. Disrupting evaluation cultures (Alejandra Boni, Stephanie Daimer, Michael Dinges and Mireille Matt) merged with Track 10. Defining, evaluating, and learning from the impacts of research in agricultural innovation systems (Genowefa Blundo Canto, Angela Vasquez, Mireille Matt, Kevin Heanue, Marina Apgar)
18. Governing Research Careers: addressing persistent and emerging challenges in the context of the ‘impact agenda’ (Carolina Cañibano, Alain Mermet, Emanuela Reale)
19. Reimagining research and funding cultures in the Anthropocene (Michael J. Bernstein, Robert D. J. Smith, Thomas Franssen, Cian O’Donovan, Filippo Cuttica)
20. Facilitating, fostering, and funding transdisciplinary research (Laurens Hessels, Jochem Zuijderwijk, Anne-Floor Schölvinck, Annemarie Horn, Lotte Krabbenborg)
21. Translational Research: How far have we come to bridge the gap between science and practice? Rationales, Design, Impact and Evaluation (Effie Amanatidou, Isabel-Maria Bodas-Freitas, Anders Broström, Cinzia Dello Russo, Dimitri Gagliardi, Jarno Hoekman, Magnus Holmén, Michael Hopkins, Oscar Llopis, Bastian Rake, Ronnie Ramlogan, Taran Maru Thune, Alfredo Yegros)
22. Performance evaluation of government S&T budgeting: theoretical, empirical, and methodological contributions (Xiaoxuan Li, Aruhan Bai)
23. Biosocial technical systems: integrating analysis on sociotechnical systems, biosocial systems, and policy evaluation (André Sica de Campos, Janaina Pamplona, Paula Xavier dos Santos, Rebeca Buzzo, Cátia Miriam Costa)
24. Creative and Cultural Industries and Innovation: New models, new policies, new institutions (Josh Siepel, Hasan Bakhshi, Bruce Tether, Giorgio Fazio)
25. Harnessing Social Innovation for Sustainability (Katrin Ostertag, Jakob Edler, Jürgen Howaldt, Rick Hölsgens, Matthias Weber, Doris Schartinger, Tineke Kleinhout-Vliek, Adrian Smith)

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# **0.1 STI Theory**

# Is the Linear Model of Innovation Dead? A ‘Topic-Sentiment Analysis’ of Policy Documents

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Friday, 16th June - 13:30: (FUL-213) - Full paper presentation

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*Thanos Fragkandreas (University of Westminster), Leo Leitzinger (Goethe University of Frankfurt), Marius Liebald (Goethe University of Frankfurt)*

This paper deals with a hitherto unnoticed ‘theory-policy’ inconsistency. On the one hand, the relationship between innovation research and policy has often been portrayed as harmonic, mutually beneficial and co-evolving. On the other hand, several contributions suggest that the assumption of linearity is still highly influential among policymakers, even though innovation researchers have abandoned the linear model of innovation (LM) since the late 1980s. This paper is among the first to empirically substantiate the influence that the LM exercises in the contemporary innovation policy discourse. It does so by identifying repeated discursive patterns (e.g. topics) and their sentiments (i.e. positive, negative or neutral) in a vast corpus of documents (n=1,895) published by four policymaking organisations (European Commission, OECD, UNCTAD, and World Bank). It is shown that key aspects of the model in question are influential, often receiving positive sentiment in all four organisations. This finding raises crucial questions regarding the extent to which policy-makers understand the extant discourse on the transformative and mission-oriented innovation policies under the prism of the LM.

## **A research impact study through semantic as well as ontological approach: Assessing how much Transition Study has influenced Climate and Energy Transition Policy in Japan**

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Friday, 16th June - 13:30: (FUL-213) - Full paper presentation

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Satoru Mizuguchi (Tokyo Institute of Technology)

Social science has been addressing how to mitigate climate change, an existential threat to humans. It is relevant to ask what impacts social science has been exercising on a current policy to mitigate climate change after three decades have passed since the United Nations' Earth Summit of 1992 prepared the stage for international climate actions. To explore this question, this paper focuses on the research impacts of Transition Study (TS), which provides such concepts as *transitions*, *pathways of change*, *co-evolution*, and *multi-actor processes*, all of which make common vocabulary in climate and energy science. This paper examines climate and energy policy documents of the West and the East. "Fit for 55" is a policy package delivering the EU's 2030 Climate Target on the way to climate neutrality. The other is the Green Transformation (GX) Bill by the Governments of Japan (GOJ) and the preceding policy papers for the Bill. Repeating the term "transition", these legal documents aim to de-carbonize each economy. This paper applies two methods. The first is etymological inquiry inspired by Giovanni Satori. Does the GOJ "correctly" translate the word "*transition*"? The second is the list approach, an ontological method to analyze the degree of concept adoption. Applying the transition researcher's "yardsticks", I examine how much the documents adopt the TS concepts. The questions are how the concept of transition is defined by the EU and the GOJ; how concepts of TS are adopted by the EU and the GOJ; how "agency" was set by the EU and the GOJ? The results are the EU's documents adopt some of the concepts of TS through employing individualistic agency while the GOJ adopts almost nothing from TS through applying corporative agency. The GOJ even promotes existing policies as transition policies by employing mistranslated language. In this sense, the impact of TS is positive in the EU while it is negative in the GOJ. In reflection, this paper analyzes the cause of the differences between the EU and Japan, suggesting the policy relevance of the research beyond Japan.

# Innovation policy making from the practitioner's perspective – A morphological design process for policy instruments – The case of Germany

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Friday, 16th June - 13:30: (FUL-213) - Full paper presentation

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*Carsten Schwäbe (Freie Universität Berlin), Martina Kovac (Freie Universität Berlin), Elina Pulkova (Freie Universität Berlin), Carsten Dreher (Freie Universität Berlin), Julia Simper (Freie Universität Berlin)*

Tackling grand societal challenges requires new conceptual foundations encouraging a debate on the need for modified innovation policy approaches. Considering accelerated innovation cycles and new transformation requirements, practical guidance regarding the governance of innovation policy is urgently needed. However, not only the role of the government per se should be discussed, but also the capabilities of the implementing policy actors, the institutional framework as well as the underlying political processes must be considered. Hence, the research project “Innovation Policy Orchestra” explores policy design and coordination processes and aims at creating a structured understanding of these processes, accounting for these dimensions. The morphological creative method is applied to build two matrices that help to analyse and solve complex innovation policy challenges in a systematic way. The first matrix offers a structured analysis of what innovation policy should address. In the situation analysis, diagnostic questions help to identify challenges and fields of action. Based on this, goals that are to be pursued by innovation policy and the associated change options are derived. The relevant innovation activities in need of change and the involved actors represent the interfaces to the second matrix which structures the analysis of possible instruments. This instrument matrix includes the dimension of polity and politics to depict innovation policy design processes in a more realistic way. For innovation policy practitioners, our approach shall point out possibilities for action and improve the selection and design of appropriate instruments. Innovation policy scholars might benefit from a holistic depiction of the innovation policy design process by understanding the practical challenges of policy-making. Overall, our project aims to improve policy recommendations from research and policy-making in practice by explicitly accounting for the perspective of practitioners.

## **0.2 National Systems of Innovation**

# Analysis of the Factors Driving Innovation Performance: Empirical Evidence from the Global South

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Thursday, 15th June - 16:40: (JUB-118) - Full paper presentation

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*Sajjad Niazi (School of Public Policy Chiang Mai University)*

This study examines the effect of various enabling factors that potentially influence the innovation performance of the global south countries by analyzing the Global Innovation Index (GII)-2020, as little was known about their innovative behavior. The systematic and comparative assessment of innovation performance permits policymakers to assess the impact of adopted STI policies. Unlike previous studies, this paper investigates what factors drive innovation performance in the global-south countries by examining the other factors unrelated to the Input-subset of GII. Multiple regressions (OLS) were employed using cross-sectional data from 86 countries to explore the relationship while controlling for GDP, democracy, R&D expenditures, R&D personnel, income gap, and population. The robust results show that innovation performance was significantly higher in countries with higher e-participation and efficiency enhancer levels. E-governance development and economic freedom factors showed mixed effects on innovation performance. Inconsistent with previous studies and the hypothesis of this study, governance performance remained indifferent to national innovation performance. These results indicate that improving developing countries' e-participation, efficiency enhancer, and economic freedom, which represent policy planning and institutional structure, would significantly contribute to increasing innovation behavior and economic development.

## **From impact evaluation to transformative evaluation: context and institutional constraints when analysing the impact of public support to private R&D in Spain**

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Thursday, 15th June - 16:40: (JUB-118) - Full paper presentation

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*Ana Fernandez-Zubieta (Complutense University of Madrid), José Molero (Complutense University of Madrid), Manuel Fernández-Esquinas (IESA-CSIC), Antonio García-Sánchez (University of Seville)*

The paper aims to analyse the effects of public subsidies to private R&D in Spain and to reflect on the contextual and institutional factors that limit innovative agencies to apply more transformative-oriented policies and evaluation practices. We focus on the evaluation experience of the main innovation agency in Spain: the Centre for the Development for Industrial Technology (CDTI). We use information coming from the evaluation assessment of the program aid of the CDTI from 2015 to 2020 that is complemented with information on the user's perspective and other organisational information coming from semi-structured interviews with employees and former employees of the centre at different organizational levels. In order to carry out the more-traditional oriented impact assessment we used Differences-in-Differences with propensity score matching (DD-PSM) in the common support. The semi-structure interviews that aim to capture the contextual and (internal and external) institutional dynamics of the centre follow the scheme developed by Portes (2006) and Portes and Smith (2010). We find that public support has positive effects on firms' R&D resources (i.e. internal R&D investment and job creation) - input additionality- and cooperation -behavioural additionality. However, the impact of public support on firms' technological outputs varies importantly across sectors, having a positive effect limited to traditional-oriented sectors. We partially explain the limited flexibility to adapt evaluation schemes through the evaluation culture, the organisational and institutional characteristics of the centre. The centre functions well from a policy-making perspective, but the low level of organisational and financial autonomy diminish its organisational innovation potential. Despite of having a horizontal structure and a meritocratic recruitment of employees, a limited number of personnel reduces the opportunities to embrace new initiatives. Low diversity and lack of mechanisms for the integration of stakeholders at the strategic level of the centre reduces the opportunities for an effective contribution of the centre to development transformative innovation policies. Low proactivity outstands among the external factors for institutional adequacy. However, the centre could move towards a transformative approach by increasing the level of autonomy, additional human resources, the integration of stakeholders and the development of pilot initiatives to acquire new capabilities.

## **Mergers between universities and governmental research organizations. Comparing the Netherlands with Denmark**

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Thursday, 15th June - 16:40: (JUB-118) - Full paper presentation

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*Arlette Jappe (University of Wuppertal, Interdisciplinary Centre for Science and Technology Studies IZWT)*

The paper argues that research policies for societal impact and sustainability transformations should focus more on institutional structures and their development in national innovation systems. The paper compares two contrasting cases concerning the reorganization of public sector research institutes. In the Netherlands, the former governmental Agricultural Research Service was merged with Wageningen University in 1997-98. In Denmark, in the course of a comprehensive university reform, several former governmental research institutes were merged with Aarhus University and Technical University Denmark in 2007. The paper investigates (a) how each merger reform affected the organization of research in the broad fields of agriculture, food production, and the environment, and (b) what implications follow from these reforms for research policies aimed at societal impact and sectoral transformations. Methodologically, the study applies insights from historical institutionalism to systematically distinguish observable events of political development from normative discourse on political objectives and substantive policy outcomes.

## **0.3 STI Policy & Technology**

# The role of demand environment, external knowledge and public policy in shaping technological trajectories and industry evolution for lithium batteries

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Thursday, 15th June - 09:00: (FUL-213) - Full paper presentation

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*Sergey Kolesnikov (University of Cambridge), Deyu Li (Utrecht University), Martin Beuse (HagerEnergy GmbH), Laura Diaz Anadon (University of Cambridge)*

This paper analyses the co-evolution of technological trajectories and lithium battery (LB) industry over the last five decades, focusing on the role of changing demand environments, external knowledge, and public policy as factors that shape these trajectories. We show that changing demand environments shaped the evolution of LB technological trajectories and industry in four distinct stages. We also show that external knowledge has been instrumental in the emergence and evolution of LB technology and industry, but its role and relative importance significantly varied over time, depending on the stage of technology and industry evolution. Third, we find that public policy not only facilitated both the supply and demand for LB technology and innovation over time, but also helped shape technological trajectories and industry evolution by helping identify and integrate unmet user needs and relevant external knowledge through mission orientation.

## **Risks of policy failure in the design and implementation of R&D support**

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Thursday, 15th June - 09:00: (FUL-213) - Full paper presentation

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*Mercedes Bleda (The University of Manchester), Seweryn Krupnik (Jagiellonian Univeristy)*

In current socio-economic contexts characterised by high levels of uncertainty, the role of R&D policies to foster innovation becomes crucial. However, increased uncertainty exacerbates the risk of policy failure leading to inefficient R&D support. Despite this, R&D policy failure risk is rarely discussed in the literature. While innovation research acknowledges the existence of policy failure risks, their nature and the appropriate ways to address them are not analysed in a systematic and integrated manner. Drawing upon risk, innovation policy and public policy research, we provide a comprehensive framework for the systematic analysis of R&D policy failure risks and their governance.

## **0.4 Evaluating approaches for transformative change**

## **Tying back Social and Non-Social Innovation to Uncover Social Innovations' Dynamics and Impacts**

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Friday, 16th June - 13:30: (FUL-201) - Full paper presentation

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*Filip Zielinski (Centre for Social Investment (CSI), Heidelberg University), Judith Terstiep (Westphalian University of Applied Sciences Gelsenkirchen, Institute for Work and Technology), Georg Mildenerger (Centre for Social Investment (CSI), Heidelberg University), Achim Oberg (Universität Hamburg), Maria Rabadjieva (Westphalian University of Applied Sciences Gelsenkirchen, Institute for Work and Technology), Dominika Wruk (Universität Mannheim)*

In the past two decades, significant progress has been made in researching social innovation and assessing social impact at the micro level of individual projects and initiatives. However, with the emergence of mission-oriented research and innovation policies that emphasise directionality, there is an urgent need to enhance our understanding of the broader societal impact of social innovation. In contrast to the commonly used technology assessments for examining the consequences of technical innovations, the field of social innovation lacks similar comprehensive assessment approaches. Recognising that innovation is dynamic and can transition across different sectors, this article proposes an initial conceptualisation of an integrated dynamic impact measurement framework rooted in theory. This framework aims to address the 'What' (objects/means), 'Why' (values), and 'How' (processes) aspects of social innovation. In so doing, we seek to integrate different types of innovation (technological, economic, social) and various forms of impact (social, ecological, economic) within a single framework while also considering the temporal dimension. The objective is to develop a more holistic understanding of the multi-faceted nature of social and non-social types of innovation and its impacts, enabling a comprehensive assessment of its contributions to society. The proposed framework strives to bridge different dimensions of innovation and impact, providing a valuable tool for researchers, practitioners, and policymakers to efficiently evaluate and guide social innovation initiatives.

# **Inclusion of the human factor in the transformative policy mix supporting connected and cooperative automated mobility**

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Friday, 16th June - 13:30: (FUL-201) - Full paper presentation

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*Carlos Montalvo (The Netherlands Organisation for Scientific Applied Research), Sven Jansen (TNO)*

Tackling the grand challenges requires the active participation of a diversity of stakeholders. Innovations are inherently transforming our societies, often with unintended consequences. Connected and cooperative automated mobility (CCAM) is an emerging transformative innovation promising radical increases in road transport overall safety and efficiency. Given the complexities of the technological development (vehicle, telecommunications, cybersecurity, recharging infrastructures and the regulatory framework to guide the transition) the participation of the European citizenry has been absent. This paper uncovers the structure of incentives, capacities and engagement that limits citizens the participation in the transition to CCAM in Europe. The citizens' engagement in CCAM is moderated by age, education and income levels. Secondary explanatory factors amenable to policy intervention concern the enablers engagement: knowledge (technology concerning ergonomics and functions, benefits and cost, new rules and regulations) and the regulatory framework. Barring the above, the cooperative and digital nature of the new technology seem to demand also a shift towards a culture and social contract based in values of "community sharing and equality matching" in contrast with the current "market pricing and authority ranking" dominant relational models between stakeholders. Taking behavioural drivers (attitudes, norms and values, agency and associated emotion) into consideration into the design of policies promoting change, transformations and transitions is relatively new. This brings the challenge not only of designing the appropriate format and content of a new social contract. It also requires delivering a policy mix that tackles information provision, enabling power to engage and shaping the modality of interaction between actors. This is a new frontier in sustainability and innovation research that must be explored and developed in order to support the transformative innovation required by the transition to a sustainable and efficient road transport system.

## Measuring Transformative Outcomes: A Multi-Level Approach for Evaluating Transformative Processes

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Friday, 16th June - 13:30: (FUL-201) - Full paper presentation

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*Michael Dinges (AIT Austrian Institute of Technology), Surya Knöbel (AIT Austrian Institute of Technology), Maximilian Gasser (AIT Austrian Institute of Technology), Harald Wieser (Austrian Institute for SME Research), Christiane Kerlen (Kerlen Evaluation), Jakob Kofler (Austrian Institute for SME Research), Kathleen Toepel (Kerlen Evaluation)*

Up to now, evaluations in the research, technology and innovation context primarily evolved around the question of programme effectiveness and efficiency. At the core lies the question to what extent (pre-defined) programme objectives have been achieved and if value for money has been delivered. In our research, we are widening the perspective. We are quantitatively assessing the perception of transition processes addressing wider societal challenges among experts in the field. By better understanding the progress of transition processes we lay the empirical foundations how to assess the contribution of transformative research and innovation (R&I) programmes to such processes. This research draws on survey data that has been collected in the context of the accompanying evaluation for Germany's "7th Energy Research Programme - Innovations for the Energy Transition" (EFP) (BMWK 2018). In the survey, which forms the basis for the present analysis, project managers were asked to share their perspective on general developments in the energy transition and in energy research in Germany, in their role of being experts in these fields. The research question of how to effectively measure transition processes is addressed using three models rooted in distinct theoretical frameworks and tested comparing construct validity across different models. To our knowledge it is the first to quantitatively operationalize the concept of transformative outcomes and to test how the concept can be used to quantitatively track transition processes. The results of the study confirm our hypothesis that a more complex model, which incorporates transformative outcomes as latent factor variables, displays higher construct validity compared to two alternative, less complex models: one that only reflects the multi-level perspective, and an even less complex single factor model. Thus, our research highlights the importance of distinguishing between transition processes on a detailed level of transformative outcomes when trying to track their progress in quantitative terms. We expect that our approach can be replicated and may form a viable basis for future research on transformation-oriented R&I programs and policies, while contributing to enhanced learning for policy makers, program owners, and actors within the program.

# **0.5 Emerging Technologies and Technology Adoption**

## Technology adoption in cybersecurity: A Delphi study of the UK E-commerce businesses

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Friday, 16th June - 13:30: (FUL-107) - Full paper presentation

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*Xiuqin Li (Alliance Manchester Business School), Richard Allmendinger (Alliance Manchester Business School), Elvira Uyarra (Alliance Manchester Business School), James Mercer (The Hut Group)*

Cybersecurity is becoming increasingly critical in the digital world. However, the literature lacks a comprehensive understanding of the impact of cyberattacks due to the absence of accessible data and well-accepted analysis methods. This knowledge gap not only hinders our understanding of the true cost of cyberattacks but also limits our ability to identify and prioritise the most effective cybersecurity technologies and other mitigation measures. To address the gap, we conducted a three-stage exploratory Delphi study with 14 experts working in the UK E-commerce industry. Our study aimed to recognise the impact of cyberattacks and their measuring methods, security technologies, challenges, measures, and adoption barriers. Our findings suggest that while technology adoption is essential, E-commerce cannot rely solely on technology to mitigate cybersecurity risks. Awareness education and skills training of individuals, as well as the development of formal security policies and processes, are equally important. In fact, effective mitigation strategies should consider technological, organisational, and environmental factors. Our study presents significant theoretical and managerial implications by identifying methods to measure cyberattacks' impact on reputation and productivity as well as recognising the most effective cybersecurity technologies and measures to better safeguard our most critical systems and information against the growing threat of cyberattacks.

# The Impact of the CIFAR Datasets on the Development of Deep Learning: the Making of a New Technoscience

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Friday, 16th June - 13:30: (FUL-107) - Full paper presentation

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*Daniel Souza (University of Turin), Aldo Geuna (University of Turin), Jeff Rodríguez (University of Turin)*

Artificial Intelligence technologies promise to revolutionize the knowledge production process. At the core of one of the most important approaches to the AI is a series of Machine Learning techniques known as Deep Learning. Deep Learning has been regarded as a new method of invention and potentially a general-purpose technology in which the next industrial revolution may be based. This paper analyses the emergence of Deep Learning as a technoscientific field, that is, a domain in the middle of scientific enquiry and technical problem-solving. More specifically, it examines the role played by labelled datasets (CIFAR-10 and CIFAR-100) and the funding institute that supported the birth and growth of deep learning. the Canadian Institute for Advanced Research (CIFAR). We carried out a qualitative and quantitative analysis of the impact of CIFAR-10 and CIFAR-100 on the fields of computer vision and object recognition and how this impact relates to development of Deep Learning. We assess both scientific and technological impact. We find that CIFAR datasets were fundamental for the developments which lead to the Deep Learning revolution and still shape the trajectory of the field. We also show that CIFAR datasets are relevant in teaching Deep Learning techniques, which highlights the profound impact of this technological artifact in the development of the field. The econometric analysis confirms that the CIFAR-10 dataset had a very significant early impact in the literature (citation count) and is still relevant and used to this day by both academic researchers and Machine Learning practitioners.

## How Expectations Collide in Shaping Science: A Case Study of the European Spallation Source

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Friday, 16th June - 13:30: (FUL-107) - Full paper presentation

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*Ekky Tammarar Alfian (Technical University of Denmark), Liisa Välikangas (Technical University of Denmark)*

Big Science is an endeavor in science that has a grand scientific objective which involves a certain scale and complexity. Scientific instruments in the Big Science context play an important role in advancing science. The success or failure in the development of scientific instruments in Big Science depends on the dynamics of expectations and interest. Despite the importance of interest and expectations in scientific instrument making, our understanding of how interest and expectations in developing scientific instrument shapes science in the Big Science context remains limited. Using the European Spallation Source (ESS) as a case study, we explored how the interest and expectations inherent in the development of 9 scientific instruments at ESS shapes science. We have found that different interests, specifically the interest of ESS as an institution and individual scientists generate divergent expectations. Triggered by budget limitations, expectations of ESS and scientists developing the scientific instrument collide. The shaping of science occurred in the collision as descopeing and enhancement of scientific instrument capabilities affect the science case of instruments. We contribute to the current body of knowledge by elucidating how interest and expectations shape science in the development process of scientific instruments.

## Technology family as a unit of analysis of innovation lifecycles: The case of nanotechnology in the United States

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Friday, 16th June - 13:30: (FUL-107) - Full paper presentation

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*Viktória Dôme (University of Cambridge), Eoin O'Sullivan (University of Cambridge)*

Strategic development of emerging technologies has been of increasing interest to academics, policy makers and companies as they provide an important route for countries and companies to enhance their competitive positions or to gain such positions. Yet, there is currently a gap between various innovation lifecycle conceptualizations and analyses that mostly exist at the micro level of product lifecycles, firms, university project grants or at the macro level of technological paradigms that obstructs timely decision making and strategizing. Analysis of wider systems dynamics but with a timescale more appropriate for policy makers and companies could contribute to a better understanding of the needs and complementarities – such as other technologies, capabilities, institutions, involvement of actors – that emerge during the lifecycle of emerging technologies and accelerate innovation in a wide range of industries. This paper therefore examines the lifecycle dynamics of nanotechnology as an emerging family of technologies not at the micro or macro level but at the body of technology level as a more appropriate alternative to strategizing for innovation while drawing on earlier lifecycle concepts. The empirical investigation primarily relies on semi-automated content analysis of policy documents of the National Nanotechnology Initiative (NNI), a US government nanotechnology R&D initiative with an aim to coordinate nanotechnology innovation activity across several federal agencies and the wider nanotechnology R&D community. The NNI's endeavor of interagency coordination sustained for over 20 years provides a systematic accumulation of knowledge on nanotechnology dynamics with potential implications for lifecycle analyses and strategic development. Nanotechnology patents are also analyzed as differences between product and process innovation provide interesting insights into the lifecycle of nanotechnology. The results indeed confirm that there is a wider lifecycle happening at the level of a family of technology where different innovation activities emerge and re-emerge as approximated through federal agency involvement and patent activity.

## **0.6 Evidence & Policy**

## **Hierarchy of evidence for policy making in COVID-19 pandemic in China: A theoretical framework**

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Friday, 16th June - 09:00: (FUL-202) - Full paper presentation

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*Cong Wu (University of Chinese Academy of Sciences), Jiahao Feng (University of Chinese Academy of Sciences)*

Evidence-based policy making (EBPM) derives from evidence based medicine and is widely adopted in the international governments for decision making. However, with massive amount of data presented to policymakers and practitioners, the selection and use of valid and reliable evidence remains a key issue. This paper suggests a theoretical model for the hierarchy of evidence in public health emergency (PHE) policymaking based on existing literature, and further conducts a two-round semi-structured interview to verify and refine the preliminary model. Our finding suggests that, based on the rules of EBPM, hierarchy of evidence for PHE policymaking in COVID-19 in China ranks as follows: ‘peer-reviewed publications- reports and guidance from prestigious organisations- raw data- expert opinions -public opinions from the internet’. We also find that in the actual context, a phenomenon of ‘conditional evidence-based policy making’ (CEBPM) may occur, which allows the policymakers and practitioners to choose second or even third best evidence that they can obtain, by following the order of the suggested hierarchy. We further suggest certain policy implications to move from the current CEBPM to the ideal EBPM and bring up a recommendation level of evidence use for the COVID-19 pandemic healthcare policymaking in China.

## **0.8 Public Procurement & Innovation**

# Product procurement and functional procurement for innovation - clarifications needed for empirical research

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Friday, 16th June - 09:00: (FUL-Amphitheatre A) - Full paper presentation

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*Charles Edquist (Center for Innovation Research (CIRCLE), Lund Univristy)*

The literature on the relations between public procurement and innovation has been growing rapidly during the latest couple of decades. However, there are still conceptual problems and unclarities with regard to key concepts. The purpose of this conceptual paper is to sort out and specify the notions of “innovation”, “public procurement”, “product procurement”, “functional procurement” and “innovation partnerships” – as well as the relations between them.

Some findings in this paper are:

- The distinction between *product specifications* and *functional specifications* is a useful dichotomy when discussions of the relations between public procurement and innovation are pursued and when public procurement is carried out in practice. It can be instrumental in transforming procurement that prevents innovations into procurement that enhances innovations. The development of this dichotomy means that we have changed the conceptual framework needed to understand and explain the relationships between (different kinds of) public procurement on one hand and innovation on the other hand.
- Functional procurement is not only allowed by the EU procurement directives. It is *strongly encouraged* “and should be used as widely as possible”, according to the EU directives.
- “Innovation partnership” is a new procedure in the EU procurement directives. It is intended to also address R&D results and innovations as outcomes of public procurement processes. However, this procedure has not been used very much. One reason is that the directive *needs a much higher specificity* to become operatively useful. This procedure should also be related to functional public procurement.

## Evaluating the innovation impacts of public procurement

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Friday, 16th June - 09:00: (FUL-Amphitheatre A) - Full paper presentation

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*Oishee Kundu (Cardiff University), Elvira Uyarra (Alliance Manchester Business School), Raquel Ortega-Argiles (Alliance Manchester Business School), Tasos Kitsos (Aston University Birmingham), Mayra Morales Tirado (Arizona State University), Pei-Yu Yuan (Birmingham Business School)*

Despite the growing interest in mobilising public procurement for strategic purposes like innovation, economic growth, social value and sustainable development, there are significant knowledge gaps regarding the impacts of public procurement and the evaluation of public procurement as a strategic policy tool. We review the different methods that have been used in academic and grey literature on the topic and highlight the background, contributions, advantages, and limitations of each approach. Conceptually, there are several notions like ‘procurement of innovation’ and ‘innovation in procurement’, but we discuss the lack of consensus over an operational or empirical definition for identifying strategic procurement. Methodologically, we highlight the inadequacy of existing data to enable robust research that can trace the causal impact of public procurement on firms, communities, and local economies. To address these gaps, we propose a set of potential actions in research and practice.

# **Does private versus public corporate ownership matter for R&D service firms' innovation performance? evidence from the UK**

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Friday, 16th June - 09:00: (FUL-Amphitheatre A) - Full paper presentation

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*Xiuqin Li (Alliance Manchester Business School), Xin Deng (Alliance Manchester Business School)*

R&D service firms (RDSFs) play a crucial role in providing contract R&D services to their clients. Moreover, these firms engage in internal R&D activities, generating intellectual properties (IP) and knowledge that significantly contribute to long-term productivity and economic growth, acting as a hidden engine within the economy. In this paper, we conducted an empirical analysis using patent data to examine the impact of public and private corporate ownership structures on the innovation performance of RDSFs in the UK. By investigating the patenting behaviour of RDSFs, we find that private RDSFs exhibit a higher capability to generate patents with greater technological value. Additionally, these firms demonstrate greater efficiency in conducting innovation activities compared to their public counterparts. Despite facing financial constraints, private RDSFs engage in more exploration of new knowledge and produce a larger quantity of exploratory innovations.

## **0.9 Intellectual Resources**

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# Intellectual capital and regional development in the agrifood sector

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Friday, 16th June - 09:00: (FUL-213) - Full paper presentation

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*Pierluigi Toma (University of Salento), [Patricia Laurens \(ESIEE\)](#)*

The importance of regional development, especially in rural areas, has increased in the globalized world, with a focus on the relationship between economic development and the territory. Intellectual capital, consisting of human capital, relational capital, and structural capital, is crucial for rural development. In the agrifood sector, intellectual capital includes innovation and tradition, which are often wrongly perceived as incompatible. The impact of intellectual capital on regional development has not been widely studied, particularly in the context of the Italian agrifood sector, which has a long tradition and strong territorial heterogeneity. This paper aims to measure the impact of intellectual capital and know-how on regional development in the agricultural sector using a nonparametric efficiency methodology applied to a unique geographic area-based dataset. The study finds that innovation, measured by patents, has a better impact on efficiency than the relational component, which has an inverted U-shaped effect. Too much concentration of different consortia in the same area does not favor efficiency but results in negative externalities. In contrast, innovation has a positive effect on efficiency at any level. A synergy effect was evidenced with the coexistence of both technological innovation and certification activities. We also study how the efficiency also varies according to regional characteristics such as the location of the region in Italy (North versus Center and South), the type of the regions (urban versus rural) or the size. The ability to benefit from the synergy effect of traditional and innovative activities in agrifood enables a few regions to perform extremely well in terms of the productivity of their agrifood system. These regions are located in Northern Italy, first in Emilia-Romagna. Neither their type (rural or urban) nor their size really matters. They benefit from a regional environment where both activities are fostered and mastered thanks to the adapted human, relational and structural capitals. Focusing only on one aspect of innovation permits to benefit for the overall economic development of the agrifood sector but with a lower efficiency. Interestingly, it seems that it is more profitable to develop PDO certification compared to technological skills.

## European Technological Sovereignty and Strategic Dependencies: the case of Photovoltaic Energy Sector

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Friday, 16th June - 09:00: (FUL-213) - Full paper presentation

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*Serenella Caravella (SVIMEZ), Francesco Crespi (Università Roma Tre), Giacomo Cucignatto (University of Rome La Sapienza),  
Dario Guarascio (University of Rome La Sapienza)*

This paper explores the concepts of Technological Sovereignty and Strategic Dependency within the escalating geoeconomic confrontation at the global level, applying them to the Photovoltaic (PV) global supply chain. Currently at the heart of the Energy Transition, in the last decades this sector provided a textbook example of hierarchical global reshuffling. Merging trade and patent data, the long-term evolution of the PV value chain and related dependencies and technological capabilities are analysed at the supply chain, segment and product-specific level, providing fresh and highly granular evidence. These intelligence within the PV value chain could provide essential insights to design adequate industrial and innovation policies, with respect to the target of reducing European strategic dependencies and strengthening EU technological positioning. Finally, the article offers a discussion of the main policy implications deriving from the proposed analysis.

# The changing work of IPR attorneys: 30 years of institutional transitions

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Friday, 16th June - 09:00: (FUL-213) - Full paper presentation

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*Jussi Heikkilä (LUT University), Mirva Peltoniemi (Jyväskylä University School of Business and Economics)*

Patents and other intellectual property rights (IPR) are at the core of innovation studies. Patent attorneys and other IPR experts play an important role in drafting and filing processes yet are usually overlooked in analyses on filing activity. We conduct an exploratory case study to shed light on how IPR service firms adapt to changes in the institutions and competitive environment that overturn the fundamentals of their business. We focus on the sector's evolution in Finland from 1990 to 2020, and analyse the impacts of globalization, European integration, and digitalization. Accession to the European Patent Convention, introduction of EU trademarks and Registered Community Designs and the London Agreement are identified as significant institutional changes for the industry. IPR register data and expert interviews show that the business has shifted from serving foreign clients filing in Finland to serving Finnish clients filing internationally, increasing the knowledge requirements of local experts. Concurrently, the filing volume has increased due to globalization partially offsetting the disappearance of some sources of revenue following from digitalization and institutional changes aimed at reducing transaction costs for innovators. This has also triggered the development of consulting services relating to technology strategy. We contribute by analysing the sector's evolution in a small open economy where start-ups typically aim at the global market from the start. Our study also highlights the need to integrate IPR attorneys into the literatures on appropriability and propensity to file IPRs.

# **O.10 R&D: Connecting Firms & Policy**

## Innovation pattern heterogeneity and crisis resilience

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Wednesday, 14th June - 09:00: (JUB-155) - Full paper presentation

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*Marina Rybalka (Statistics Norway SSB), Michael Spjelkavik Mark (Nordic Institute for studies in Innovation, Research and Education NIFU)*

We use the new taxonomy for innovative firms developed by Capasso and Rybalka (2022), microlevel data from the Community Innovation Survey (CIS2018) on a sample of 6,360 Norwegian firms, and information on users of Covid-19–related compensation schemes for firms with significant loss of turnover and furloughed employees to analyse how resilient different innovative firms have been to the crisis (in both the short and the long run). By using different probabilistic regression models, we study the probability (controlling for industry, size and age) of firms being affected negatively during the pandemic period as a whole and in different sub-periods between March 2020 and February 2022. This period covers three waves of societal restrictions in Norway due to the pandemic. Our main assumption is that all firms were hit by a shock at an early stage due to a complete lockdown of Norwegian society in March 2020, but that firms were more resilient if they either did not use the compensation schemes or used them for a briefer period than the less resilient firms. We find “active R&D doers” to be most resilient (in both the short and the long run), while “strategic adapters” (firms with a main strategy of producing high-quality products for a specific group of customers) are found to be least resilient. These results imply that pre-existing innovation capabilities are important for meeting the crisis.

## **Firm growth in knowledge-based industries and risk perceptions towards COVID-19: web-scraped evidence from Finnish firms**

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Wednesday, 14th June - 09:00: (JUB-155) - Full paper presentation

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*Matthias Deschryvere (VTT Technical Research Centre of Finland), Sajad Ashouri (VTT Technical Research Centre of Finland),  
Arash Hajikhani (VTT Technical Research Centre of Finland)*

Knowledge-based firms are critical drivers of long-term economic growth, and understanding their short- and long-term responses to global crises can be valuable in promoting the future resilience of national innovation systems. In this study, we examine the relationship between the COVID-19 pandemic and the growth of knowledge-based firms in the Finnish manufacturing and service sectors. Our approach involves a novel combination of administrative financial data and structured web-scraped data. To develop indicators that reflect how companies perceive and adapt to pandemic-related risks, we draw from the literature and assess whether companies communicated about the pandemic and the specific concerns they raised. Our results indicate that, on average, firm growth has been negatively impacted by the crisis. However, we find that firms that communicated about the pandemic performed better than firms that did not communicate. This is especially true for firms that mentioned the pandemic in the context of remote work. Statistically better performance is observed at the left-hand side of the growth distribution, suggesting a moderating effect of COVID-19 risk perceptions on the adverse effect of the COVID-19 shock on firm growth. Our study sheds light on the importance of communication and risk perception during times of crisis and provides insights into strategies that firms can employ to weather the storm and promote future resilience.

# **0.11 Firm Innovation and Strategy**

## **Firms R&D signaling strategies: Firms' Knowledge Disclosures through Websites and Patents**

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Friday, 16th June - 09:00: (FUL-107) - Full paper presentation

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*Arash Hajikhani (VTT Technical Research Centre of Finland), Daniele Rotolo (SPRU, University of Sussex)*

This paper investigates knowledge disclosures on firms' websites resulting from Research and Development (R&D) efforts, a topic receiving increased attention due to its impact on firms' innovative performance. While significant research has examined disclosures via patents and publications, less is known about disclosure through websites. Leveraging the growing use of text-based indicators to understand the innovation process, this study employs Natural Language Processing (NLP) and topic modeling to examine knowledge disclosures on websites and compares these with patent disclosures. The paper contributes to the evolving literature on text-based innovation indicators by shedding light on the use of different knowledge disclosure channels. It aims to address the knowledge gap regarding the extent to which firms use their websites for knowledge disclosures and the relationship of website disclosures with other disclosure channels. The findings from this study are expected to inform policymakers and practitioners on promoting innovation and knowledge sharing among firms and across sectors. This research offers a novel approach to mapping firms' knowledge activities and understanding their strategies in the broader context of innovation studies.

## Can Stable Institutional Ownership Facilitate Firms' Exploratory Innovation?

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Friday, 16th June - 09:00: (FUL-107) - Full paper presentation

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*Xin Deng (Alliance Manchester Business School), Hesham Ali (University of Nottingham), Heba Aboelkheir (University of Nottingham)*

We investigate the impact of institutional ownership stability on firms' new knowledge exploratory behaviours. Using a large sample of public US firms from 1990-2018, we find that firms led by stable institutional investors are more likely to pursue exploratory innovation. The results are robust to different measures of institutional investors' stability and exploratory innovation. We also analyze the mechanisms through which stable IIs influence exploratory innovation. Our cross-sectional tests provide evidence that the positive influence of stable IIs on exploratory innovation is more pronounced in firms suffering from financial constraints, political risks, and severe information asymmetry and is less pronounced in firms with high competition. Our findings indicate that stable IIs can support innovation executives during hardships including financial constraints, political risks, and severe information asymmetry to enhance exploratory innovation. Through agency theory and resource-based view, our results advance the dual roles (monitoring and resource-provision) that stable IIs play in promoting exploratory innovation.

# **0.12 Bibliometric perspectives on scientific collaboration**

## University scientific coproduction becomes more social in economic crisis

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Friday, 16th June - 09:00: (JUB-115) - Full paper presentation

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*Joaquín M. Azagra-Caro (INGENIO (CSIC-UPV)), Alfredo Yegros (Centre for Science and Technology Studies, Leiden University)*

Universities coproduce scientific knowledge with industry and hospitals. We investigate whether the relative share of university coproduction with one or the other varies according to economic growth. Focused on the case of cancer, our sample of around over 450 thousand copublications reveals a robust pattern: economic growth favours university copublication with industry rather than with hospitals. We interpret copublication with hospitals as more socially-oriented than with industry. From this standpoint, economic crises favour a more social orientation of university knowledge coproduction. We recommend policies to sustain university coproduction with hospitals during expansions.

## Collaboration Patterns of Public Research Institutes in Korea and Their Relation to Positioning of Research

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Friday, 16th June - 09:00: (JUB-115) - Full paper presentation

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*Seung-Hyun Lee (The University of Manchester)*

The roles and functions of research actors have become more diverse and complex due to the expansion of the innovation system, which has made it more challenging for research actors to define their roles, and functions within the innovation system. The case of Korean public research institutes (PRIs) is an evident example. Korean PRIs were established as a means of economic development of the country; thus, their research focus was closely related to the industries that Korea supported for economic development at the time. As the country achieved its goal of economic development, and universities and business enterprises developed their own capacity to carry out R&D, PRIs were required to perform more leading research distinct from research performed by other research actors. Therefore, it became more important for research actors to understand their positioning of research – roles, functions, capabilities, and material and immaterial assets and their relationship with other research actors. Moreover, as research questions grow more complex, it becomes increasingly difficult to solve them with knowledge from a single discipline. As a result, interdisciplinarity and collaboration have become imperative to deal with those complex research questions. In this sense, the paper aims to discover how interdisciplinarity and collaboration could represent the positioning of research of Korean PRIs and how this adds knowledge about the dynamics between interdisciplinarity and collaboration. In order to investigate the positioning of research from the perspective of interdisciplinarity and collaboration, I analysed project and publication data from various points of views. In terms of interdisciplinarity, I calculated variety and balance – two main factors of interdisciplinarity – and used the combination of the two factors to describe positioning of each PRIs. I also investigated co-authorship network of publication, which developed a classification related to characteristics of the research area each PRI focuses on. The finding suggests that interdisciplinarity and collaboration, which were traditionally not considered as a means of representative of PRIs' activities – can provide knowledge about positioning of research. Also, we found out that collaboration has significant impact on variety, and how dynamics between collaboration and interdisciplinarity varies by the positioning of research.

## Connecting the dots: The role of internationally mobile scientists in linking home with foreign scientists

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Friday, 16th June - 09:00: (JUB-115) - Full paper presentation

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*Rodrigo Ito (UNU-MERIT, United Nations University), Diego Chavarro (SPRU, University of Sussex), Tommaso Ciarli (UNU-MERIT, United Nations University), Fabiana Visentin (UNU-MERIT, United Nations University), Robin Cowan (UNU-MERIT, United Nations University)*

Going abroad, mobile scientists meet scientists from different countries and become carriers of knowledge not readily available in their country of origin. The benefits of a mobility experience might extend to the home scientists who did not move but entered contact with a mobile scientist. In our paper, we investigate the role played by mobile scientists in acting as brokers connecting home non-mobile scientists with foreign ones. We consider mobile those scientists who move abroad to pursue their Ph.D. Looking at the case of Colombia and Brazil, we find that mobile scientists boost the share and the number of publications with foreign co-authors of the home non-mobile scientists with whom they enter contact. Interestingly, we observe that the most effective in creating connections are the mobile diaspora scientists, i.e., those who never return to their country of origin, followed by the mobile intermitted scientists, i.e., those who move in and out of their country of origin. Our paper contributes to the literature on mobility, generally focused on the impact of mobility experiences on individual performances, and provides insights to scholars and policymakers on the spillover effects of mobility experiences.

# **0.13 Quantitative perspectives on research funding**

## **Do funded research projects deviate from grant proposals, and does it matter?**

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Thursday, 15th June - 16:40: (FUL-213) - Full paper presentation

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*Andres Madariaga Espinoza (KU Leuven), Stijn Kelchtermans (KU Leuven), Cindy Lopes-Bento (KU Leuven), Arvids Ziedonis (KU Leuven)*

Despite the substantial resources devoted to detailed reviewing of grant proposals, funding agencies usually do not require that executed research closely adheres to the awarded proposal. In this paper, we examine whether funded projects systematically deviate from proposals, the reasons for such deviations, and whether they lead to more or less impactful science. Using a large corpus of publication-grant pairs combined with detailed administrative data on 1,200 scientists from a large European research university, we find support for multiple arguments that are consistent with a knowledge recombination perspective on why proposed and published research deviate. As far as scientific impact at the individual publication level is concerned, we find that deviating from the original grant proposal is associated with lower impact in (only) the life sciences, and confirm this negative association across disciplines at the (grant, publication portfolio)-level. We reflect on the implications of our analysis for the mechanisms to allocate science funding.

## **More hype than substance? How university public relations affect university third-party funding**

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Thursday, 15th June - 16:40: (FUL-213) - Full paper presentation

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*Holger Graf (Friedrich Schiller University Jena), Nils Grashof (Friedrich Schiller University Jena), Christina Günther (WHU - Otto Beisheim School of Management), Matthias Menter (Friedrich Schiller University Jena)*

University third party funding is increasingly perceived as a means to enhance innovation through collaboration, knowledge transfer and exchange. Little research attention has been devoted to the strategies pursued by universities to signal their attractiveness as a research partner. Besides being excellent across all three university missions, universities need to effectively communicate science and technology. In this paper, we are interested if substance (research excellence) and hype (press releases) are complements or substitutes in attracting third party funding from different sources. We assess this relationship empirically for a panel of 70 German universities over a period of 20 years.

## **“Do interesting scientific work, not die of stress.” What do young climate researchers hope for their future career? A hypotheses generating case study**

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Thursday, 15th June - 16:40: (FUL-213) - Full paper presentation

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*Cathrine Egeland (OsloMet), Agnete Vabø (OsloMet), Torstein De Besche (Nordic Institute for studies in Innovation, Research and Education NIFU), Liv Langfeldt (Nordic Institute for studies in Innovation, Research and Education NIFU)*

Despite the privileges, high social and intellectual status and high degree of individual autonomy traditionally associated with members of the academic profession, the academic institutions today are also characterized by a recruitment crisis. It is difficult to recruit and retain young talents- both among women and men; many drop out, especially in STEM subjects. Climate research is explicitly and directly involved in policy developments aiming at solving the big climate challenges facing our societies. The knowledge produced within climate research communities is vital for the development of future climate, environmental and societal policies. Against this backdrop, recruitment of dedicated and competent young climate researchers should be of obvious and extreme importance. Today's climate research institutions and work modes usually requires international mobility among their researchers, as a result of international collaboration on data sets, modelling, and with a need for complementary specialized expertise in the projects and teams that collaborate (Laudel & Bielich 2019). In this paper, we present data from a survey sent out to young climate scientists, which can provide deeper insight into what is at stake for young scientists in general and climate scientists in particular. We explore reasons for choosing, staying in or leaving research among young climate scientists with the aim of *generating hypotheses for future studies and policies* for recruiting and retaining the researchers that we rely on to produce the knowledge needed to address the severe climate and societal challenges we are already facing.

# **O.14 Supporting University Research**

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# An empirical assessment of Open Hardware practices in the academic community and their policy implications

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Friday, 16th June - 13:30: (JUB-G22) - Full paper presentation

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*Alexandre Hannud Abdo (LISIS, Gustave Eiffel University), Andre Maia Chagas (University of Sussex)*

Open Science Hardware (OSH) is a term for the practice of sharing, as open-source, the material means of science: the reproducible designs, assembly and operation instructions of research hardware, plus any software they may depend on. A practice that spans lab-grade pipettes, rotators, scales, sensors, microscopes, beams, and imaging devices, but may also include cell lines, reagents, genetic parts, and even laboratory automation systems, diagnostic equipment, small satellites and components of particle accelerators (Pearce, 2013; Ravindran, 2020). Proponents of OSH articulate promises of better science and greater and more positive societal impacts, achieved through facilitated collaboration, higher replicability, reduced efforts, inclusion and more equitable research capacity, freedom to innovate, customise and appropriate technologies, and lower risks of monopolistic and lock-in conditions (Arancio et al., 2022; Chagas, 2018). In the open hardware model, a critical and early condition for such value co-creation are the qualities of the documentation of designs published (Bonvoisin et al., 2017). In the case of OSH, this concerns academic journals and online file repositories that papers refer to: Are they available, complete, and useful to reproduce and build on existing work? Are legal aspects, such as licences, properly dealt with? Is there an infrastructure for collaboration deployed? The answers to these questions are, thus, both informative of actual research practices and needs, and required to reliably connect them to the aforementioned promises, in view of planning, executing, monitoring and evaluating policies to foster OSH.

This paper contains two main contributions:

I) A qualitative assessment of the co-creation enabling characteristics of open scientific hardware publications, and associated features such as publication venue, allowing us to evaluate their progress in time and in relation to the establishment of standards for sharing open hardware designs.

II) A solution to a not uncommon problem with research on bibliographic databases: because OSH is an approach and not a subject of research, usual search strategies in bibliographic databases fail to capture the usage of the indicative term, in our case “open hardware”, as it may be absent from title and abstract.

## Inside University Technology Transfer: empirical findings from a leading Brazilian university

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Friday, 16th June - 13:30: (JUB-G22) - Full paper presentation

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*Matheus Campos (InSySPo - Unicamp), Bruno Fischer (School of Applied Sciences - Unicamp), Christopher Hayter (Arizona State University), Ana Carolina Spatti (School of Applied Sciences - Unicamp), Sergio Queiroz (InSySPo - Unicamp)*

This paper presents a study on university technology transfer and academic entrepreneurship, with a focus on a leading Brazilian institution. The study draws on empirical data collected through semi-structured interviews with inventors and researchers at the university. Our findings suggest that, even though inventors have a strong academic self-identification, they also demonstrate entrepreneurial characteristics, suggesting an interplay of roles when it comes to intellectual property development and commercialization. In that regard, we highlight the importance of understanding the dynamics of university-industry interaction in negotiating intellectual property agreements. Both inventors and the technology transfer office play an important role in this process, and their perspectives must be taken into account to increase the likelihood of successful co-development and/or commercialization of IP with an industrial partner. However, overreliance on the TTO can be detrimental. On the other hand, chances of success increase with the academic's active engagement. Our findings also point to challenges in this process. Divergent expectations between businesses and universities, dependency on the company to get the IP to market, lack of capital from some of the companies that seek the university for technology development are among the most common problems mentioned throughout interviews. Overall, this paper offers valuable insights into university technology transfer in Brazil. The findings suggest that by understanding these dynamics universities can maximize their impact on society while maintaining their commitment to scientific research.

## Opportunities and Challenges of Higher Education Administrative Data (HEAD) Analysis

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Friday, 16th June - 13:30: (JUB-G22) - Speed Talk

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*Victoria A. Bauer (Leibniz University Hannover), Christoph Hönnige (Leibniz University Hannover), Monika Jungbauer-Gans  
(German Centre for Higher Education Research and Science Studies (DZHW))*

Higher Education Administrative Data (HEAD) are a large set of observed behavioural data based on documentation from higher education institutions' administrative software systems, which allows for the comprehensive collection of data on performance and behavioural patterns across entire cohorts of students. However, unlike survey data, they are comparatively rarely used in research on higher education due to property rights and data privacy rules. This contribution presents opportunities and challenges for the analysis of HEAD, using the example of a large German University. Increased usage of HEAD by researchers could lead to greater efficiency in structuring course programs and examination rules, but often requires reforming IT governance structures to move towards predictive analytics in higher education.

# **0.15 Regional Systems of Innovation & Policy**

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# Structural dynamics of inter-city innovation networks in China: A perspective from temporal exponential random graph models

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Wednesday, 14th June - 15:45: (FUL-107) - Full paper presentation

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*Antonio Zinilli (National Research Council of Italy), Yujie Gao (Renmin University of China), Thomas Scherngell (AIT Austrian Institute of Technology)*

The investigation of structures and dynamics of innovation networks have attracted increasing interest in the recent past, in particular from a geographical perspective looking at interacting spatial entities (usually regions) in joint innovation activities (see Scherngell 2021 for an overview). The objective of this paper is to estimate the role of endogenous network effects for shaping inter-city innovation networks across China, mobilizing a rich data source on joint innovation activities as captured by co-patents between applicants located on 297 Chinese cities. We use data collected from the Chinese Patent Office, and divide the whole period into three subperiods, 2010-2012, 2013-2015, and 2016-2018. We have used a Temporal Exponential Random Graph Model (TERGMs), which is designed to accommodate inter-temporal dependence in longitudinally observed networks (Leifeld et al., 2018). Such models are highly suitable to incorporate endogenous network structural characteristics in predicting the innovation collaboration intensity between regional pairs, controlling for standard drivers included in previous literature, such as geographical or technological distance. In particular we shift attention to preferential attachment, transitivity and network stability as potentially highly important drivers for the dynamics of cross-region innovation networks. The results are very promising and suggest that preferential attachment and transitivity indeed play an important role in the co-patenting network between cities in China. In the context of an intercity co-patent network, the preferential attachment mechanism suggests that cities that already have a large number of co-patents with other cities are more likely to attract new co-patents, compared to cities with a smaller number of co-patents. Transitivity in an intercity co-patent network can reflect a clustering of cities into groups that tend to collaborate with each other more frequently than with cities outside of their cluster.

## Can we go the distance? When geographic proximity matters for the innovation modes of small firms

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Wednesday, 14th June - 15:45: (FUL-107) - Full paper presentation

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*Philip Piercey (University of Calgary), Chad Saunders (University of Calgary)*

We question the role of geographic proximity for innovation policy through an investigation of innovation modes among small firms. Our mandatory response, cross-economy sample of 4,887 Canadian small firms enabled an examination of innovation mode use per firm location. It revealed that geographic proximity, as distance to metropolitan regions, is more critical for some innovation mode learning processes than others. Although the science-technology-innovation (STI) mode (e.g., formal processes of R&D) and the external dimension of the doing-using-interacting (DUI) mode (e.g., supply chain collaborations) feature prominently in policy, small firms are less likely to engage in these activities as their distance to metropolitan regions increases. Whereas use of STI and external DUI relies on external knowledge sources, the internal activities associated with the DUI mode (e.g., cross-functional teams, employee training) remain comparatively viable for small firms in less proximal locations. For small firms located far from metropolitan regions, we propose that impactful innovation policy should aim to support the internal capabilities of small firms, thereby serving as a counterweight to a policy tradition that has been dominated by STI interventions stressing external interactions. Our findings further endorse the important role of geographic contexts for innovation modes and add to the currently thin research on the DUI innovation mode, in particular.

# **O.16 Responsible Innovation**

## **Responsibility-oriented Foresight to facilitate sustainable socio-technical system creation with research and innovation: An empirical study in the German agri-food sector**

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Thursday, 15th June - 15:00: (FUL-213) - Full paper presentation

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*Delia Mangelkramer (Freie Universität Berlin), Kerstin Cuhls (Fraunhofer Institute for Systems and Innovation Research ISI),  
Dagmara Weckowska (Freie Universität Berlin)*

Even though Foresight provides valuable analytical and outlook tools to guide research and innovation processes in a sustainable direction and thereby to facilitate sustainable socio-technical change, the toolkit needs to be adapted to capture multidimensional sustainability in its complexity. Otherwise, innovation may contribute to creating socio-technical systems, in which current sustainability issues are either exacerbated or reproduced, or new issues emerge. To this end, we build on insights from the Responsible Research and Innovation (RRI) literature to design a multi-stage Delphi survey, which aims to enhance the taking of responsibility for sustainability issues during Foresight activities. The method is tested with experts from the public and private sector (N=52) and examines 15 potential changes in the socio-technical agri-food system in Germany, which are commonly portrayed as desirable. The findings reveal the perceived desirability and probability of the selected changes, the level of consensus among experts as well as possible risks to sustainable development that the 15 changes carry. We find that risks occur regardless of how desirable the change in the agri-food system is considered. The findings present points of orientation for future responsible innovation. By offering a **responsibility-oriented Foresight** approach, which goes beyond searching for desirable future options by critically examining them in light of system complexities, the study expands the strategic possibilities of current Foresight approaches. It goes beyond a goal-oriented approach towards a systemic approach of solution-seeking along identified risks, which could undermine good sustainability intentions.

# The Transformation Will Not Come from Above: How to Institutionalise Responsibility-Related Changes at the Organisational Level

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Thursday, 15th June - 15:00: (FUL-213) - Full paper presentation

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*Peter Biegelbauer (AIT Austrian Institute of Technology), Alice Ampolini (TU Delft), Caroline Lackinger (University of Vienna), Santtu Lehtinen (VTT Technical Research Centre of Finland), Mika Nieminen (VTT Technical Research Centre of Finland), petra wagner (AIT Austrian Institute of Technology), Martijn Wiarda (TU Delft), Emad Yaghmaei (TU Delft)*

A large part of societal life is arranged via organisations, and we believe that debates on transformation should pay more attention to the organisational level. We would like to ask the following **research questions**: How can we institutionalise responsibility-related changes on the organisational level? Which are operational lessons to learn and how can we frame these activities at a theoretical level? Finally, what can we learn from the interplay between practical experiences and theorising? The data for this paper comes from the H2020 Science with and for Society (SwafS) funded project Co-Change, active from 2020-2023, where eight research teams have worked with research performing and research funding organisations, ministries, standardisation organisations, NGOs, and firms. The goal was to institutionalise RRI-inspired changes. In this paper we focus on the perspective provided by *Institutional Entrepreneurship*, which focuses on how dynamic actors shape and transform institutions through visions of divergent change and by mobilising allies to translate the vision of change into long-term institutional change (e.g., Battilana et al. 2009; Garud et al. 2007). What we want to contribute to the discussion is a systematic appraisal of the factors influencing institutional entrepreneurship in eight organisations over more than two years' time. Most importantly, time and resources available to the entrepreneurs, as well as allies, are a crucial factor for the success of introducing RRI. These are directly linked the question of power, i.e., the willingness of management to endorse and allocate resources for these changes. Management is, in turn, influenced by the ecosystem-related demands, which are often driven by upcoming regulations. Such windows of opportunity can be used by institutional entrepreneurs acting as proactive leaders. This works best if they have already accumulated social capital and legitimacy within their organisation and beyond, as well as RRI-related expertise, so they can propose solutions to the management and provide services to deal with the arising demand.

## **Implementing regional RRI: Drivers and Barriers on the road towards responsible and sustainable RIS (regional innovation system)**

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Thursday, 15th June - 15:00: (FUL-213) - Full paper presentation

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*Mika Nieminen (VTT Technical Research Centre of Finland), Nina Rilla (VTT Technical Research Centre of Finland), Juha Oksanen (VTT Technical Research Centre of Finland), Katariina Palomäki (VTT Technical Research Centre of Finland)*

During the last decade responsible research and innovation (RRI) as an approach to solve expanding societal, ethical, and environmental challenges gained increasing attention especially in EU-policy but also in research circles. Less attention has been paid, however, to the regional dimension of RRI. Drawing on the results of our regional RRI project on four European regions, Cantabria, Karlsruhe, Tampere and Szeged-Timisoara, we ask, how does regional implementation context affect, if at all, development of RRI and what should be taken into account if we attempt to introduce RRI in regional or local innovation and business ecosystems? We draw conceptually on three strands of previous studies: RRI related studies, regional innovation studies and the sustainable ecosystem approach. The tentative results of the study indicate how regional responsibility and sustainability related challenges vary in regions and how regional pilot actions have to be designed and linked to existing territorial agendas and processes i.e. local actors' needs and interests: the already existing ecosystem of actors, their values, and dynamics. The general challenge is creating processes in which responsibility and sustainability can be collectively addressed and acted upon. In addition, a change actor(s) is needed, first, to orchestrate change among regional actors and ecosystem(s), and second, to stabilize and sustain operations.

# **0.17 Digital Transformation & Sustainability**

## Mapping the regional scientific knowledge base for the “twin” transition

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Thursday, 15th June - 15:00: (JUB-118) - Full paper presentation

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*Stefano Bianchini (BETA, University of Strasbourg), Giacomo Damioli (University of Bremen), Claudia Ghisetti (University of Milano-Bicocca)*

This study focuses on how digital and environmental scientific research are recombined to create scientific knowledge in an emerging domain related to the “twin transition”. This field is small but rapidly growing and diffusing to an increasing number of European regions. The strength of scientific knowledge in Internet of Things and big data is particularly important for its creation. On the contrary, and perhaps surprisingly, artificial intelligence does not play a strong role. These findings have important implications for future research and policy makers aimed to understand and promote the deployment of digital solutions to solve environmental issues.

## Exploring the effects of the digital transformation on sustainable development: the perspective of scientists

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Thursday, 15th June - 15:00: (JUB-118) - Full paper presentation

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*Giacomo Damioli (University of Bremen), Stefano Bianchini (BETA, University of Strasbourg), Marco Colagrossi (European Commission, JRC Ispra), Claudia Ghisetti (University of Milano-Bicocca), [Kevin Michoud](#) (BETA, University of Strasbourg)*

While we must recognize that technology has undoubtedly played a role in exacerbating some of the current challenges that humanity faces, it also has the potential to be part of the solution. A growing body of qualitative research has sought to examine the impact of digital technologies on the achievement of the Sustainable Development Goals (SDGs). In this study, we leverage natural language processing (NLP) techniques to evaluate abstracts of more than 50,000 scientific publications at the intersection of the SDGs and digital technologies, categorizing them into seven groups: Additive Manufacturing; Artificial Intelligence; Blockchain; Big Data; Computing Infrastructure; Internet of Things; and Robotics. From our study, we draw three main conclusions: (i) NLP tools applied to the corpus of scientific literature can provide a valuable complementary approach to qualitative research; ii) Artificial Intelligence is mostly beneficial for the SDGs, and has less beneficial impact on SDG5 (Gender Equality), SDG10 (Reduced Inequality) and SDG16 (Peace, Justice and Strong Institutions); and (iii) SDG16 is the most negatively affected by digital technologies, especially blockchain and big data. This study represents a first attempt to use bibliometric data to gain clearer understanding of how digital technologies can be leveraged by science and public policy to promote peace and prosperity for both humanity and the planet.

# **0.18 AI & Data Governance**

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# Designing Data collaboratives' governance for their long-term stability: a key success factor analysis

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Wednesday, 14th June - 15:45: (JUB-G32) - Full paper presentation

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*Federico Bartolomucci (Politecnico di Milano), Simone Bartalucci (Politecnico di Milano)*

The momentum surrounding the use of big data for the public good has developed over the past few years, resulting in a proliferation of initiatives (see [www.datacollaboratives.org](http://www.datacollaboratives.org)) demonstrating the potential benefits derived from the cross-sectoral and collaborative use of both public and private datasets to stimulate socially oriented innovation. These cross-sectoral initiatives, frequently referred to as Data Collaboratives, have however not frequently progressed beyond the pilot level, a condition hindering their ability to generate long-term benefits and scale their impact (Flanagan Anne & Sheila, 2022; GSMA, 2018). The lack of well-defined incentives schemas for both public and private actors (Klievink et al., 2018a), the lack of effective intermediation reference schemas (Klievink et al., 2018b; Sussha et al., 2022), and the lack of business models able to make these collaborations economically sustainable (GSMA, 2018; Sussha et al., 2020), are among the governance-related variables (Bharosa, 2022; Bryson et al., 2015) that undermine the long-term stability of these sort of collaboration. From the combination the literature on Data Collaboratives' governance (Ruijter, 2021; Stalla-Bourdillon et al., 2019a; Sussha & Gil-Garcia, 2019) with the most developed one on collaborative governance (to cite some Ansell & Gash, 2008; Bryson et al., 2006; Emerson et al., 2016) we deductively derived seven governance dimensions that are considered relevant for the long-term stability of a partnership. We then developed sixteen heterogeneous and explanatory multiple case studies to investigate how more stable types of data collaboratives have managed these dimensions. The construction of several case studies allowed us to inductively identify governance critical factors and their settings spurring the collaboratives' stability. Results demonstrate that the peculiarities of data collaboratives, require managing this type of partnership with different logics than those applied in traditional cross-sectoral partnerships, thereby necessitating the adaptation of existing governance on both governance structures, processes and the elements in between. The paper enriches existing literature moving from previous descriptive research (Ruijter, 2021) identifying relevant governance dimensions, to an explanatory approach, clarifying how to best design and manage these dimensions. In doing so it contributes to theory-building on the topic and might stimulate further research on it.

## **Politics of dangerous tech policy framings: Artificial Intelligence as global race and technological fix**

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Wednesday, 14th June - 15:45: (JUB-G32) - Full paper presentation

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*Inga Ulnicane (De Montfort University)*

This study examines the policy discussions surrounding the purpose of the development and use of an emerging technology. It applies the two stylized technology policy frames of economic growth and societal challenges to analyse framing of one of the key emerging technologies today—Artificial Intelligence (AI). It demonstrates that recent AI policy documents include both—economic growth as well as societal challenges—frames. While AI is a novel technology, its recent policy builds on traditional ideas about the role of technology in facilitating economic growth and competitiveness supported by well-known measures such as investment in research and highly skilled workforce. Additionally, AI policy draws on more recent frame on the contribution of technology to addressing societal challenges and the Sustainable Development Goals but presents AI as a technological solution to complex societal issues. While some interest in addressing both economic and social objectives in AI policy can be observed, the policy documents remain silent about their compatibility.

# **O.19 Digital Transformation & Firms**

## **Innovation policies for digital transformation and firms' productivity: the Italian Industry 4.0 Plan**

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Wednesday, 14th June - 13:45: (JUB-144) - Full paper presentation

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*Elena Cefis (University of Bergamo), Stefania Scrofanì (Sant'Anna School of Advanced Studies), Matteo Tubiana (Politecnico di Torino)*

Industry 4.0 technologies radically change industrial processes, stimulating automation, digitisation and flexibility. National governments have enacted innovation policies to support firms' investments in new technologies and increase productivity growth. The Italian Industry 4.0 Plan (II4.0 Plan) was implemented with this purpose in 2017 and consisted mainly of a universal, automatic fiscal plan. By using a new methodology that relies on firms' financial accounts rather than survey data, we can identify the firms that have benefited from the II4.0 Plan's incentives and extend the analysis to the entire population of Italian firms. The results from a Difference-in-Differences regression approach show that the investments spurred by the II4.0 Plan positively affect firms' labour productivity but there is heterogeneity between size classes, sectors and type of incentive. Hyper and super amortisation and the credit for innovation drive the results. Moreover, we frame our policy evaluation exercise into the most recent discussion about innovation policies, raising some criticisms on the appropriateness of horizontal policies to foster the digital transition.

## More technology, more money? How advanced digital technologies are shaping firms' financing conditions

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Wednesday, 14th June - 13:45: (JUB-144) - Full paper presentation

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*Marco Sforza (Università Roma Tre)*

The paper investigates whether the adoption of advanced digital technologies (i.e., *Industry 4.0*) exerts a signal effect on financial intermediaries, eventually improving the firms' access to credit. The econometric analysis exploits the microdata from Bank of Italy's "Survey on Manufacturing and Service Firms", merged with balance sheets data provided by Cerved, covering the period 2015-2020. To address a potential reverse causality issue, a binary treatment model with heterogeneous average treatment effect and treatment endogeneity is used. The results show a reduction in the likelihood of being credit rationed following the adoption of advanced digital technology and improved overall financial conditions, measured with a composite index. It is also observed an increase in leverage associated with a reduction in the cost of debt along with a composition effect between bank and financial debt. From a technological point of view, a strongly differentiated effect between operational and information technologies is detected, suggesting a few considerations on the drivers of change in the current wave of technical progress.

# **O.20 Sustainability Transitions: Policy**

# **The decarbonisation strategies of National Recovery and Resilience Programs: a country comparison based on the policy mixes perspective.**

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Thursday, 15th June - 16:40: (FUL-201) - Full paper presentation

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*Bianca Maria Potì (National Research Council of Italy), Lucio Morettini (National Research Council of Italy)*

The policy mix has gained increasing attention in the STI literature as a tool to foster transformative innovation processes. A broader policy mix conceptualisations emerged, including policy strategies, policy mix characteristics and policy implementation processes. The present paper explores the link between policy mix characteristics and sustainable transition through the study of two cases (Italy and France). The research question is how much the use of policy mixes perspective helps to understand the position of a Country with respect to the objective of redirection and acceleration of innovation towards low-carbon solutions. The idea is that policy mix analysis could be used as part of the ex-ante evaluation currently required by the European Union for sustainable development programs.

## **Innovation Radar: Exploring Technological Innovations for Production of Cultured Meat and Their Impacts**

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Thursday, 15th June - 16:40: (FUL-201) - Full paper presentation

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*Dagmara Weckowska (Freie Universität Berlin), Lisa Franke (Technische Universität Berlin), Carsten Dreher (Freie Universität Berlin), Cornelia Rauh (Technische Universität Berlin)*

Studies of technological innovation systems have a rich conceptual and methodological apparatus to examine what drives or blocks the development and diffusion of innovation but are comparable less well equipped to examine directionality within a technological innovation system. To enhance the capacity of innovation system studies to explore directionality and generate evidence that can inform transformative policies, we propose to develop a technology radar for a specific innovation system. A technology radar method is adapted to examine the variety of innovative solutions in a specific innovation field and their implications for selected aspects of sustainability. The outputs from the first phase of the radar development for the cultured meat are reported in this paper. The results can be used to inform R&D, investment and policy decisions for development of cultured meat.

# **0.21 Sustainability Transitions: Interacting Systems**

## Multi-system interactions in hydrogen-based sector coupling projects: system entanglers doing transition work

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Friday, 16th June - 13:30: (FUL-Amphitheatre A) - Full paper presentation

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*Meike Lühr (University of Oldenburg), Camilla Chlebna (University of Kiel)*

Our contribution aims at better understanding the concrete activities which underlie the integration of multiple sectors as part of the ongoing decarbonisation beyond the electricity sector. We analyse how actors realise the integration of different sectors. To identify their activities, we build on the recently established concept of transition work which adapts the institutional work framework for use in the analysis of transition processes and link it to the concept of ‘system entanglers’. Originating from the Deep Transitions literature, system entanglers deliberately connect systems through activities such as network building and fostering between-system links. Empirically, we apply this to three qualitative case studies of hydrogen-based sector coupling projects within mobility, industry, and heating in Germany. We find that cross-sectoral competencies and learning as well as fostering between-system links are key to entangle different systems. Thus, we identify the concrete activities and key characteristics of system entanglers and we discuss how the sectoral context, the constellations of actors in projects, and the self-perception matter.

# Challenges in accelerating multi-system sustainability transitions: Cross-country comparison of the electrification of transport in Germany and the USA

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Friday, 16th June - 13:30: (FUL-Amphitheatre A) - Full paper presentation

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*Karoline Rogge (SPRU, University of Sussex), Nicholas Goedeking (SPRU, University of Sussex)*

A key strategy for decarbonising the transport sector is its electrification. This strategy requires multi-dimensional changes within both the mobility system and electricity system, with digitalisation serving as an enabler of this system innovation. The transitions literature has conceptualised such socio-technical change processes across multiple systems through the lens of multi-system interactions (Markard et al. 2021, Rosenbloom 2020), but so far with limited studies applying this novel conceptual thinking to empirical cases. We address this empirical gap by investigating the case of the electrification of land-based passenger transport, i.e. the transition to e-mobility. This technology-oriented sustainability transition implies that electricity and mobility systems are increasingly interconnected through new investments and emerging business models from actors originating in either of the original systems. Rather than focusing on one country only, we adopt a comparative format to pay attention to the context-specificity and global interplay of these transition processes, for which we have selected Germany and the USA as key actors. By asking experts about what they perceive as core challenges hindering the acceleration towards widespread vehicle electrification, we shed new light on how system actors make sense of ongoing multi-system transitions and what they perceive to be key challenges for accelerating them. Methodologically, we follow a qualitative research design combining document analysis with 35 expert interviews conducted between September 2022 and January 2023 in Germany and the US. Based on the coding of transcribed interviews in MaxQDA, we investigate key similarities and differences across both countries; seek deeper insights into the reasons and solutions for the challenges; and reflect upon the fit of the identified challenges with Markard et al.'s categories. Based on our analysis, we offer an empirically refined conceptualisation of acceleration challenges in multi-system transitions by proposing two additional challenges – “international dynamics” to capture the global interplay between countries, and “growth issues as the parallel development to decline and resistance. We also argue that closer attention should be given to the importance of institutional context in order to better understand country differences, including regarding the politics and policies in accelerating transitions in multi-system contexts.

# **1.1 From patent data to emerging technologies**

# Adoption of AI in Pharmaceutical Innovation: Evidence from Patenting Data

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Thursday, 15th June - 15:00: (JUB-144) - Full paper presentation

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*Sawan Rathi (Indian Institute of Management Ahmedabad), Adrija Majumdar (Indian Institute of Management Ahmedabad),  
Chirantan Chatterjee (SPRU, University of Sussex)*

It is now much discussed that Artificial Intelligence (AI) as a General Purpose Technology (GPT) can resolve the efficiency problems of industries, including in pharmaceutical markets where productivity challenges continue in costs and time for new drug discovery. But did the COVID-19 pandemic inadvertently accelerate the pace of AI adoption in pharmaceutical innovation? We answer this question using novel data on pharmaceutical patents. We use two different databases to analyze abstracts of pharmaceutical patents applied in the USA. Topic modeling was used to identify patents with technical artifacts and classify them as treated group AI adopting patents. An AI dictionary is used to match AI-related keywords in the patent abstracts. Subsequently, using a difference-in-differences research design we observe that both presence and count of AI keywords in pharmaceutical patents have increased with pandemic. An increase in AI is also related to reduced time taken from application to publication of a patent suggesting innovation efficiencies in the industry. Finally, we find that results are driven by firms that have already built AI capability in the past. Our results remain consistent with various robustness checks, and we conclude by discussing managerial and policy implications of our findings.

## What's the Future of Automation? Using Semantic Analysis to Identify Emerging Technologies

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Thursday, 15th June - 15:00: (JUB-144) - Full paper presentation

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*Sugat Chaturvedi (University of Sussex), Tommaso Ciarli (UNU-MERIT, United Nations University), Önder Nomaler (UNU-MERIT, United Nations University), Ekaterina Prytkova (SPRU, University of Sussex)*

Identification of emerging technologies is critical to understanding the changing patterns of work, labor demand, and income distribution, and formulating policies to mitigate the associated risks while harnessing their potential benefits. In this paper, we curate a large corpus comprising millions of patents and scientific publications from Derwent, PATSTAT, and OpenAlex databases related to automation technologies across a wide range of domains, including but not limited to industrial robots and artificial intelligence. To identify emerging technologies, we propose a methodology which combines machine learning methods with state-of-the-art sentence transformers from the field of computational linguistics. We first identify radically novel patents and publications relative to those that existed prior to these using a novelty detection algorithm and their semantic off-shoots. We then cluster them into cohesive technology groups based on similarity in their content. We validate these clusters based on obtained labels and observe that citation patterns across patents and publications are heavily dependent on semantic similarity. Finally, we construct aggregate indicators of emergence for these technologies and characterize these based on trends in novelty, bibliometric impact, uncertainty, and growth rates during the past decade. This allows us to identify the stage within the technology life cycle and forecast which technologies are likely to be important in the future. The resulting data set of emerging technologies will be useful to practitioners, policymakers, and researchers interested in the implications of these technologies on labour markets and the society.

## **1.3 Innovation and investment in technology**

## **Automation, firm-level employment and industry dynamics: new evidence from Italy**

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Friday, 16th June - 09:00: (JUB-144) - Full paper presentation

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*Laura Bisio (ISTAT - Italian National Institute of Statistics), [Angelo Cuzzola \(Sant'Anna School of Advanced Studies\)](#), Marco Grazzi (Università Cattolica del Sacro Cuore - Milan), [Daniele Moschella \(Sant'Anna School of Advanced Studies\)](#)*

We investigate the impact of investment in automation-related goods both on adopting and non-adopting firms in the Italian economy during the period 2011-2019. We integrate datasets on trade activities, firms' and workers' characteristics for the entire population of Italian firms and estimate the effects on adopters' outcomes within a difference-in-differences design exploiting import lumpiness in product categories linked to automation and AI technologies. Positive trends after adoption are estimated for employment, value-added and labour share, while sales, productivity and salaries increase after an initial drop with a net positive effect five years from adoption. We study the changes in the workforce composition and contracts, finding positive effects in the share of managers, of mature and low-educated workers, with full-time and permanent contracts. We complete the framework with a 5-digit sector-level analysis, highlighting the market-level effects of the exposure of non-adopters to automation adoption from other firms and finding evidence of a business-stealing effect.

## Multi-establishment Firm Structure and R&D Subsidies

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Friday, 16th June - 09:00: (JUB-144) - Full paper presentation

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*Elodie Andrieu (King's College London), John Morrow (King's College London)*

How do firms distribute resources across establishments, and does this result in spillovers far from headquarters? This paper describes Multiple Establishment firm structure in France and estimates the impact of subsidies which induce firms to open new establishments and expand their footprint, while hiring occupations at different rates. The most policy responsive occupations are techies and support workers in line with R&D targeting, with most growth coming through new establishments and little evidence of reallocation. We estimate an employment spillover elasticity of 10% at the commuting zone level within industry, but no effect across industries and a postcode level elasticity of 1.3%. Spillover hiring is highest in techies and high-skill workers. While subsidies may nominally be given to headquarters in predominantly high-skill advanced areas, firms function to redistribute employment and positive spillovers more broadly.

## **1.4 Technology, Automation and Labor**

## The digital truck driver – is an inclusive governance of transport innovations possible?

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Friday, 16th June - 13:30: (JUB-144) - Full paper presentation

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*Gisle Solbu (Norwegian University of Science and Technology NTNU), Marianne Ryghaug (Norwegian University of Science and Technology NTNU), Tomas Moe Skjølsvold (Norwegian University of Science and Technology NTNU)*

The expectations of how digitalization will deeply transform and disrupt future mobility systems have been important for legitimizing technology- and innovation-oriented transport policies (Haugland and Skjølsvold, 2021, Ryghaug et al., 2022). In this context, governance discourses in transport have besides focusing on aspects related to techno-optimisation, mainly evolved around big questions concerning the ethical and social acceptance of “innovations yet to come” like fully automated vehicles (Stilgoe and Cohen, 2021). Much less attention has been given to the incremental and gradual steps of innovations and the real-world implications of new technologies that are already in use. That is, many advanced transport technologies are gradually introduced, but often go ‘under the radar’ of public scrutiny. The wider effects of digitalization on professional drivers’ work conditions is one such neglected area. This paper is thus an attempt to contribute to new understanding of potential ramifications of the digitalization of the transport sector, including the increased use of AVs and intelligent driving systems, by focusing on a type of public who is seldom listened to: truck drivers. Drawing on a qualitative interview study of professional truck drivers in Norway we ask, what are the real-world consequences of digitalization on *today’s* truck drivers and is their voice heard in the developments we now see? In particular, we want to draw attention towards the relation between visions of mobility disruptions, and how we approach the governance of slow and mundane developments of new technologies that we often find in work contexts. Based on our findings we argue for an important, but often neglected, role for governance and innovation policy to include publics in relation to specific user-contexts, and to form a continuous dialogue with professional users that can generate deliberation on the unexpected issues that will emerge through technology use. Based on this, we want to raise a discussion on possible ways forward for handling the tension between supporting innovation, anticipating emerging technologies and other temporalities of governance (Skjølsvold and Coenen, 2021).

## Technological substitution of low wage work: Evidence from Germany.

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Friday, 16th June - 13:30: (JUB-144) - Full paper presentation

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*Nicholas Rounding (Maastricht University)*

significant literature suggests that the impact of technological change in the last thirty years has led to wage polarisation, as technologies have substituted routine tasks, predominantly in the middle of the wage distribution. Despite this well documented phenomenon, there has been a shortage of work investigating the relative costs of automation, and thus the financial incentives. Thus far, little work has been done investigating the relationship from the angle of labour prices. Minimum wages are one of the prime determinants of the price of low wage labour, yet the relationship between the level of the minimum wage and its effects on the substitution of tasks has been underexplored. This study enhances the understanding of how a minimum wage interacts with the technological substitution of low wage jobs, and thus provides insight into how a key policy lever interacts with automation. To investigate this, we use the 2015 introduction of a national minimum wage in Germany. This provides an ideal experimental situation as there was little institutional lead up, a high wage floor and no previous national minimum wage. I exploit the rich register data provided by the German Federal Employment Agency, a highly representative 50% sample of the German working population from 2010-2016. These detailed employment biographies are linked to employer data, allowing us to also measure the effect of the firm. I combine the register with a routine share score generated by Dengler et al (2014) to identify workers who are susceptible to technological substitution. I utilise a difference-in-difference setting with individual level outcomes, investigating the wage and employment effects. Following Dustmann et al (2021) we also investigate reallocation effect of workers between firms. Results suggest that routine workers are more susceptible to employment effects, confirming the Routine-Biased Technical Change (RBTC) hypothesis, and that there is a small but significant effect of the minimum wage.

## **2.1: Capacity for delivering innovation policy missions**

## **The challenge of grand challenges: From disorganised to loosely organised mission-oriented innovation activities**

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Wednesday, 14th June - 09:00: (FUL-Amphitheatre A) - Full paper presentation

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*Niko Lipiäinen (Aalto University), Robin Gustafsson (Aalto University), Robert van der Have (Aalto University)*

Modern missions which aim to tackle wicked problems by system-level transformations encounter various challenges. Therefore, this study aims to define the key challenges in mission-oriented innovation activities. Our synthesis exposes five areas of difficulties in mission-oriented activities: impeded actorhood, mission formulation, mission implementation, and informational and incentive-related challenges. We also discuss the systemic nature of the key challenges in mission-oriented activities. These challenges have two-directional relations between each other, creating direct and indirect effects.

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## Missions agencies as change agents? Reflections on intra-organizational change and the creation of agencies for transformative missions

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Wednesday, 14th June - 09:00: (FUL-Amphitheatre A) - Speed Talk

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*Ralf Lindner (Fraunhofer Institute for Systems and Innovation Research ISI), Florian Wittmann (Fraunhofer Institute for Systems and Innovation Research ISI), Thomas Jackwerth-Rice (Fraunhofer Institute for Systems and Innovation Research ISI), Stephanie Daimer (Fraunhofer Institute for systems and innovation research ISI), Jakob Edler (Fraunhofer Institute for Systems and Innovation Research ISI), Daniel Posch (Bertelsmann Foundation)*

The increasing demand for transformative, mission-oriented policy-making comes along with numerous requirements, challenging existing structures and practices of governmental actors. This particularly relates to the significantly increased coordination requirements in dealing with problems cutting across established policy fields. In addition, a key characteristic of transformative approaches is the need for co-creative interaction with heterogeneous groups. In many cases, established institutional settings, organizational routines and administrative cultures do not live up to these demanding requirements. A well-illustrated example is Germany, where effective transformative policy-making is undermined by several structural factors. Against this background, the issue of how to enable institutional systems and (public) actors involved in the design, implementation and the governance of mission-oriented policies to effectively deal with the newly emerging requirements has increasingly received attention. On a general level, two basic approaches to better address the requirements for transformative, mission-oriented policies are currently being discussed: (1) the reform of existing institutional arrangements and organizational structures, and (2) the establishment of new organizations. This paper contributes to the current search for appropriate approaches to transformative policies by focusing on the latter, namely by proposing an innovative institutional solution. To overcome existing structural obstacles in the German federal political-administrative system, the paper discusses the creation of a specialized mission agency acting independently within the scope of its competencies, taking a leading role in the design and governance of a selected mission and located within the responsibility of the Federal Chancellery. However, at this stage, the proposed institutional solution should be understood as a thought experiment, as both conceptual development as well as insights derived from empirical research are currently at an early stage. The paper presents an analysis of the implications of key institutional bottlenecks at the German federal level, before outlining key functional requirements a mission agency should fulfill. It then presents a proposal on the institutional design and the key capabilities of such an agency. Besides contributing to academic debate on the necessary scope and type of institutional change, the suggestions of the paper are relevant for policy-making, indicating possible ways forward for bringing transformative policies into practice.

## **2.2 Policy capacity and transformation**

# Acceleration Capacity: How California Is Driving the Electric Vehicle Revolution

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Wednesday, 14th June - 13:45: (FUL-Amphitheatre A) - Full paper presentation

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*Nicholas Goedeeking (SPRU, University of Sussex), Karoline Rogge (SPRU, University of Sussex)*

Research on state capacity has emphasized the need for skills and resources, Weberian bureaucratic capacity, and different kinds of policy capacity. Recent work has also explored the components of urban transformative capacity and the institutional origins of strategic state capacity. These frameworks, however, cannot yet explain why some governments demonstrate greater ability than others to accelerate transitions. We argue that states must wield a special kind of state capacity to effectively navigate the novel challenges emerging in the acceleration phase of transitions: acceleration capacity. We define acceleration capacity as the state capacity which enables governments to effectively address the unique challenges associated with an acceleration phase. Our main proposition is that governments must respond to two competing dynamics, one driving the transition and another slowing it. The first dynamic arises from enabling market developments, agglomeration effects, and policy feedback effects. We hypothesize that policymakers must deliberately take advantage of these effects to enable more ambitious policy. The second dynamic arises from higher risks associated with policy failure, greater concerns for performance reliability, and intensifying political conflict. Even if policymakers leverage the enabling effects, acceleration might stall if government actors cannot or do not proactively tackle these disabling tensions. To explore how government actors leverage enabling dynamics and minimize disabling ones we investigate how policymakers in California are driving the electric vehicle revolution. The state is at the cusp of charging ahead with widespread electrification of private vehicles, which presents a unique research opportunity to empirically uncover how its decisionmakers are currently grappling with this new transition phase. For data, we draw on over 30 semi-structured interviews conducted between September 2022 and March 2023. We expect acceleration capacity to be a scarce but renewable policy resource. Decisionmakers will have to strategically decide when, where, and how to use it. Some policy decisions will mainly serve to accelerate policy change while others will chiefly serve to counter political opposition, mitigate risk, and foster social inclusion. Ideally, acceleration cultivates political legitimacy while legitimacy enables further acceleration. Our results will offer valuable insights into how governments can deliberately cultivate and harness acceleration capacity.

# **From capacity building to sectoral transformation: the co-evolution of policy mixes and innovation trajectories of clean energy technologies in China**

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Wednesday, 14th June - 13:45: (FUL-Amphitheatre A) - Full paper presentation

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*Deyu Li (Utrecht University)*

Public policies, including both technology-push and demand-pull policies, played significant role in the development and deployment of clean energy technologies. Recent literature on the green industrial policies further highlights the role of industrial policies in the policy mixes for sustainability transitions. However, existing literature on the impacts of policy mixes on clean energy innovations has been rather conceptual and descriptive. There remains a gap in the understanding of how policy mixes interact and co-evolve with the sectoral dynamics of sustainability transitions in shaping technological change. This paper collects national and regional-level policies related to the clean energy transitions in China, and then identifies the shift in the focus of policy mixes by combining interviews with topics covered in those policy documents using natural language processing methods. Furthermore, patent data is employed to construct novelty and impact indicators to track the changing technological trajectories of key clean energy technologies. The results show that the focus of clean energy policy mixes in China shifted from building manufacturing and innovation capacities towards supporting the net-zero transformation of the electricity sector. This shift led to the emergence and the dominance of new technological trajectories in key clean energy technologies which addressed the issues associated with the integration of electricity generated from renewable sources into the electricity grids. The shifting focus of policy mixes towards system transformation also facilitated the integration of external knowledge from broader sectoral contexts. The results of this paper help deepen the understanding of the interactions between policy mixes and technological change for designing future policy mixes for net-zero transitions.

# Transformative Policy Capacity for Sustainability Transitions. Zero-emission Ferries in Denmark and Norway

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Wednesday, 14th June - 13:45: (FUL-Amphitheatre A) - Full paper presentation

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*Susana Borrás (Copenhagen Business School), René Taudal Poulsen (Copenhagen Business School)*

This paper explores the overlooked connection across the literatures on policy capacity and the governance of sustainability transitions. Mitigating climate change requires a deep transformation of socio-technical systems, and therefore the need to re-think policy capacity in terms of its transformative dimension. We suggest the concept 'transformative policy capacity' as a useful analytical tool to examine the design and the implementation of sustainability policy goals in the governance of socio-technical systems' transformation. The paper compares Denmark and Norway policies towards zero-emissions ferries and their efforts to transform the domestic shipping sector - two similar countries in a sector characterized by network governance mode. The findings bring to the fore the exceptionally strong transformative capacity required for municipalities (the key public sector organizations in Denmark) to be able to act as change agents overcoming a weak directionality and policy mix at the system level; which contrasts with the better resourced and better developed practices and routines organizational capacity of Norwegian national agencies in the implementation of a well-tuned policy-mix with clear directionality in Norway. Other than showing empirically the different degree of critical deficits in transformative policy capacity in both countries, these findings have at least three theoretical implications for future studies: variation in the transformative policy capacity across countries is related to particular features at system and organizational level, even in the similar mode of network governance; likewise, the exercise of change agency by public sector organizations is embedded, but not entirely determined, by system-level arrangements as we see strong - even if geographically peripheral- public sector organizations in weakly articulated system level; and last, the resources of public sector organizations are important for transformative policy capacity, but more important are how those organizations define new internal practices and routines for addressing new directional tasks.

## **2.3: Mission agencies' transformative capacity**

# Capacities and capabilities for Transformative Mission-Oriented Policies: a case study of the Vinnova approach

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Thursday, 15th June - 09:00: (FUL-Amphitheatre A) - Full paper presentation

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*Diana Velasco (INGENIO (CSIC-UPV)), Caetano Penna (TU Delft), Jordi Molas-Gallart (INGENIO (CSIC-UPV)), Johan Schot (Centre for Global Challenges, Utrecht University)*

The past decade has seen a rise in science, technology, and innovation (STI) policies aimed at addressing environmental and social challenges. Scholars have sought to understand these policies through the use of conceptual frameworks that explain their rationales. Two main approaches have been identified in challenge-led innovation policies: mission-oriented innovation policy (MOIP) and transformative innovation policy (TIP). MOIP is based on the establishment of clearly defined goals within a specific timeframe to direct cross-sector innovation, while TIP focuses on emergent, open-ended transformations in socio-technical systems. This paper builds on both frameworks defining Transformative Mission-Oriented Innovation Policy (TMOIP) and proposing a set of capacities and capabilities from government agencies to develop transformative missions. The TMOIP framework is then applied to an explorative case study of the Swedish innovation agency, Vinnova, showing that it works both as an analytical and prescriptive tool to advance the accomplishment of systemic, challenge-led, and focused on experimentation innovation missions.

## Public sector capabilities in times of turbulence

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Thursday, 15th June - 09:00: (FUL-Amphitheatre A) - Full paper presentation

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*Lisa Scordato (Nordic Institute for studies in Innovation, Research and Education NIFU)*

This paper pays attention to the capabilities that managers and employees of public sector organisations (PSOs) turn to when faced by unforeseen and turbulent problems and events. Despite several scholarly contributions to the field of public governance and innovation capabilities questions about the specifics of PSOs capabilities under uncertain and unpredictable conditions remain open. Drawing on the literature on public governance and organisational capabilities, the paper advocates that a micro-foundations approach is a fruitful contribution to both understanding and developing capabilities in the public sector and thereby coping with contemporary wicked problems.

## **Do mission-oriented innovation policies for net zero deliver on their many promises?**

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Thursday, 15th June - 09:00: (FUL-Amphitheatre A) - Full paper presentation

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*Philippe Larrue (OECD)*

Mission-oriented innovation policies are increasingly popular as a policy response to meeting net-zero targets. They have clear objectives and measurable targets, promote broader co-ordination of policy plans across administrative silos, and better integrate various support instruments across the different stages of the innovation chain than more traditional and fragmented policy approaches. These policies remain unproven, however, and early indications suggest they lack sufficient scale and reach to non-STI policy domains to have wide-ranging impact. The challenge remains to move these initiatives from effective co-ordination platforms to integrated policy frameworks that mobilise and align a wide range of actors. Overcoming many of the barriers – including administrative and legal rules, accounting structures and governance models – requires changes that are far beyond the reach of STI authorities alone and will need significant political support.

## **2.4 Social innovation and bottom-up approaches**

## **Grand missions toward poverty alleviation: build synergies between top-down and bottom-up approaches based on China's cases**

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Thursday, 15th June - 10:50: (FUL-Amphitheatre A) - Speed Talk

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*Kejia Yang (TIK, University of Oslo), Guangxi He (Chinese Academy of Science and Technology for Development)*

This paper explores two interconnected research questions: how to effectively address fundamental uncertainties when implementing missions, and how to promote the dissemination of good practices. Specifically, we examine one of China's poverty alleviation initiatives, which mobilizes science and technology commissioners. Unlike previous binary approaches that advocate for either a top-down or bottom-up approach, we adopt a dynamic approach to account for the non-linearity of development. We argue that the diffusion of good practices is facilitated by two intertwined processes of local adaptation and national-level institutionalization, which are driven by different patterns of learning. China's ability to build synergies between these bottom-up and top-down approaches has played a crucial role in addressing uncertainties. We also discuss the enabling factors and institutional conditions that support these mechanisms and generate useful insights for other empirical contexts.

## Exploring the digital transformative potential of the Conformity Assessment industry: an international comparison

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Thursday, 15th June - 10:50: (FUL-Amphitheatre A) - Speed Talk

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*Luana Ladu (Bundesanstalt für Materialforschung und -prüfung (BAM)), Claudia Koch (Bundesanstalt für Materialforschung und -prüfung (BAM)), Parsa Asna Ashari (Bundesanstalt für Materialforschung und -prüfung (BAM)), Knut Blind (Technische Universität Berlin, Chair of Innovation Economics; Fraunhofer Institute of Systems and Innovation Research), Pavel Castka (University of Canterbury)*

Using new digital technologies to drive digital transformation and innovation is inevitably linked with organizational transformation, requiring accordant capacities and resources. Digital maturity models help understand the paths towards digital transformation in organizations and industries [1], allowing to derive support measures for innovation ecosystems from them. Organizations in the conformity assessment (CA) industry provide services such as quality testing and certification, thereby contributing to transparency and trust in almost every aspect of our lives and economic activities. They thus play a crucial role in value chains, in innovation systems, but also for health and environmental protection [2]. Against this background, it is not only in the interest of the CA industry itself, but also of economies, policy makers, and the public at large, that digitally mature and capable organizations fulfill their tasks efficiently and reliably [3, 4]. Yet, there is no comprehensive empirical study on the status and trends of digital transformation in that particular industry. Building on a unique dataset of 1,447 organizations across 15 countries surveyed online in 2022, this empirical study analyses the CA industry's transformative capacity to deliver digital innovation at the organizational level. In particular, it seeks to answer two major questions: (1) Is the CA industry ready for digital transformation? (2) What are the drivers and challenges?

## **2.5 Transformative universities and public sector organizations**

## The Role of University Leadership in Addressing Mission-Oriented Policies – A Change Agency Perspective

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Thursday, 15th June - 15:00: (FUL-Amphitheatre A) - Full paper presentation

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*Henning Kroll (Fraunhofer Institute for Systems and Innovation Research ISI), Torben Schubert (Fraunhofer Institute for Systems and Innovation Research ISI)*

In recent years, mission-oriented policies have placed new expectations on universities, demanding contributions towards solving large-scale, interdisciplinary challenges. This stands in some conflict with existing insights from university governance research emphasising that scientific communities focus on reproducing disciplinary practices unsuitable to address large-scale interdisciplinary problems effectively. Moreover, at the same time university leaders are unable to bring about large-scale change in organisational scripts based on bureaucratic powers alone. In this conceptual paper, we will elaborate what follows from the premise that individual researchers remain equipped with the option to deviate from routine practice by forming new alliances within the organisation and by developing new interdisciplinary scripts which are needed to address large-scale societal problems. We will demonstrate what that logically implies for university leadership's use of soft leverage to legitimise and encourage new transdisciplinary research settings and agendas. Concluding, we outline basic approaches likely to render universities more important drivers of mission-oriented policies.

# Building policy capacities for tackling grand social challenges: Exploring the boundary-spanning potential of university research in the social sciences

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Thursday, 15th June - 15:00: (FUL-Amphitheatre A) - Full paper presentation

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*Ainhoa Arrona (Orkestra and Deusto University), Edurne Magro (Orkestra and Deusto University), James R. Wilson (Orkestra and Deusto University)*

The embracing of more strategic approaches to economic development policy, seen most clearly in the widespread development of ‘smart specialisation strategies’ (S3) across European regions, has highlighted the crucial role of policy capacities for effective strategy development. Moreover, as the development of such strategies are increasingly oriented to driving forward the transformative innovation required to address grand social challenges, the need for developing sophisticated policy capacities is heightened. This relevance on capacities for strategy and policy development is reflected on the increasing academic interest to identify and characterise policy and governance capacities required in a region and its main public organisations for innovation strategy development. Experimental approaches to territorial strategy-making and related policy processes have also increased the pressure on universities and the research they develop to play more strategic and relevant roles within their territories. Within this frame, this article explores how universities - concretely social sciences research- can contribute to regional policy capacities for tackling social challenges. Specifically, it focuses on arrangements that universities develop to facilitate engaged research in regions, which -building from science-policy works-, can be labelled as “university-based boundary organisations”. Moreover, the article characterises university boundary organisations as *facilitators of regional knowledge co-construction for addressing social challenges*, through three main roles : reflective scientist, intermediary and facilitator of knowledge co-construction. The paper explores how these roles contribute to regional policy capacities, by illustrating and extracting learnings from Orkestra, Basque Institute of Competitiveness, a university-based boundary organisation in the Basque Country, and on the research developed by this organisation around a key social challenges in the region and in the UE: attracting, training and retaining skilled people for regional development in a context of sustainable transitions

## Public sector organizations as agents of transformations

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Thursday, 15th June - 15:00: (FUL-Amphitheatre A) - Speed Talk

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*Thomas Jackwerth-Rice (Fraunhofer Institute for Systems and Innovation Research ISI), Stephanie Daimer (Fraunhofer Institute for systems and innovation research ISI), Florian Wittmann (Fraunhofer Institute for Systems and Innovation Research ISI), Ralf Lindner (Fraunhofer Institute for Systems and Innovation Research ISI)*

The demand for a more active role of the state in transformation processes towards a more sustainable development of society raises the question of what capabilities Public Sector Organizations (PSO) would need in order to fulfill this role and to contribute to tackling wicked problems such as climate change. Being able to contribute to the transformation towards a sustainable society requires new organizational capabilities, however. In particular, public sector organizations acting as agents of transformation must focus on problem-solving instead of simply executing bureaucratic procedures. This form of problem-oriented governance contains five stages, defining the problem, designing and implementing a response, evaluating its impact, and adapting the problem definition and policy response. To date, little research on the capabilities required by public sector organizations seeking to take on the role as agents of transformation has been conducted. This article uses the three capabilities of problem-oriented governance as a heuristic for analyzing managerial and organizational routines facilitating transformative work. In fact, the paper presents a model to systematically analyse the organizational capabilities a specific PSO might require to take a more active role in shaping transformation processes. The article therefore asks *which formal structures within PSO might strengthen the latter's problem-solving capabilities* and put them in a position to shape transformation processes more actively. This conception of PSO's capabilities actively supporting transformations will be empirically illustrated and critically assessed based on semi-structured expert interviews in PSO in the context of the German environmental policy.

## **2.6 Municipalities and regions capacities**

## **Learning to innovate - How can municipalities increase their innovation capacity to address complex societal challenges?**

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Thursday, 15th June - 16:40: (FUL-Amphitheatre A) - Full paper presentation

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*Tess Tjokrodikromo (TNO), Amber Geurts (TNO), Diana Vonk Noordegraaf (TNO)*

In recent years public organizations have increasingly faced complex societal challenges. Addressing these societal challenges demands new ways of working, calling for public organizations to transform their innovation capacity and develop and stimulate solutions to these challenges. In this study we develop an operational framework to analyse the innovation capacity of municipalities. Innovation capacity is defined as the set of competencies and conditions that enable and support innovation in a public organization. The elements that arise in this framework are: leadership, organization, knowledge management, network and learning. We test this framework by analysing the innovation capacity of two municipalities by means of empirical case studies. Therefore, the main research question in this study is: *what capacities do municipalities need to address complex societal challenges and how can municipalities create an institutional environment that stimulates the development of these capacities?* Key findings are the large influence of the organizational culture on the development of innovation capacities, high dependency on intrinsically motivated, entrepreneurial individuals and the importance of leadership that creates space for transformative innovation. We complete this paper with five policy recommendations to increase transformative innovation capacity in municipalities.

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# Innovation governance and its underpinnings: A comparative analysis of RIS3 in Toscana and Emilia-Romagna

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Thursday, 15th June - 16:40: (FUL-Amphitheatre A) - Full paper presentation

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*Iacopo Gronchi (University College London & Demos Helsinki)*

In the last decades, the role of the state in the economy has been brought back to the forefront of the academic and political debate. These trends fed into a widespread call for the adoption of new frameworks – such as transformative (Schot and Steinmueller, 2018) and mission-oriented innovation policy (Kattel and Mazzucato, 2020). So far, most of the literature that investigated this broad field of research focused on two variables: policies and institutions. Yet, none has been able to provide a unified perspective on how to propel and steer innovation for public purpose (Nelson, 2011). To overcome this limitation, this paper draws on the theoretical account championed by Potts (2019) of the “innovation problem” as “a governance problem of collective action” (223) to analyse innovation in terms of the possibility for state-centric governance: that, the process of developing and implementing collective choices that are influenced by the public sector via the marshalling of political, organisational, and administrative resources (Bell and Hindmoor, 2009; Pierre and Peters, 2020; Roberts, 2020). To do so, the paper gathers comparative evidence on the functioning of two innovation governance modes devised by the local government of two Italian regions – i.e., Toscana and Emilia-Romagna – in order to design, implement, and revise their 2014-2020 Research & Innovation Smart Specialisation Strategies (RIS3). As a result, I aim to respond to two research questions: (RQ1) *How can the public sector effectively govern innovation?*; and (RQ2) *Under which conditions can the public sector govern innovation effectively?* Moving from key premises detected in the relevant scholarly literature, I infer two hypotheses: first, a theoretical model of innovation governance for the public sector (Block, 2008); second, the ‘embedded autonomy’ of public sector organisations as a key prerequisite for its successful implementation (Evans, 1995). By means of a theory-testing process tracing methodology, the paper provides preliminary evidence in support of the hypotheses: first, by showing the relationship between positive innovation outcomes and the proposed innovation governance model; second, by showing the mediating role of embedded autonomy in determining them.

## **3.1 Challenges of sustainable innovation policy**

# Learning from and contributing to Responsible Research and Innovation (RRI) in the Transformative Innovation Policy Consortium

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Wednesday, 14th June - 09:00: (FUL-107) - Speed Talk

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*Paloma Bernal Hernandez (SPRU, University of Sussex)*

Transformative Innovation Policy (TIP) emerged as a new framing to theorize and implement science, technology innovation (STI) policy that directly works towards meeting social needs as well as sustainable, inclusive and just paths of development. The Transformative Innovation Consortium (TIPC) was initially conceived as learning platform, a niche of transdisciplinary work in which scholars, hand-in-hand with practitioners and policymakers, were able to research, develop and experiment with the TIP framework, methodologies and practices. The final aim of this co-creation process was to advance in socio-technical system change whilst nurturing the principles and evaluation methodologies of the TIP framework. This paper analyses the learnings that emerge in TIPC when doing transdisciplinary research by evaluating the extent to which this research can be considered responsible research. Building on the literature of Responsible Research and Innovation (RRI), we use four dimensions identified by the RRI framework (anticipation, responsiveness, reflexivity and inclusion) to evaluate the TIPC Learning History that captures and presents the learning process in TIPC during a five-year period. Based on the evidence and evaluation, we can argue that transdisciplinary research in TIPC has presented some challenges to become fully responsible. We also argue that the RRI approach can benefit from the learnings that emerge from the transformative research in TIPC engagements. The RRI approach could be enriched with more systemic thinking and methods for implementation as is proposed by the TIP principles. Furthermore, when including other communities of stakeholders, pay particular attention to relational values that need to be embedded in engagements and the limitations and available capacities of these stakeholders to continue with future interactions.

## **Great expectations: the promises and limits of innovation policy in addressing societal challenges.**

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Wednesday, 14th June - 09:00: (FUL-107) - Speed Talk

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*Mart Laatsit (Center for Innovation Research (CIRCLE), Lund University), Markus Grillitsch (Center for Innovation Research (CIRCLE), Lund University), Fünfschilling Lea (Lund University)*

In the policy discourse on societal challenges, it has become common to think of innovation policy as the universal tool for addressing societal challenges. However, we argue that innovation policy has limits to what it can do, and for it to remain a useful tool for tackling societal challenges, it is necessary to re-assess its role. Thus, this paper addresses the following research questions: What are the theoretical implications of the augmented expectations of innovation policy in addressing societal challenges, what role can innovation policy play in responding to societal challenges, and what conditions this role. We analyse the adaptability of existing innovation policy tools for addressing transformative failures and develop a new take on how innovation policy can deal with wicked problems by differentiating between paradigmatic and progressive transformations. Acknowledging both the potential and limitations of innovation policy, we make a proposition for how an ambitious innovation policy contributing to solving societal challenges may be conceived.

## **3.2 New ways of innovation policy and emerging tensions**

## **Against innovation? Antagonists, floating signifiers and the evolving hegemonic discourse on innovation.**

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Wednesday, 14th June - 13:45: (FUL-107) - Full paper presentation

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*David Barbera Tomas (INGENIO (CSIC-UPV))*

The omnipresence of innovation in public policies, in business strategies and in contemporary culture invites to think about the “hegemony” of innovation. The study of hegemony can be approached from different perspectives. One of the most fertile in recent years is the analysis of the formation and development of hegemonic narratives as “common sense”, as proposed by authors such Ernesto Laclau (initially in collaboration with Chantal Mouffe). This paper aims to analyze the distinctive elements of the narrative on innovation. In this paper we will show how Laclau’s theory can be applied to innovation narratives. We will study the emergence of innovation as an empty signifier that constitutes a hegemonic narrative. We will also establish the limit of this hegemonic narrative by showing the antagonistic narratives constituted by the very emergence of the hegemony of innovation. Finally, we will discuss the floating narratives that modify the boundary between hegemony and antagonism. Our results consist of 9 “triads” (hegemonic, antagonistic and floating) of innovation-related narratives that show the evolution of the hegemonic meaning of innovation since its emergence.

## Reimagining Innovation Pathways: Exnovation and Buen Vivir as Global North-South Dialogues

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Wednesday, 14th June - 13:45: (FUL-107) - Full paper presentation

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*Karina Maldonado-Mariscal (TU Dortmund University), Rick Hölsgens (TU Dortmund University)*

With growing awareness of limits to growth, debates around sufficiency and degrowth rise to prominence. At the same time, we still witness a great divide between the global 'north' and the 'south' and innovation, or lack thereof, is oftentimes seen as vital determining factor. However, in the light of mounting sustainability concerns, 'traditional' narratives of innovation aiming at economic welfare through techno-economic innovations have come under scrutiny. In this article we look at two alternative approaches to innovation that place sustainability at centre stage. From a global north perspective, the concept of exnovation of unsustainable practices and technologies has been gaining prominence. Whereas a global south perspective, predominantly in South America, the concept of buen vivir calls for responsible and nature-inclusive approaches to innovation. This article presents a reflexive and comparative approach that analyses the two alternative models of innovation. These concepts represent discourses on more sustainable orientations of innovation. The juxtaposition of these approaches presents a dialogue between alternative models of innovation from the North and the South, which are currently trying to address major societal challenges. These challenges include not only environmental concerns, but also social inequality and inclusion of vulnerable groups. This study is based on a qualitative review of recent research on these two concepts. We aim to identify the main characteristics of both concepts in relation to four dimensions within each concept (Environmental, Economic, Technological and Social). These categories will serve to analyse main dimensions in order to understand different types of innovation, their contributions and the limits of each. We contextualise this analysis within the theories of the global north and south in order to better understand its development and historical context, with the goal to contribute to a better understanding of alternative models of innovation and the development of a theoretical understanding of principles based on more sustainable forms of development and innovation that are aligned to current social, economic, technological and environmental needs.

## **3.3 Sustainability oriented innovations**

## Literature review and scientific mapping of Sustainability-Oriented Innovation: an EDI approach

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Thursday, 15th June - 09:00: (FUL-107) - Full paper presentation

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*Evandro Cristofolletti (University of Campinas - Unicamp), Karen E F Pinto (University of Campinas - Unicamp), Yohanna Juk (University of Campinas (Unicamp)), Vanessa Avanci (InSySPo - Unicamp)*

As the world becomes competitive and firms strive to consolidate themselves in the market, environmental and societal concerns emerge. There are several terminologies to approach such recurring socioenvironmental concerns. An example of such a conundrum can be seen through the several terms in the literature to refer to the phenomenon: sustainability-oriented innovation (SOI). The purpose of this research in progress is to investigate the profile of authors debating the topic of SOI in recent literature. Verifying the elements of equity, diversity, and inclusion in a dynamic field such as that of SOI is relevant for understanding the profile of researchers in a specific academic field and providing the necessary support to base public policies targeting social inclusion. Therefore, considering the relevance of sustainability-related topics and the prominence of research on innovation, we decided to conduct a literature review and scientific mapping of SOI considering gender equality, diversity, and inclusion (EDI) elements. We conducted a literature review and scientific mapping using the Scopus database. Our preliminary results suggest that the participation of females in SOI-related articles can still be considered unexpressive compared to that of men. Such a gender gap seems more prominent when the authors of a paper all have the same affiliation, most commonly in a developing country (e.g., China, India, and Brazil).

## **Innovating towards net zero with technology-neutral policy: Promising principle or problematic policy design practice?**

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Thursday, 15th June - 09:00: (FUL-107) - Full paper presentation

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*Sophie-Marie Ertelt (Örebro University, School of Business), Zeinab Reznavi (Örebro University, School of Business), Vojtech Klezl (Örebro University, School of Business)*

This paper investigates the potential tensions that may arise between technology-neutral innovation policy and the advancement of sustainability-related objectives, specifically in the context of road freight transport. Despite the availability of zero-emission vehicles (ZEVs) and regulatory actions, widespread adoption of ZEVs among transport operators has been slow. To shed light on potential reasons for this, the paper examines the relationship between perceived technology neutrality of existing policies, contestations over future technological pathways, and anticipated regret on innovation adoption intentions of transport operators with a survey. The findings suggest that technology-neutral policies may contribute to increased uncertainties over future technology pathways and anticipated regret over adoption decisions which may make transport operators hesitant to invest in already available ZEVs. The paper contributes, therefore, to innovation policy development by highlighting the need to reconsider the principle of technological neutrality and calls for caution when implementing such policies, as it underscores the importance of considering sector-specific challenges and uncertainties when designing effective sustainability-oriented innovation policies.

## **3.4 Socially sustainable digitalization**

## Digital transitions in Healthcare: the need for Transdisciplinary Research to overcome barriers of Privacy Enhancing Technologies uptake

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Thursday, 15th June - 10:50: (FUL-107) - Speed Talk

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*Sarah van Drumpt (TNO), Tjerk Timan (Technopolis Group), Linda van de Burgwal (VU Athena Institute), Soukaina Talie (Vrije Universty Amsterdam), Thijs Veugen (TNO)*

Despite recent efforts to adopt Privacy Enhancing Technologies (PETs) in the health sector, such technologies often do not go beyond the proof-of-concept phase, thus failing to bridge the gap between science and practice. Subsequently, such technologies also fail to achieve the envisioned societal impact. Implementation PETs is complex as they imply fundamental changes in existing cultures, structures and practices. To achieve a digital transition in the health domain, researchers stress the importance of transdisciplinary approaches (TD), in which societal stakeholders are involved in the co-creation of knowledge and innovation. Such co-creation poses challenges, as different stakeholders bring different perceptions of the problem, interests and values. To effectively collaborate, alignment among partners is required. One of the steps to facilitate collaborative learning and congruency in these perspectives is an analysis of the different underlying frames of thinking concerning a certain research or innovation topic. Using a TD, the purpose of the study is to understand: a) underlying value misalignments and b) if methods from TD help in overcoming such misalignments to truly feed mutual learning and c) whether such mutual learning has an effect on alleviating barriers for adoption. A collaborative innovation project in which a PETs infrastructure is being developed was used as a case study. One of the aims of this three year project is to enable the construction of prediction models that can support healthcare professionals with cardiovascular risk management of patients. Among twelve collaborating partners, eleven framed challenges and five underlying values were identified through interviews and focus group discussions with key opinion leaders. Frame reflection and agenda setting activities revealed that even though actors can reach consensus on what the challenges are, they are rooted in different underlying contextual values, causing tensions and disagreements. Using a TD approach and mutual learning, alignment can be reached to some extent but it is unclear if this is enough to reach sustainable adoption in the future. In conclusion, further research is necessary to understand how alignment of frames can lead to adoption of PETs in the health domain and if the TD approach is a valid method for this.

## **Creating human-centered and socially sustainable public services: reflecting the sustainable innovation policy in the context of Finnish artificial intelligence programme Aurora AI**

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Thursday, 15th June - 10:50: (FUL-107) - Speed Talk

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*Anton Sigfrids (VTT Technical research center of Finland), Kirsi Hyytinen (VTT Technical Research Centre of Finland), Nina Rilla (VTT Technical Research Centre of Finland)*

There is increasing pressure to develop and implement innovation policies that promote sustainability in public AI service development, but scant evidence is available about how sustainability targets are translated into concrete practices and what potential tensions and trade-offs between goals such as traditional economic growth and sustainable development emerge. This paper examines how social, economic, and ecological sustainability is translated into practices in Finnish national innovation policy by investigating the Aurora AI programme, which aimed to provide human-centered and cost-effective public services through digitalization, ethical data policy, and cross-sectoral collaboration. We analyse the program according to the CIIA framework public AI governance (Sigfrids et al. 2022) to grasp the extent to which the program incorporates elements of ethical governance and hence its capacity to embrace and operationalize sustainability in public services. Preliminary findings suggest that while some sustainability goals are integrated into innovation policy, limited observable changes in policy implementation exist, particularly in the Aurora AI programme. This highlights the challenge of balancing cost-efficiency, social acceptance, and human-centeredness in digital public services. The study aims to inform research on the principles-to-practices problem and human centered approaches to ethical AI governance and provides an empirical case study to a highly abstract field of study. The study also aims to inform future sustainable innovation policy design for long-term, desirable outcomes and sustainable public service provision.

## **3.5 Tensions in sustainability transitions**

## Diversity and directionality: Friends or foes in sustainability transitions?

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Thursday, 15th June - 15:00: (FUL-107) - Full paper presentation

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*Brit Bulah (Copernicus Institute of Sustainable Development, Utrecht University), Barbara Van Mierlo (Knowledge, Technology, and Innovation group, Wageningen University and Research), Koen Beumer (Copernicus Institute of Sustainable Development, Utrecht University), Alwin Gerritsen (Wageningen Environmental Research), Simona Negro (Copernicus Institute of Sustainable Development, Utrecht University), Marko Hekkert (Copernicus Institute of Sustainable Development, Utrecht University), Laurens Klerkx (Knowledge, Technology, and Innovation group, Wageningen University and Research)*

Literature on mission-oriented innovation policy and mission-oriented innovation systems has highlighted the necessity of directionality when it comes to achieving transitions to more sustainable modes of production and consumption. Directionality is created by actors across the value chain and the wider network in attempts to shape transition pathways. Simultaneously, literature on diversity in transitions has stressed the need of keeping diverse directions open while warning for early lock-ins and path dependencies. Like directionality, diversity is also created by innovation system actors in order to tackle the complex and uncertain nature of sustainability transitions. We aim to show how socio-technological processes are shaped by differing dynamics across scales that result in a complex constellation of diversity and directionality in a mission-oriented innovation system. Our empirical focus is the plant-based protein innovation system centered around Wageningen - a food research hotspot in The Netherlands. We conduct a qualitative single-case study of the Wageningen alternative protein innovation system by means of 35 semi-structured interviews in order to provide insights into the types of socio-technological trajectories actors are pursuing in alternative proteins and how different selection environments shape each solution trajectory. We observe the presence of a mission exhibiting a clear direction towards (meat) substitutes. Yet underlying this mission, significant diversity is visible since several diverse search directions coexist. This is due to factors such as researchers' personal interests and competencies, networks, expected consumer preferences, and global future visions.

## Solution paths and lock-ins within the mission to a Circular Economy

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Thursday, 15th June - 15:00: (FUL-107) - Full paper presentation

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*Sanne Bours (Utrecht University), Iris Wanzenböck (Utrecht University), Vivian Tunn (Utrecht University), Marko Hekkert (Utrecht University)*

Mission-oriented innovation policies have become more prominent in addressing societal challenges. To achieve a mission, multiple different solution paths can co-exist in parallel. However, current studies lack clarity on how missions operate in environments where multiple directions, or solution paths, in different stages of development emerge and diffuse. To assess this gap in the literature, we investigate the Dutch mission to a circular plastic packaging sector, which includes three solution paths: refuse, reuse and recycle. With different solution paths emerging around a circular mission one solution can become dominant over others because of path-dependencies, thereby, creating barriers for alternatives, and becoming locked in. With this study, we aim to understand the dynamics that contribute to the dominance of one solution over others. We first identify the current stage of development of each solution path, after which we assess what lock-in types (*infrastructure and technological lock-in, institutional lock-in and behavioural lock-in*) can explain the dominance of a solution. We collected data from an event history analysis of 463 events (e.g., technological developments and policy documents) and seventeen semi-structured interviews with supply chain actors, government, and knowledge institutes to answer these questions. We build on theoretical knowledge of missions and lock-ins for the initial coding. Then, through open coding, we identify the lock-in characteristics creating barriers for alternative solutions. Results show recycling is the dominant solution path in all three lock-in types. First, regarding the *infrastructure and technological lock-in*, we find that historical decisions for technology and infrastructure create network dependencies, high switching costs and resistance to change for recycling compared to other strategies. Second, recycling is favoured through rigid 'government-key actor' relationships, and in measuring methods for circular progress (*institutional lock-in*). Third, a *behavioural lock-in* was observed through the reluctance of consumers and producers to transform to other strategies than recycling. The mutually reinforcing effect between the lock-in types demonstrated the systemic nature of the recycling lock-in and the barriers hindering the emergence and diffusion of other strategies. This also highlights a lack of destabilizing effects of alternative innovations, and the rigidity of strong, core regime elements.

## **4.1 Public engagement through art and grand challenges**

## Science communication through art and scientific impact

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Thursday, 15th June - 15:00: (FUL-203) - Full paper presentation

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*Joaquín M. Azagra-Caro (INGENIO (CSIC-UPV)), Vincenzo Pavone (Institute of Public Goods and Policies (IPP), CSIC)*

Science communication is important to raise public awareness of science. There are two types of science communication: public outreach and public engagement. Public outreach implies that researchers include scientific contents in their artistic work and public engagement that they exchange scientific knowledge with art stakeholders. The former is unilateral, whereas the latter is bilateral and thus implies a higher degree of commitment of researchers with the public. One channel of science communication is art. However, some institutional ambivalence may shape involvement in science communication as a deviance from the academic norm of achieving scientific impact. Scientific impact is the repercussion of researchers' scientific work on later scientific works. Deviance theories, particularly labelling and stigma theories, suggest that researchers focused on scientific impact will be less involved in science communication, especially in public engagement, which deviates even further than public outreach from the norm. Double standards theory suggests that privileged researchers (those who have already achieved scientific impact) may have wider opportunities to be involved in science communication. The analysis of responses to a survey of some 2,500 Spanish artistic researchers supports these claims. Public outreach through art is more frequent than public engagement through art. The effect of scientific impact on public outreach through art is initially negative and then positive after a threshold, which confirms polarisation among artistic researchers. The effect of scientific impact on public engagement is always negative, indicating the difficulties of a deeper commitment of researchers with the public. Striking a good science-art balance inhibits these relationships, so the recommendation is to use the existing margin to increase incentives for science communication without affecting scientific impact.

## **The Bad Bugs Bookclub: a long-running public engagement project using fiction to encourage discussion around infectious disease**

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Thursday, 15th June - 15:00: (FUL-203) - Full paper presentation

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*Joanna Verran (Manchester Metropolitan University)*

The Bad Bugs Bookclub (<https://www.mmu.ac.uk/engage/what-we-do/bad-bugs-bookclub/>) was set up by the author in 2009 with the aim of encouraging scientists and non-scientists to read and discuss novels of fiction in which infectious disease formed part of the plot. It began as a public engagement initiative, but over time has developed into a fascinating long-term learning project, where both scientists and non-scientists have benefited from the interactions. Fourteen years and almost 100 books on, the bookclub continues apace. Various themes have emerged from the discussions, enabling research projects and collaborations across disciplines. The bookclub went online during the pandemic, which increased national and international membership, enabled author attendance on occasion, and provided significant support for members as we discussed novels where protagonist experiences could be applied to our own during different stages of the pandemic. A survey revealed that 'old' and 'new' members enjoyed the online meeting format; 'older' members preferred it and appreciated the more diverse inputs that the new members brought (more non-scientists). Members were asked about memorable meetings/best books. The variety of best books was diverse, reflecting reader interest, and author attendance was regarded as a very special bonus. They also appreciated the planning and hosting of the bookclub, as well as the learning and camaraderie that was evident. The bookclub will continue to meet online; members felt that the supply of appropriate novels was not yet exhausted!

## Embracing Art and Technology Transfer: Pathways for Universities to Address Climate Change

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Thursday, 15th June - 15:00: (FUL-203) - Full paper presentation

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*Iciar Dominguez Lacasa (Technical University of Applied Sciences Wildau), Dana Mietzner (Technical University of Applied Sciences Wildau)*

Coping with climate change and mitigating its impact is a complex societal challenge that requires the development and diffusion of various types of innovations and fundamental changes in societal practices. These include not only rethinking production processes but also the way individuals and communities do things. Universities play a pivotal role in the creation and dissemination of knowledge. Art can unlock new ways of seeing and invite questioning the world around us. This research contribution presents an extensive literature review to study the potential of art and university technology transfer in involving civil society to address climate change. Based on the preliminary findings from the literature review, six theoretical modes of interaction between universities, art, and civil society have been identified: “Artistic research at universities,” “Art-science collaboration,” “Art-based research,” “Artistic Scientists,” “Art-based Responsible Research and Innovation,” and “Art-based Science Communication.” Additionally, the paper presents project examples illustrating different modes of interaction between universities, art, and society concerning climate change. Drawing from the literature review and from the description of the selected projects, the paper presents preliminary findings and conclusions. Beyond the theoretical models derived from the literature review, in terms of impact, our findings suggests that universities should consider not only traditional channels of science and technology transfer, such as patents, publications, or collaborative research with industry stakeholders but also explore the inclusion of art (with its diverse manifestations) already in early stages of university research projects. Given the complexity of climate change-related problems, the institutional barriers for transformation processes and, most importantly, the different outcomes that art practices can yield to, assessing the impact of art-science-society interactions may require moving beyond quantifying the outputs of this interaction. Instead, impact assessment could involve evaluating the extent to which experimentation with art-based research formats and art-science-society collaboration is taking place within university or how it is organized in its different forms. The paper proposes a research agenda for studying the interactions between art and science in university knowledge and technology transfer to address climate change.

## **4.2 Fiction, Science and Impact**

## Are scientists heroes or villains? The fascinating case of DC and Marvel superheroes comics

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Thursday, 15th June - 16:30: (FUL-203) - Full paper presentation

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*Alessandro Muscio (University of Foggia), Matteo Farinella (-)*

The acceptability of scientific discoveries among the public is a key concern for scientists. Recent events such as the Covid-19 pandemic have just evidenced, once again, how widespread is the public mistrust in science. The stereotype of the mad scientist, completely dedicated to her/his research but emotionally unstable and inclined to evil purposes, is well known in the field of scientific communication. Yet, this stereotype is so pervasive that it seems to have insinuated even apparently innocent outlets such as superhero comic books. Superhero comics, unlike other outlets, are incredibly popular, dominating even the movie industry and constantly reaching new audiences. By many scholars, they are considered *de facto* a valuable resource for communicating the value of science in popular culture. However, a glance at some popular DC and Marvel stories might raise some concern about the part played by scientists in superhero stories, questioning the public image of science they promote. In this paper, we analyse scientist characters in the DC and Marvel universes (313 identified characters among 2,459 cases), the two largest and popular superheroes publishers in the world, to investigate for the first time their connotation in comics and the characteristics associated to them. Based on econometric evidence and in line with the existing literature, we find that while comics could play a huge part in promoting the acceptability of scientific discoveries, they just perpetuate the myth of the ‘mad scientist’, undermining our scientific communication efforts.

# Generating impact from collaborations between universities and arts and culture organisations (ACOs): evidence from a survey of arts and culture professionals in the UK

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Thursday, 15th June - 16:30: (FUL-203) - Full paper presentation

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*Federica Rossi (Birkbeck, University of London), Ning Baines (University of Leicester), Evelyn Willson (National Centre for Academic and Cultural Exchange)*

Higher Education Institutions (HEIs) actively engage in supporting the cultural industries. However, establishing partnerships between HEIs and Arts and Culture Organisations (ACOs) has proved challenging. It is difficult to capture and understand the impact of these collaborations, and evidence about interactions between HEIs and ACOs, including the impact created, is mostly anecdotal and fragmented. By building on the framework of Collaborative Value Creation (CVC), this study aims to address part of this gap in research by investigating which types of HEI-ACO collaborations create impact, focusing in particular on the beneficiaries of the impact and on the role of the ACO in the collaboration. A unique and purpose-built survey was disseminated to arts and culture professionals in the UK. The empirical findings confirm the notion proposed by the CVC framework, that different types of collaborations are associated with different beneficiaries of the collaboration. Transactional collaborations generate value and benefit to a single party, i.e., the ACO, as they are the recipient of a resource from partnered HEI. On the other hand, when HEIs and ACOs engage in integrative collaborations, both parties are working together. Hence, the value and benefit generated from this type of collaboration confer to both parties. Additionally, when HEIs and ACOs take part in transformative collaborations, they generate value by achieving synergies between the parties that create external benefits. Management and policy implications are discussed.

## Towards alternative forms of knowing about societal impact: Examining researchers' emotion work in relation to the impact agenda

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Thursday, 15th June - 16:30: (FUL-203) - Full paper presentation

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*Anne Theunissen (VUB)*

While extant studies have provided valuable insights into researchers' experiences with the impact agenda, they have (apart from a few exceptions, see Watermeyer et al., 2022) largely ignored researchers' emotions. However, we know from organization studies that emotion helps us to better understand how organizational processes (such as the implementation of the impact agenda) function (Hochschild, 1990), as 'organizational procedures and processes are shaped, negotiated, rejected, reformed, fought over or celebrated, because of feelings' (Fineman, 2003: 1). Relying on interviews and focus groups with researchers of a Belgian university and on the concept of emotion work, this research explores how researchers shape their relation with the impact agenda through emotion work. Emotion work is defined here as 'self-reflexive engagement with or adaptation of emotions that aims at authenticity' (Hibbert et al., 2022: 799) in response to the 'structural and ideological pressures' (Hibbert et al., 2022: 799) in organizations. The findings reveal three types of emotion work: 1) researchers' supporting the impact agenda in line with their *passion* to change society for the better, 2) researchers criticizing the impact agenda in line with their feelings of being *misrecognised* by the impact agenda in their societal impact practices, and 3) researchers criticizing the impact agenda in line with their feelings of being *attacked* by the impact agenda in their researcher identity. This article contributes to the societal impact literature by illustrating how researchers' support of the impact agenda may depend on the extent to which it allows them to sustain their authentic selves, and provides recommendations for practice, by revealing how researchers' emotions in relation to the impact agenda may provide clues about how to further finetune its implementation.

# **5.1 Cities and regions in transformation: anchoring the logic of transformative innovation policy in sub-national context**

## **All the same but yet different? An attempt to conceptualize sub-national missions**

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Wednesday, 14th June - 09:00: (FUL-203) - Full paper presentation

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*Florian Wittmann (Fraunhofer Institute for Systems and Innovation Research ISI), Andrea Zenker (Fraunhofer Institute for Systems and Innovation Research ISI), Thomas Stahlecker (Fraunhofer Institute for Systems and Innovation Research ISI), Ralf Lindner (Fraunhofer Institute for Systems and Innovation Research ISI)*

There is an increasing variety of missions that can be observed at different institutional levels. This paper focuses on the role of sub-national missions, trying to juxtapose mission-oriented approaches there with “classical” national level missions. Thereby we argue that sub-national missions differ considerably from missions at the national level, among others with regard to the main type of innovation, actor constellations but also potential processes. In a second step we introduce a further differentiation within sub-national mission, pointing to the need to distinguish between top-down and bottom-up driven approaches.

## How actors transform healthcare: combining evolutionary and institutional perspectives on practice

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Wednesday, 14th June - 09:00: (FUL-203) - Full paper presentation

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*Stefan Philipp (ZSI Centre for Social Innovation), Anestis Amanatidis (CWTS, University of Leiden)*

Innovation is expected to ease the pressures that aging populations put on healthcare systems. However, healthcare innovations often fail. To understand why innovations fail, the opportunities and constraints of actors aiming to transform healthcare practices need to be understood. The paper compares the health and care development paths of Murcia (ES) and Örebro (SE) with a micro-perspective on agency, combining evolutionary and institutional approaches. It illustrates the dynamics of the agency-practice-structure relation and how actors aim to modify structural barriers for future practice. Finally, it discusses the implications of this relation for regional development and healthcare policy.

## **5.2 Cities and regions in transformation: anchoring the logic of transformative innovation policy in sub-national context**

## **Inward innovative FDI and the knowledge sources of regional Industry 4.0: Evidence from the EU**

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Wednesday, 14th June - 13:45: (FUL-203) - Full paper presentation

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*Michela Bello (European Commission, JRC Ispra), Davide Castellani (University of Reading), Giacomo Damioli (University of Bremen), Giovanni Marin (University of Urbino Carlo Bo), Sandro Montresor (Gran Sasso Science Institute)*

This paper investigates the extent to which inward innovative FDI can contribute to regions' Industry 4.0 by enabling them to globally source the relevant technological knowledge. By contributing to recent research on regional Industrial 4.0, we maintain that incoming MNCs enable regions to access knowledge generated abroad that is useful for the local development of digital inventions. Using citation data about Industry 4.0 patent applications in EU regions and data about greenfield innovative FDI that reach them, we estimate a gravity model that supports this argument. The knowledge base of Industry 4.0 technologies developed in EU (NUTS 3) regions positively correlates with the FDI at stake, but the result is driven by those originating outside the EU. These findings are consistent with the relative weakness of the EU in the development of Industry 4.0 technologies and suggest that place-based FDI policies could help EU regions to overcome this gap.

## How the national level supports local implementation of mission-orientated policies – A multi-level governance perspective

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Wednesday, 14th June - 13:45: (FUL-203) - Full paper presentation

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*Gu~~drun~~ Haindlmaier (University of Vienna), Katja Lamprecht (AIT Austrian Institute of Technology), Pia Weinlinger (AIT Austrian Institute of Technology)*

Missions such as the “climate neutral and smart city mission” are directed towards tackling grand societal challenges. These challenges point to the need of systemic societal transformation not only technologically but also institutionally and behaviorally (Wanzenböck, et al. 2020; Mazzucato, 2018). This is recognized most prominently in the sustainability transitions literature (Geels, 2004; Geels & Schot, 2010; Rotmans et al. 2001) which, over the last decades, has shed light on underlying dynamics and leverage points for fundamental societal changes. This paper draws upon three important starting points from literature, namely (1) Transformative changes are taking place in complex adaptive systems and are therefore characterised as multi-actor processes (Köhler et al., 2019). The complexity of such change dynamics implies that they cannot be maneuvered by means of direct control by a single actor but require more distributed and decentralized governance structures and processes (Kuhlmann & Rip, 2018). (2) The role of democratically legitimized public authorities and public policy at large is key in creating the institutional framework conditions for the emergence, acceleration, and ultimately, the establishment of more sustainable systems (Johnstone & Newell, 2018) and (3) Public actors need innovative governance, policy and urban management models if they want to advance transformations because they need to challenge entrenched structures, bring in important new actors and support the accelerated diffusion of new practices (Matschoss & Repo, 2018). Consequently, this paper focuses on the Horizon Europe Mission to supporting 100 cities to become climate neutral and smart by 2030 and draws upon empirical work conducted in the frame of two ongoing EU projects, namely TRAMI and CapaCITIES by discussing the main research questions: How to shape a European environment conducive to urban climate neutrality transitions for national, regional and local authorities? How are national change processes and platforms/networks initiated and how can they support local public authorities to put enabling conditions and measures for cities in place to achieve the mission? Are there new governance structures in place for mission implementation and what are their characteristics? Do intervention portfolios differ across different countries?

## **Diversification and Multilevel Policy Supports as Enablers of Specialization in Green Technologies at EU regional level**

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Wednesday, 14th June - 13:45: (FUL-203) - Full paper presentation

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*Zhuoying You (KU Leuven), Peter Teirlinck (KU Leuven)*

This paper focuses on the influence of related and unrelated diversification on the intensification of specialization and on new specialization in climate change mitigation technologies at the regional level in Europe. The intensification of specialization in climate technologies is more linked to an exploitation process, whereas the emergence of new specialization is paralleled by a process of exploration. In addition, we investigate the moderating role of policy support from the regional, national, and EU regime. Based on fixed effect estimators on OECD REGPAT patent data targeting on Y02 technology system in 203 NUTS2 regions, we confirm the positive effect of related diversification on the intensification of specialization side and demonstrate a weakening effect of national policy support. For the emergence of new specialization, we reveal a positive role of unrelated diversification, and a negative moderating effect from the stringency of national environmental tax, while policy support from the local dominant political party exerts a positive and direct effect.

## **5.3 Cities and regions in transformation: anchoring the logic of transformative innovation policy in sub-national context**

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## Local Capabilities for Empowering Public and Private Sector in Transformative Innovation Policy

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Wednesday, 14th June - 15:45: (FUL-203) - Full paper presentation

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*Markus Bugge (TIK Center, University of Oslo), Julia Winslow (Western Norway University of Applied Sciences)*

More transformative forms of governance and innovation policy are needed to address problems of directionality, demand articulation, policy coordination and reflexivity within contemporary societal challenges (Weber and Rohrer 2012; Schot and Steinmueller 2018). So far most of the transformative innovation policy (TIP) literature has been dedicated towards agenda setting without accounts of practical implementation, and its relevance for policymakers is therefore considered limited (Haddad et al., 2022). Thus, there is a need for more detailed empirical accounts of how TIP plays out in practice (Borrás and Edler 2020; Bergek, Hellsmark, and Karltorp 2023). Against this background, the aim for this paper is to contribute to the TIP literature with an empirical account of transformative processes underway in the waste sector within a particular city-region. Through a case study of the waste sector in the city region of Bergen, Norway, the paper illustrates how a twin transition may look like in practice; i.e. how digitalisation enables the development of new sustainable value chains and circular business models. Adding data to waste along with identification of the consumer causes new financial incentives for increased recycling and waste minimization (European Commission 2008). Conceptually the paper discusses the role of public-private collaborations in transformative innovation policies. In particular, the paper puts emphasis on the institutional arrangements and capabilities that have enabled the collaboration across public and private sector towards transformative change. By applying the notion of 'bureaucratic autonomy' from political science we discuss the relationship between governmental direction setting on the one hand (autonomy of will), and the capacity to transform these strategies into action (autonomy of action). The paper finds that in order to enable both autonomy of will and autonomy of action, a key feature is to allow a hybrid approach across public and private domains to develop new sustainable services and circular value chains. As such the paper exemplifies how the governance of TIP could balance and include various types of actors with their respective innovative capabilities, and that such an integrated working mode seems necessary when faced with complex societal transitions such as that of enabling the circular economy.

# The Transformative Capacity of Municipalities in Sustainability Transitions: Implementing Climate Actions

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Wednesday, 14th June - 15:45: (FUL-203) - Full paper presentation

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*Susana Borrás (Copenhagen Business School), Henrik Larsen (Copenhagen Business School), Susanna Kugelberg (Copenhagen Business School), Francesco Gerli (Copenhagen Business School)*

This paper investigates the transformative capacity of municipalities when implementing ambitious local climate plans. The paper argues that the transformation of socio-technical systems towards sustainability is a process, and the municipality's capacity to implement climate actions is a fundamental aspect to analyze if sustainability is to be accelerated. The paper builds a conceptual framework of transformative capacity at the municipality-organisational level by synthesizing the literature on public administration, sustainability transition studies, and dynamic capabilities. Three constitutive elements of transformative capacity are identified, namely, the enactment of various directional roles of public sector organizations, the availability of resources, and the practices/routines/procedures in form of dynamic capabilities. Following a most-similar comparative method, this paper conducts a qualitative analysis of three municipalities in Denmark (Køge, Middelfart and Aarhus), studying their current implementation of climate actions in the energy sector, more concretely, their efforts of scaling up solar panels. The results show that the three municipalities exercise different approaches to their change agency, with variation in the way they are building transformative capacity. Our results show as well that previous historical experience is key for moving boldly and quickly ahead, and that deficiencies in human resources and technical knowledge/data are a real hindrance even with strong financial and physical resources. Municipalities chose specific courses of action navigating through these constraints, maximizing the available resources, devising processes on an experimental manner, and informally 'learning from others' across municipality networks. The paper contributes to the literature bringing forward clues for understanding variation across municipalities' organizational efforts to build transformative capacity in their implementation of climate plans for accelerating socio-technical transformation of the energy sector.

## **Contributions of Citizen Innovation Experiments to Sustainability Transitions: Kitchen community project of the Labic Novale**

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Wednesday, 14th June - 15:45: (FUL-203) - Full paper presentation

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*Diego Hernando Florez Ayala (Universidade do Vale do Itajaí), Anete Alberton (Universidade do Vale do Itajaí)*

Cities are now recognized as crucial for sustainable development, economic growth, innovation, and social cohesion. To achieve this, citizen involvement in designing and testing sustainable solutions, such as product reuse, consumption reduction, and material recycling, is becoming more common. Public-private collaborations are also helping connect communities, and Urban Living Labs (ULLs) are emerging as important drivers of sustainability transitions. ULLs can turn Citizen Innovation Experiments into successful sustainability initiatives by bringing together different users, funding, and resources. In our research, we explore how the ULL methodology contribute to the sustainable transformation of an innovative city system based to provide a bottom up perspective towards urban sustainability solutions. We used a case study about a citizen innovation experiment of a kitchen community project of the Labic Novale in Jaragua do Sul, Brazil. The project is called ‘the Kitchen to connect program’ which is a social program that aims to connect the formalization of micro and small food producers. The paper has been informed by multiple sources such as observations, documents, interviews, and videos of the project. We concluded that the citizen innovation program of ULLs can inspire and connect communities to prototype solutions through societal transformation, urban governance, and transformative place-making, contributing to the shift towards a Circular Economy perspective.

## **5.4 Cities and regions in transformation: anchoring the logic of transformative innovation policy in sub-national context**

## Forging new pathways of sustainable development in resource-dependent less developed regions.

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Thursday, 15th June - 09:00: (FUL-203) - Full paper presentation

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*Matias Ramirez (University of Sussex), Claudia Obando (University of Sussex)*

This paper studies the evidence for and prospects of diversification of regions in the global south that have traditionally been dependent on mining non-renewable activities towards more environmentally sustainable economic activity. We focus our study in Colombia, where divestments from regions highly dependent on fossil fuels - coal and oil – for employment and generation of income is a strategic imperative as the demand and foreign revenue from fossil fuel extraction declines. However, divestment from these sectors implies a profound economic restructuring and challenging undertaking. Mining regions in Colombia historically have low technological and infrastructure endowments, as well as poor entrepreneurial capabilities. We address this question by adopting a spatial analysis and engaging with recent debates on related and unrelated diversity. This approach to regional innovation has focused on how the development of common intra-regional routines by firms and local institutions facilitate joint learning, innovation agglomeration economies. We will argue that unrelated variety this approach has potential to help understand the development of new more sustainable pathways of regional development. However, doing so requires an understanding of “the process” by diversification happens, which is an area less emphasized by this literature. This is particularly the case in the global south, for, as will be argued and shown, some of the conventional measures of diversity may not be adequate at capturing processes of diversification taking place, particularly in their early embryonic stages when new pathways are forged. We addresses some of these complexities by adopting a mixed method that combines the traditional quantitative analysis of regions with a qualitative study of the processes of change in a region of Colombia heavily dependent on mining. Our main argument, followed throughout the paper, will be that the sustainability agenda is a much more socially constructed process that involves forging new networks with different types of actors and policy making approaches. A “relational analysis” is necessary that embraces the complexity of spatial economic unevenness and eschews crude solutions that are unlikely to be effective.

## **Levelling up through Public-Funded R&D and Collaboration? Do UK research and Collaboration in R&I promote Economic Prosperity and Levelling-up? An analysis of UKRI funding between 2004-2021**

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Thursday, 15th June - 09:00: (FUL-203) - Full paper presentation

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*Raquel Ortega-Argiles (Alliance Manchester Business School), Pei-Yu Yuan (Birmingham Business School)*

Public funding for research and innovation (R&I) has played a crucial role in driving economic prosperity and development. R&I funding not only aims to achieve research excellence but also encourages the establishment of research partnerships to leverage the benefits of supporting R&I in a multidisciplinary context. These partnerships can facilitate complementarities between public and private sectors and help to achieve a more balanced spatial distribution of public research funding. Moreover, R&I partnerships can promote local innovation and research, contributing to more spatially balanced economic growth. This paper analysed the UK Research and Innovation (UKRI) funded projects repository between 2004 and May 2021 and other official data sources to explore the potential of public funding in promoting levelling-up in the UK. The dataset contains 25,122 projects and 44,406 participants. The analysis focuses on the role of public-funded collaborative research and development (R&D), feasibility, smart and innovation voucher grants, and Knowledge Transfer Partnerships in 41 UK NUTS2 regions. Social network analysis techniques are used to identify the spatial patterns of spending distribution over time and the changes in the spatial distribution of R&I partnership collaboration, including the geographical composition. Our analysis reveals that the private sector receives 80% of funds and often leads multi-participant projects. At NUTS1 level, London and the South-East received 46% of grants between 2014 and 2021, with Inner London West and Inner London East as top NUTS2 recipients. Collaborative R&D funding accounted for almost half of funded projects, but London and the South East remained the top recipients, suggesting an imbalanced R&I distribution. Moreover, UKRI has yet to contribute to the levelling-up of R&I funds, with London and the South East seeing a continuous increase in UKRI projects at the expense of other regions. Mediation analysis results show that public-funded R&D and interregional and intraregional R&I UKRI collaboration contribute to explaining regional economic development in the UK, and these effects are mediated by the role of regional business R&D. Our results, however, do not indicate that there is any relationship between public-funded R&D collaboration and levelling-up on regional economic convergence.

**5.5 Cities and regions in  
transformation:  
anchoring the logic of  
transformative  
innovation policy in  
sub-national context**

# The Role of Proximity in Government-Funded R&D Collaboration: A Comparison of Region-specific and Nationwide Projects in Major Scientific Program in China

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Thursday, 15th June - 10:50: (FUL-203) - Speed Talk

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*Yongyuan Huang (University of Sussex)*

Government-funded R&D collaboration is a crucial approach for sharing knowledge and organizing collective intelligence to address societal problems and challenges. However, most societal problems and challenges are contextual and localized, which adds complexity to coordinating and organizing potential actors to mobilize resources for problem-solving. Drawing upon the proximity framework, this paper investigates the mechanisms of R&D collaboration induced by public funding among actors and the extent to which these mechanisms are affected by the contextual nature of societal problems. More specifically, this article examines how the role of multiple forms of proximity in fostering R&D collaboration is influenced by the contextual nature of R&D projects. We develop a unique dataset that documents R&D project information and their collaboration networks based on a scientific program related to water pollution treatment and control in China. Based on this, we distinguish between two types of projects: those addressing region-specific problems and those targeting nationwide problems. We compare the impact of geographical proximity, organizational proximity, vertical institutional proximity, and horizontal institutional proximity on the likelihood of collaboration formation between potential collaborators through econometric models. Our findings indicate that for nationwide projects, the roles of geographical and organizational proximity are not significant, while for region-specific projects, both types of proximity are important. Institutional proximity, both vertical and horizontal, is crucial for both types of projects. Robustness checks demonstrate that our baseline results are robust. Lastly, our findings can provide policy implications for developing partnership-based R&D projects targeting societal problems and challenges.

## **Transformative, open innovation in practice: a case study of the Designing London's Recovery Programme**

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Thursday, 15th June - 10:50: (FUL-203) - Speed Talk

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*Julie McLaren (University College London), Gemma Moore (University College London)*

Complex challenges, such as sustainability and health inequalities, require a transformation of wider systems contexts. There has been a reorientation of innovation policy and practice towards more transformative frames which focus on shifting systems to meet such challenges. However, there are gaps in understanding around the implementation of mission-orientated and other transformative policies. For instance, there is a need to understand how state actors at local scales are experimenting with and adapting to these new approaches, whilst using the levers available to them. In this article we share our experiences of undertaking participatory action research, being part of the delivery of an open innovation challenge programme in London - Designing London's Recovery Programme – which was aimed at transformative systems change against selected missions in the London Recovery Programme. Our reflections point to the value of learning and reflection in experiments like this one, but also the challenges of shaping and maintaining a coherent framing around transformation and systems change within (and during) the programme implementation. We conclude that a full shift towards transformative innovation will not fully materialise without a wider shift in the practices of policy design, implementation and evaluation.

## Universities in Less Developed Regions: Analyzing their Local Research Impact

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Thursday, 15th June - 10:50: (FUL-203) - Speed Talk

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*Michalis Papazoglou (University of the Aegean), Theodoros Daglis (University of the Aegean), Anastasia (Natasha) Constantelou (University of the Aegean), Dimosthenis Drivaliaris (University of the Aegean), Evangelos Vassiliou (University of the Aegean)*

It is not uncommon to encounter overoptimistic views among policy-makers concerning the extent to which the research outcome of a university can have an impact on the innovation and economic performance of the local economy. Policies and expectations are usually determined by copying optimal cases of top-ranked universities in highly innovative geographies. However, most universities do not function in such contexts, but in regions of weak innovation and economic development, often characterized as Less Developed Regions (LDRs). Making an effort to enrich our understanding of the contribution of universities to local economies in LDRs, this study attempts to provide insights into the local research impact of a university (i.e., the University of the Aegean) located within an LDR (i.e., North and South Aegean, Greece) by analysing bibliometric data. Findings show that although the university's research output grows, there is hardly any evidence of an impact on local organizations, suggesting that the expected universities' roles and the related innovation policies should be formed, to a significant degree, based on the characteristics of the place within which they function.

# **6.1 Prioritising science, technology, and innovation that address diverse societal challenges**

## Knowledge spillovers from HIV research-funding

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Wednesday, 14th June - 09:00: (JUB-118) - Speed Talk

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*Ohid Yaqub (SPRU, University of Sussex), Josie Coburn (SPRU - Sussex), Duncan Moore (SPRU, University of Sussex)*

HIV/AIDS has been a major focus for research funders. The US National Institutes of Health (NIH) alone has spent over \$70bn on HIV/AIDS. Such investments ushered in antiviral drugs, helping to reverse a rapidly growing HIV/AIDS pandemic. However, the idea that research can deliver unexpected benefits beyond its targeted field, in fact, predates HIV/AIDS to at least Vannevar Bush's influential 1945 report. Cross-disease spillovers – research investments that yield benefits beyond the target disease – remains unexplored, even though it could inform both priority-setting and calculations of returns on research investments. To this end, we took a sample of NIH's HIV grants and examined their publications. We analyzed 118,493 publications and found that 62% of these were spillovers. We used Medical Subject Headings (MeSH) terms assigned to publications to explore the content of these spillovers, as well as to corroborate non-spillovers. We located spillovers on a network of MeSH co-occurrence, drawn from the broader universe of medical publications, for comparison. We found that HIV spillovers were unevenly distributed across disease-space, and often in close proximity to HIV, which, when discounted, reduced our spillovers estimate to 40%. We further reviewed 1,000 grant–publication pairs from a local sample and 1,000 pairs from a remote sample. For local spillovers, a quarter seemed to be unexpected, on the basis of on their grant description; for remote spillovers, that proportion increased to one third. We also found that the NIH funding institutes whose remits were most closely related to HIV/AIDS were less likely to produce spillovers than others. We discuss implications for theory and policy.

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## Cross-category spillovers in medical research

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Wednesday, 14th June - 09:00: (JUB-118) - Full paper presentation

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*Yasemin Aslan (SPRU, University of Sussex), Ohid Yaqub (SPRU, University of Sussex), Daniele Rotolo (SPRU, University of Sussex), Bhaven N. Sampat (NBER and Columbia University)*

Whether research funding is targetable is one of the central unresolved questions of science policy. A particular question is how often research aimed at understanding one disease or problem spills over to others. This has been a perennial topic of debate at the world's largest single funding body of biomedical research, the U.S. National Institutes of Health (NIH). Critics of the agency's priority-setting process have repeatedly called for better alignment between funding and disease burden, and patient advocates for specific diseases for more funding for their causes. In response, opponents of planning have argued that research in one area frequently leads to advances in others. In this paper, we provide new evidence to inform these debates by examining the extent to which research funding (grants) in one scientific or disease area leads to research findings (publications) in another. We used the NIH's Research, Condition, and Disease Categorization (RCDC) to identify categories for NIH grants awarded between 2008 and 2016. We applied machine-learning to map text to these categories and use this model to categorize publications resulting from these grants. We categorized over 1.2 million publications, resulting from over 90,000 grants. We found that 70% of the publications have at least one RCDC category not in its grant, which we termed "unexpected" categories. On average, 40% of categories assigned to a publication were unexpected. After adjusting for similarity across some of the RCDC categories by empirically clustering the categories, we found 58% of the publications had at least one unexpected category and, on average, 33% of publication categories were unexpected. Our results suggest that disease-orientation and clinical research were less likely to be associated with spillovers. Grants resulting from targeted requests for applications were more likely to result in publications with unexpected categories, though the magnitude of the differences was relatively small.

# Averting the antimicrobial apocalypse: a diagnostic analysis of the UK's antibacterial innovation system within a global context

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Wednesday, 14th June - 09:00: (JUB-118) - Full paper presentation

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*Adrian Ely (SPRU, University of Sussex), Alexander Ghionis (University of Sussex), Duncan Moore (SPRU, University of Sussex), Adina Lalu (SPRU, University of Sussex), Andrea Perez (University of Sussex), Deepak John (Technopolis Ltd.), Michael Hopkins (University of Sussex)*

Antibiotics to treat and prevent infection underpin modern medicine and save millions of lives per year globally. However, the emergence and spread of resistance among microorganisms such as bacteria is undermining effectiveness. A recent estimate suggested that almost 5 million deaths globally were associated with bacterial antimicrobial resistance in 2019 (Murray et al, 2022). This figure has been forecast to rise to 10 million per year by 2050 (O'Neill, 2014). The development of new antibiotics is one part of the solution to this global challenge. This article explores different aspects of antibacterial innovation in the UK, analysing the national context within a global innovation system. Adapting the structural-functional approach to innovation systems analysis (Hekkert et al 2007; Wieczorek & Hekkert 2012) and exploring notions of mission-oriented innovation systems (Wesseling & Meijerhof 2020), we present quantitative and qualitative data on seven different aspects of antibacterial innovation in the UK. We identify several limitations of the UK innovation system in this area, in particular declining indicators of key system functions, and the need for a more coordinated approach. We draw on qualitative data to explain how various innovation activities link to national or international efforts elsewhere. In so doing, we emphasize the importance of structural couplings within a global innovation system (Binz and Truffer 2017). These international links are important in understanding how the UK can contribute to this global challenge even with some deteriorating system functions. UK has played a leading role in international efforts to address antimicrobial resistance (AMR) through science policy and diplomacy. Domestic efforts in scientific research, and pioneering new reimbursement models that better recognises the value of new antibacterial drugs, work as part of combined international efforts. While highlighting the UK's contributions to an international effort through its capabilities and structural couplings, we argue that a range of indicators need to be monitored and greater coordination is needed to drive impact and avert what stakeholders have termed the 'antimicrobial apocalypse'.

## **6.2 Prioritising science, technology, and innovation that address diverse societal challenges**

## Tracing causal mechanisms for the impact of societally targeted funding

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Wednesday, 14th June - 13:45: (JUB-118) - Full paper presentation

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*Carter Bloch (Danish Centre for Studies in Research and Research Policy, Department of Political Science, Aarhus University), Rikke E. Povlsen (Danish Centre for Studies in Research and Research Policy, Department of Political Science, Aarhus University), Mette L. Falkenberg (Danish Centre for Studies in Research and Research Policy, Department of Political Science, Aarhus University), Irene Ramos-Vielba (Danish Centre for Studies in Research and Research Policy, Department of Political Science, Aarhus University), Duncan A. Thomas (Aarhus University), Andreas K. Stage (Danish Centre for Studies in Research and Research Policy, Department of Political Science, Aarhus University)*

Drawing on two in-depth cases of research projects that have received societally targeted funding and appear to have involved highly intensive academic/non-academic engagements, this study examines processes and mechanisms leading from research funding towards societal impact. We trace causal linkages from the specific research funding to the actual or potential societal impact of the research they fund. Using process-tracing, we aim to explore how societally targeted funding and its specific characteristics can be linked to impact, with particular focus on collaboration/productive interactions. Through interviews and document analysis, we trace how the funding shaped the research project and how research was conducted, and subsequently how the project design promoted the development of societally relevant research results.

# Challenges in interdisciplinary challenge-oriented research: learnings from the evaluation of the Global Challenges Research Fund

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Wednesday, 14th June - 13:45: (JUB-118) - Full paper presentation

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*Mann Virdee (RAND Europe), Susan Guthrie (RAND Europe), Cagla Stevenson (RAND Europe), Joe Francombe (RAND Europe)*

The Global Challenges Research Fund (GCRF) is a five-year £1.5 billion fund that aims to support cutting-edge research to address the challenges faced by low- and middle-income countries. It aims to ensure that UK research takes a leading role in addressing the challenges faced by developing countries whilst also developing the UK's ability to deliver cutting-edge research and innovation for sustainable development. GCRF is managed by the Department for Science, Innovation and Technology and implemented across several of the UK's research and innovation funders. Our evaluation of GCRF is ongoing and has taken a multimethod approach including rubrics-based assessment of value for money; detailed analysis of a sample of signature programmes and how they operate; as well as detailed analysis of key underlying aspects such as the relevance and coherence of the programme, its management structures, and how it addresses aspects such as gender, poverty, and social inclusion. Our view so far is of a complex fund with ambitious aims to deliver challenge-led, multi and interdisciplinary research to address global challenges with a development focus. Implementing this has been challenging, and though learnings are complexed and nuanced depending on context, there are some cross-cutting observations around the needs and determinants of success in delivery of research to address global challenges on this scale. In particular, our work so far highlights the needs for capacity building in the UK as well as other countries to be able to do this work well, sensitively and effectively; the need for sustained investment of resources and particularly time into partnership development and meaningful collaboration; the potential benefits of cohort building and networks; and the importance of portfolio oversight and management to realise benefits that are more than just a series of discrete investments. In this paper, we share key learnings, examples of good practice and challenges faced both in delivery and evaluation of a fund of this scale.

## **Combining excellence and societal impact in research assessment: Do change agent qualities make a difference?**

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Wednesday, 14th June - 13:45: (JUB-118) - Full paper presentation

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*Hendrik Berghaeuser (Fraunhofer Institute for Systems and Innovation Research ISI)*

Research funders are increasingly faced with the challenge to design funding programs generating both scientific and societal impact, which in turn places new demands on research assessment processes. Using a case study of a German research funding program targeting scientists from the global south, this paper examines how different funding goals and selection criteria - in this case research excellence on the one hand and social or development relevance on the other - can be combined in research assessment. One possible selection criterion for this appears to be change agent characteristics among the applicants. The analysis shows that funded research fellows do indeed have much stronger change agent attitudes than scientists in the non-funded control group. Differences with regard to concrete change agent activities, on the other hand, cannot be determined. All in all, change agent characteristics represent a promising element for research assessment procedures, but the selection criterion suffers from an insufficient definition and conception, especially for the science sector.

## **6.3 Prioritising science, technology, and innovation that address diverse societal challenges**

## Contributions to conceptualize and measure Equity, Diversity and Inclusion in R&D

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Wednesday, 14th June - 15:45: (JUB-118) - Full paper presentation

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*Yohanna Juk (University of Campinas (Unicamp)), Karen E F Pinto (University of Campinas - Unicamp), Evandro Coggo (University of Campinas (Unicamp)), Sergio Salles-Filho (University of Campinas (Unicamp)), Vanessa Avanci (InSySPo - Unicamp), Gabriela Araujo Tetzner (University of Campinas (Unicamp)), Emily Campgnolli (University of Campinas (Unicamp))*

Recent events have reinforced the so-called 'impact agenda' and the need to generate research impact assessments and metrics. In addition, debates about the various forms of inequality observed in knowledge production and dissemination dynamics have become increasingly relevant. Although some initiatives point to the need to consider Equality, Diversity, and Inclusion (EDI) in research practices and activities, a framework or proper metrics are necessary to assess these elements. Despite being a topic of interest among scientific organizations and funding agencies, a gap exists between rhetoric and action, affecting the development of indicators that address EDI and narrowing this discussion to narratives, principles, and best practices. Through a brief literature review and bibliometric analysis, this research in progress aims to investigate if other areas or already established approaches can contribute with examples of metrics for evaluating EDI. For that, we consider external sources of indicators and experiences for United Nations Sustainable Development Goals (SDGs) and the environmental, social and governance (ESG) to be a good starting point to advance in this discussion. Our preliminary findings indicate that similar to the few EDI indicators, SDG and ESG indicators, when addressing 'inequalities,' still focus on gender inequalities metrics, using a binary approach (male/female). This demonstrates the existence of invisible data that is not fully addressed when we consider other variables such as ethnic origin, race, presence of people with disabilities, age, and others.

## How does SDG Related Research Differ?

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Wednesday, 14th June - 15:45: (JUB-118) - Full paper presentation

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*Tommaso Ciarli (UNU-MERIT, United Nations University), Hugo Confraria (European Commission, JRC Seville), Ed Noyons (CWTS, University of Leiden), Ismael Rafols (Centre for Science and Technology Studies, Leiden University)*

There is a growing demand for research addressing societal challenges. This paper examines the characteristics and impact of research related to the United Nations' Sustainable Development Goals (SDGs), and it aims to understand specific features of SDG-related research compared to non-SDG related research. The findings reveal that research focusing on SDGs related to people and society, such as poverty alleviation, education, gender equality, and justice, are less likely to receive funding compared to non-SDG related research. However, these publications are more likely to be cited in policy documents, indicating their relevance for public use. Furthermore, across most SDGs, SDG-related research is more likely to adopt features of open science, such as open access and interdisciplinary approaches. However, SDG related publications are generally less likely to be cited in academic publications compared to non-SDG related research, suggesting a disconnect between potentially more impactful research and academic recognition. Taken together, our results suggest some potential gaps in research funding priorities and emphasize the importance of considering the societal relevance of research alongside traditional excellence criteria.

## **6.4 Prioritising science, technology, and innovation that address diverse societal challenges**

## **Priorities of health research in India: evidence of misalignment between research outputs and disease burden**

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Thursday, 15th June - 09:00: (JUB-118) - Full paper presentation

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*Moumita Koley (Indian Institute of Science, Bangalore), Ismael Rafols (Centre for Science and Technology Studies, Leiden University), Alfredo Yegros (Centre for Science and Technology Studies, Leiden University), Avinash Kumar (Indian Institute of Science, Bangalore)*

This study examines whether India's research efforts address the country's health needs. It does so by investigating the degree of alignment between the burden of diseases in India and knowledge production in health and biomedical sciences by Indian institutions. WHO data from Global Health Estimates on Disability-Adjusted Life Years (DALYs) is used as the indicator of disease burden, and the number of publications in the Web of Science as the proxy measure of research efforts. We find that the alignment between publications and DALYs of India is much lower than in High-Income Countries (HICs) and lower than in countries such as China or Brazil. This is due to some disease areas having little research in relation to their burden, while others receive high attention in spite of low burden. For example, cardiovascular and respiratory diseases contribute to ~23% of the disease burden in India, but their publication share is ~6% of the total publications. In contrast, cancer diseases contribute to ~5 % of the burden, while their publication share is almost 25%. We discuss some of the major driving factors behind this misalignment, such as the market demand associated with the diseases prevalent in HICs, the academic prestige of certain disease areas, and funding opportunities in global health. We also explore where the misalignment is likely to be mainly due to weaknesses in healthcare delivery systems in India (e.g., in neonatal conditions), rather than a lack of research.

## **From seed to tree: how do regional market specializations in environmental innovation emerge? An analysis of EU regions**

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Thursday, 15th June - 09:00: (JUB-118) - Full paper presentation

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*Carolina Castaldi (Utrecht University), Milad Abbasiharofteh (University of Groningen), Sergio Petralia (Utrecht University)*

European regions are increasingly motivated to invest in environmental innovation, with policies supporting the development of regional smart and sustainable specializations. An extensive literature inspired by evolutionary economic geography has investigated the emergence of regional specializations in green technologies. We know much less on how regions develop specializations in green markets, where actual green products and services capture the diffusion of environmental innovation. In this study we shed light on these regional specializations by focusing on two mechanisms. First, we explain new green market specializations as stemming from existing related regional capabilities in technologies and other markets. Second, we account for green public procurement initiatives, to capture regional policy efforts directed towards market formation and green product development. Our empirical analysis focuses on European regions in the period 2000-2020. We employ original trademark-based metrics to capture specialization in green markets and links between technologies and markets. Our preliminary results reveals that only a few regions have been able to develop green market specializations, related or unrelated to green technology specializations. We find that both prior related capabilities and green public procurement are positively associated with the emergence and persistence over time of regional specializations in environmental innovation. The role of green public procurement appears less strong than prior capability development for the emergence of specializations, while the two forces are comparable when it comes to persistence.

## **6.5 Prioritising science, technology, and innovation that address diverse societal challenges**

## **Researcher perspectives on why their research changes direction: What constitutes a change in direction for biomedical researchers?**

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Thursday, 15th June - 10:50: (JUB-118) - Full paper presentation

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*Josie Coburn (SPRU - Sussex)*

Scientific research is an activity beset by uncertainties and changes in direction, but relatively little is known about the nature of these changes and why they happen. This paper presents qualitative evidence gathered from 21 hour-long interviews with biomedical researchers whose research changed direction during a project in between grant funding and publication of results. Changes in direction were also reported before and after the project, and throughout the course of research careers. A range of reasons are offered for these changes in direction, both purposeful and accidental (including serendipity and failure). At the level of individual grants, researchers may change direction to take advantage of tools, techniques or biological mechanisms. At a higher level, the direction of research may be influenced by aspects of the research organisation and the environment within which research is evaluated or funded. Collaboration and interpersonal networks are also reported to influence changes in direction in a variety of ways. Finally, there are variations by disease, including factors that mainly influence those working on diseases that are prevalent in low-income countries, such as a lack of resources or capacity. These findings contribute to literature on research direction, which has thus far largely focused on patterns and impacts of change, but less on why changes happen. Change in research direction reported by researchers is common, systemic and diverse in nature. For policies aiming to set or change the direction of research, these findings suggest it may be useful to consider the different dimensions involved and how they might interact with each other - timing, motivation, levels, actors and variation by disease.

## The Effects of Challenge-driven Sustainability Orientation on Research and Teaching Efficiency in German Universities

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Thursday, 15th June - 10:50: (JUB-118) - Full paper presentation

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*Torben Schubert (Fraunhofer Institute for Systems and Innovation Research ISI), Hendrik Berghaeuser (Fraunhofer Institute for Systems and Innovation Research ISI), Henning Kroll (Fraunhofer Institute for Systems and Innovation Research ISI), Cecilia Garcia Chavez (Fraunhofer Institute for Systems and Innovation Research ISI)*

Academic research increasingly focuses on societal challenges such as environmental sustainability. The effects of the increasing sustainability orientation on output generation in public research organizations are however largely unexplored. In this paper, we analyse the effects of the increasing importance sustainability-oriented research topics on research and teaching efficiency in German universities in 2018. Our results are mixed. On the one hand, we find that a higher share of publications related to sustainability increases research efficiency. On the other hand, it decreases teaching efficiency. The latter negative effect seems to relate however primarily to a notion of teaching efficiency associated with quantity rather than quality of teaching-output. We conclude that the tendency to focus academic research to challenge-driven sustainability orientation can have non-trivial effects for the efficiency of output generation and therefore need to be considered ex-ante by policy-makers, administrators and university managers.

## How bias in peer review can hinder societal-oriented research?

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Thursday, 15th June - 10:50: (JUB-118) - Full paper presentation

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*Adriana Bin (University of Campinas - Unicamp), Ana Carolina Spatti (University of Campinas - Unicamp), Evandro Cristofoletti (University of Campinas - Unicamp), Larissa Lopes (University of Campinas (Unicamp)), Emily Campgnolli (University of Campinas (Unicamp)), Raissa Demattê (University of Campinas (Unicamp))*

Peer review is a mechanism that aims to ensure the quality and integrity of scientific research by subjecting it to the scrutiny of other experts in the same field. However, this process is not immune to bias, which can have particularly significant consequences for the selection and funding of societal-oriented research. In this article, based on Scopus (Elsevier) and WoS (Thomson Reuters) data, we conduct a systematic literature review about the employment of peer review processes in research and innovation funding agencies, focusing on the relationship between selection biases and research priorities underlying social challenges. We bring evidence to what extent biases are present in real experiences of research and innovation funding agencies and what are the possibilities of overcoming the potential conflict between peer review and societal challenges. To mitigate the impact of bias in peer review, we propose several strategies, which include increasing transparency throughout the peer review process, diversifying the pool of reviewers to include individuals from different backgrounds and disciplines, providing training for reviewers on how to recognize and avoid biases, and incorporating alternative evaluation criteria that prioritize societal impact alongside traditional measures of scientific excellence.

# **7.1 Studying Transdisciplinarity – Frameworks and Concepts**

# Exploring Interdisciplinarity and Transdisciplinarity as Knowledge Regimes: A Heuristic Tool for Disentangling Understandings in Academia and Policy

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Wednesday, 14th June - 09:00: (JUB-G22) - Full paper presentation

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*Bianca Vienni-Baptista (ETH Zurich), Christian Pohl (ETH Zurich)*

Interdisciplinarity and transdisciplinarity are multidimensional and entail a heterogeneity of practices, values, institutionalising processes, imaginaries and programmatic approaches. Though this recognition has been long discussed in the academic literature, few approaches seek to put this plurality at the centre of attention. In the policy literature, these terms are usually employed very generally and do not acknowledge nuances in practice or between countries. In this paper we propose a heuristic tool to disentangle this heterogeneity and to present the different understandings in a comparable way by analysing key definitions and explaining the implications different conceptualisations have. We anchor our study on the concept of knowledge regime and its three components (ideologies and myths, shared beliefs and practices, and imaginaries and values) to develop a comprehensive view of the heterogenous understandings of interdisciplinarity and transdisciplinarity that goes beyond the cognitive dimension. Grounded on this theoretical framework, we applied a qualitative methodology to develop a heuristic tool to disentangle researchers, funders and policy makers' discourses. The tool maps these discourses and their differences to help the prosecution of shared aims and improved interdisciplinary and transdisciplinary research.

## **7.2 Doing Transdisciplinarity – Challenges and Strategies**

## **Bioleft and the politics and practice of conducting transdisciplinary action-research: some tensions and strategic responses**

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Wednesday, 14th June - 13:45: (JUB-G22) - Full paper presentation

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*Patrick van Zwanenberg (SPRU, University of Sussex, UK), Anabel Marin (IDS, University of Sussex)*

It is commonly the case that transdisciplinary research claims to both democratize research practices and knowledge production and empower social actors (*a reflexive, empowering logic*), whilst at the same time create relevant, actionable knowledge (*an instrumental logic*). Whilst those logics often co-exist within the ways protagonists and funding programmes describe transdisciplinary research, some commentators note that the two sets of ambitions are often in tension. They imply different ways of how to practice transdisciplinary research, with whom and for what ends. In this paper, we reflect on attempts to reconcile both logics within a transdisciplinary research project in Argentina concerned with collaboratively identifying, understanding, and responding in novel ways to sustainability problems in the agricultural seed sector. Our work sought to make explicit contestation around different understandings of problems and possible solutions, and to prioritize the perspectives and situations of actors who are marginal to mainstream policy processes; yet at the same time we have been trying to heed the aspiration to provide useable, actionable, knowledge and ideas for interventions that are put into practice. We reflect on the tensions between these two logics, and the ways in which we have responded and tried to resolve them, and on the consequences of those experiences for other areas of transdisciplinary research.

## Creating societal impact through impact practices in large-scale transdisciplinary research projects

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Wednesday, 14th June - 13:45: (JUB-G22) - Full paper presentation

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*Tessel Wijne (Copernicus Institute of Sustainable Development, Utrecht University), Jarno Hoekman (Copernicus Institute of Sustainable Development, Utrecht University), Wouter Boon (Copernicus Institute of Sustainable Development, Utrecht University), Ellen Moors (Copernicus Institute of Sustainable Development, Utrecht University)*

Science and research projects are increasingly expected to create, and show, societal impact. In general, societal impact is concerned with social, cultural, environmental and economic returns from the results or products of research projects (Bornmann, 2013). The expectation to create societal impact is especially prevalent in transdisciplinary research (TDR) projects in which scientist interact and form networks with a wide variety of societal partners (Hoffmann et al., 2019; Pohl, 2008; Pohl et al., 2021). The assumption is that TDR, through integration of different bodies of knowledge and perspectives will be closely aligned and potentially better able to contribute to tackling societal challenges (Hessels et al., 2009). Integration, as a key process in TDR, can be understood as the establishing of designated relations throughout the research process between elements that were not previously related, such as knowledge, perspectives, expertise, and practices from different collectives or individuals (Pohl et al., 2021). In this context, many researchers have aimed to understand what societal impact is, and how it can be created. The current thinking on this emphasizes the need for purposeful efforts by researchers to create impact (De Jong & Balaba, 2022; Spaapen & van Drooge, 2011). Such efforts have recently been understood as *impact practices* (De Jong & Balaban, 2022). However, little is known about how researchers create impact practices, and how impact practices actually contribute to the creation of societal impact. In this study we adopt a process-ontology to study how the creation of impact practices and integration processes co-constitute, and hereby aim to gain a more holistic insight into the creation of societal impact in TDR. To do this, we perform an in-depth case study for multiple years in which we follow integration processes and the creation of impact practices.

## **7.3 Exploring Transdisciplinarity – Examples and Inspiration**

## **Building a Knowledge Infrastructure for Transformative Innovation Policy (TIP). An analytical and practical approach based on the experimental TIP Conference 2022**

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Wednesday, 14th June - 15:45: (JUB-G22) - Full paper presentation

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*Diana Velasco (INGENIO (CSIC-UPV)), Bipashyee Ghosh (University of Sussex), Alejandra Boni (INGENIO (CSIC-UPV)), Katharina Schiller (Fraunhofer Institute for Systems and Innovation Research ISI), Laura Winkler (AIT Austrian Institute of Technology)*

Tackling social and environmental challenges requires communities that can create, integrate, use, and contextualise diverse knowledges. The Transformative Innovation Policy (TIP) seeks to respond to these challenges through collective action enabled by experimental and inclusive approaches. This paper focuses on examining the kind of knowledges, structures and practices required to build a knowledge infrastructure (KI) for TIP taking the TIP conference 2022 as a case study. The conference aimed at building a sustainable and inclusive KI for systemic transformation pathways. By exploring the design, implementation and evaluation of the conference a framework for a TIP KI is developed, which includes the need for tangible and intangible infrastructures that support broadening and deepening networks, learning, unlearning and alignment of visions. These are the constituent elements to build communities of practice that can integrate knowledge towards transformation pathways. Furthermore, the paper explores how conferences can contribute towards transdisciplinary and action-oriented research by developing theories of change and monitoring, evaluation and learning plans as part of their developing strategies.

## Sourcing insights elsewhere: the positive influence of academic engagement on scientific impact

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Wednesday, 14th June - 15:45: (JUB-G22) - Full paper presentation

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*Carolin Nast (University of Stavanger), Oscar Llopis (University of Valencia), Dima Yankova (INGENIO (CSIC-UPV)),  
Pablo D'Este (INGENIO (CSIC-UPV))*

In recent years there has been an increasing call from science policy to encourage interaction between academics and non-academic actors in research activities to align research priorities and societal challenges. Despite the rising consensus on the societal benefits from academic and public engagement in research, it is still an open debate whether greater interaction stimulates or compromises fundamental advances in science. This paper explores to what extent academic engagement contributes to cutting-edge research and findings of high scientific impact. We test our propositions by assessing researchers' scientific impact based on the number of top cited papers published by scientists (sourced from WoS) and by a measure of academic engagement based on primary data from a large scale survey. The representative sample of respondents consists of 11,992 scientists affiliated with Spanish public research organisations and universities from all fields of science. We also consider different forms of academic engagement, differentiating between mechanisms oriented to stimulate knowledge exchange and equal participation of partners (i.e. *joint-research* mode) and mechanisms that dominantly rely on knowledge transfer as a response of scientists to requests from non-academic actors, as in the case of consulting or contract research (i.e. *response* mode). Our results indicate that academic engagement is positively associated with scientific impact. However, this positive association is strongly influenced by the specific mechanism of academic engagement: joint-research shows a stronger association with scientific impact than response mode mechanisms. We argue that academic engagement, and particularly joint-research, benefits novelty in research activities by enabling exposure to multiple research perspectives, deeper contextual knowledge and greater cross-learning opportunities. Acknowledging the potential benefits of establishing different forms of academic engagement with non-academic actors for novelty and the advance of scientific knowledge, has important implications for research policies aimed at pursuing both excellence and relevance in science.

# **8.1 Research that leads to endings: Reflections about Impacts of Destabilisation and Discontinuation Research**

## The politics of phase-out and deliberate destabilisation for sustainability transitions

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Friday, 16th June - 09:00: (JUB-118) - Full paper presentation

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*Laura van Oers (Copernicus Institute of Sustainable Development, Utrecht University), Giuseppe Feola (Copernicus Institute of Sustainable Development, Utrecht University), Hens Runhaar (Copernicus Institute of Sustainable Development, Utrecht University), Ellen Moors (Copernicus Institute of Sustainable Development, Utrecht University)*

This paper advances scholarship on deliberate destabilisation for sustainability transitions. To understand how deliberate destabilisation plays out in practice, the politics of such processes must be confronted. To this end, we bridge research on the political economy of sustainability transitions with recent theorisations of the deliberate destabilisation of unsustainable socio-technical regimes and propose a set of analytical dimensions and guiding questions for the study of the latter. The added value of a political economy perspective to understand the politics of deliberate destabilisation in capitalist economies is demonstrated through the historical example of the phase-out of hen battery cages in the Netherlands. The poultry sector in the Netherlands embodies an industrial approach to food and farming, orientated towards producing large amounts of standardised and cheap food. We foster new insights on the influence of intertwined political and economic interests for phase-out and deliberate destabilisation processes, which may reproduce, rather than transform, unsustainable and unjust socio-technical regimes.

## **8.2 Research that leads to endings: Reflections about Impacts of Destabilisation and Discontinuation Research**

## **Coal industry destabilization: State response in South Africa and Russia**

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Friday, 16th June - 13:30: (JUB-118) - Full paper presentation

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*Olga Ustyuzhantseva (University of Johannesburg)*

This paper discusses the coal industry and its decline, which is considered irreversible despite the growth of demand and prices in 2022. Although coal will still be part of some countries' economies in the next 20-30 years, the industry's transformation or dismissal will have socioeconomic consequences. Therefore, policy intervention is necessary to address the challenges associated with the decline. The paper investigates the role of the state in transforming such a socio-technical system as the coal industry, using Russia and South Africa as cases. The study generates an analytical framework using elements of a multi-level perspective to answer questions such as what external factors influence the coal industry, how policymakers frame these factors, and what policy measures they implement. The paper also discusses different modes of governance of sociotechnical changes, the role of the state in transformation, and how state and business alliances stabilize incumbent regimes in resistance against low-carbon transformation.

## **So many ways out! Explorations into the existence of destabilisation as a research problem beyond the domain of transitions studies**

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Friday, 16th June - 13:30: (JUB-118) - Full paper presentation

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*Alexandre Hannud Abdo (LISIS, Gustave Eiffel University), Benjamin Raimbault (LISIS, Gustave Eiffel University), Marc Barbier (LISIS, INRAE), Bruno Turnheim (LISIS, INRAE)*

In the context of socio-technical transitions, a research stream has emerged around notions like destabilisation, decline, phase-out, discontinuation, collapse, dismantling, rolling back, failure, ends of, losses etc. So many ways out of existing socio-technical regimes have been capturing attention within transitions studies (Rosenbloom and Rinscheid 2020), and in the world-at-large as means for addressing systemic environmental issues (Rinscheid et al 2022). This is an exciting prospect, signalling an increasing focus on processes by which undesirable system lock-ins may be overturned, and bringing new questions to bear on transition challenges such as issues of power and incumbencies (Stirling 2019). The wealth of such enquiries is evidenced by the multiplicity of conceptual entry points (Turnheim 2022) and the multiplication of empirical research. Nonetheless, framings of the destabilisation problem remain rather homogenous within transitions studies, and this is likely true of other fields of importance to civil society, policy, management and decision-making. Our hypothesis is then that destabilisation exists as a research problem for various strands of social sciences, independently of the constitution of our epistemic community of transitions studies (and very likely preceding it). Following Andy Stirling's injunction to Open up! and Pluralise!, this paper focuses on exploring the (expected) breadth of research concerned with destabilisation problems within the social sciences, in search for a variety of problem formulations, problem structures, concepts, methods and empirical sites – all of which may be put to work to mutually enrich those perspectives. Measuring the scope and diversity of destabilisation research outside transition studies leads to the challenge of positively accounting for this plurality of perspectives in our work, as well as establishing the relevance and impacts of studies on these phenomenons on areas of policy and decision making. To do this, our approach focuses on the exploration of large volumes of bibliographic data, which we identify, extract, explore and analyse using a quantitative and qualitative mixed methods approach, one which employs textual analysis, corpus extension by querying the lexical neighborhood of terms, thematic multi-level clustering of documents through domain-topic modelling (Hannud Abdo, 2021), and sense-making through systematic coding and annotation by domain experts.

# **9.1 Governance and policy processes for transformative R&I: Directionality**

## **Directionality for transformation: Analytical dimensions and illustrations of selected ‘policy tools’**

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Wednesday, 14th June - 09:00: (JUB-115) - Full paper presentation

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*Paula Kivimaa (Finnish Environment Institute), Dimitrios Pontikakis (European Commission, JRC Seville), Ramojus Reimeris (European Commission, JRC Seville), Michal Miedzinski (European Commission, JRC Seville)*

One of the key aspects of the transformation pursuits is ‘directionality’. This means, for example, that when promoting science, technology, and innovation (STI) activities, these activities should respond to addressing the grand environmental and societal challenges the world is facing. Drawing on academic literature on innovation studies and sustainability transitions, this paper first examines what directionality for transformation can mean, creating a typology to characterise directionality, containing elements that can be used to analyse planned or realised policy instruments and policy mixes. Second, it will explore how directionality is present in selected policy tools (transition arenas, missions, the entrepreneurial discovery process, just transition initiatives, and policy coherence), by illustrating a light analysis of these tools, and what might be there of use for the EU regional innovation policy initiative - Partnerships for Regional Innovation (PRI) - to advance transformation via increasing attention on directionality. None of the explored policy tools are perfect for directionality but hold much potential if their use is planned carefully.

## Discovery processes for transformative innovation policy

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Wednesday, 14th June - 09:00: (JUB-115) - Speed Talk

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*Manuel Laranja (Universidade de Lisboa), Inma Perianez (Universidad Pablo de Olavide), Ramojus Reimeris (European Commission, JRC Seville)*

Based on a previous published report of a research project conceived and managed by the European Commission Joint Research Centre, this paper reviews available studies on how “Entrepreneurial Discovery Processes” were practiced. The purpose is to identify which lessons learned from Smart Specialisation implementation and entrepreneurial discovery process (EDP) during the 2014-2020 framework period, are relevant to the new context of Transformative Innovation Policies. In particular, lessons from EDP practices may be useful for conceptualising policy practices needed to support discovery and experimentation processes which are key activities for strategic niche formation in transformative innovation.

## **9.2 Governance and policy processes for transformative R&I: Governing transformative innovation**

## **Towards transformative governance? A comparative analysis of innovation policy in the US, China, and EU**

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Wednesday, 14th June - 13:45: (JUB-115) - Full paper presentation

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*Iacopo Gronchi (University College London & Demos Helsinki)*

During the last decades, the role of the state in the economy has been brought back to the forefront of the academic and political debate. These fed into a call for innovative policy paradigms – notably, transformative innovation policy (Schot and Steinmueller, 2018) and mission-oriented innovation policy (Kattel and Mazzucato, 2018). Yet, major doubts still remain on their ability to yield results against the challenges of SDGs. Most of these doubts concern implementation: i.e., how the ‘new generation of innovation policy’ can be adopted in different contexts (Janssen et al., 2021) in the face of varying capacities available to different public sector organisations (PSOs) (Borrás et al., 2023). Moving from this acknowledgment, the paper has two objectives: i) to investigate whether and how it is possible to identify a consensus and specify the features of the governance underpinnings that underlie the ‘new generation of innovation policy’; and ii) to assess and compare their emergence across past and present policy efforts in different empirical contexts. As a result, I aim to respond to two research questions: (RQ1) *What are the governance underpinnings of the new generation of innovation policy?*; and (RQ2) *What do PSOs do in order to help establish new governance underpinnings?* To address them, the paper explores the role of two hypotheses: namely, experimentalist governance (Sabel and Zeitlin, 2012) and metagovernance (Torfing, 2022). By doing so, it advances theoretically and tests empirically a preliminary framework of ‘transformative governance’ for the analysis of contemporary innovation policy. The framework is tested by means of a pre-study (Swedberg, 2012) of three cases of innovation policy developed at different moments by three geopolitical entities: the United States (US), China, and the European Union (EU). Based on emerging results, the paper illustrates how the proposed framework can help both elucidate political, organisational, administrative challenges that hinder the successful adoption of the ‘new generation of innovation policy’, and contribute to the development of a knowledge base on why and how reform of public sector organisational design (Trondal, 2022) and capacity building (Borrás et al., 2023) can empower urgent socio-economic transformations.

# Power in urban logistics: A comparative analysis of networks and policymaking

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Wednesday, 14th June - 13:45: (JUB-115) - Full paper presentation

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*Subina Shrestha (University of Bergen), Håvard Haarstad (University of Bergen)*

Urban logistics has, to a large extent, been studied following the techno-rational model. This has led to a growing recognition of the need to assess the socio-political dimensions associated with it, especially in sustainable urban logistics governance. This paper unpacks the politics and influence within the sector by drawing on literature on power in sustainability transitions and conceptualizing urban logistics as a policy network. As a sector governed by several actors with competing interests, each actor exercises their power and position to favour their own interests. In this context, the paper asks, (1) who are the key actors in urban logistics? and (2) how do they leverage their positions to favour their framing of sustainability? Empirically, this paper uses as case studies three of the largest Norwegian cities- Oslo, Bergen and Trondheim. We employ a mixed-method approach and combine a quantitative social network analysis with semi-structured interviews, to identify key actors and how they leverage their power to influence sustainable urban logistics policy processes in the three cities. Our findings demonstrate that in addition to private sector, public authorities and interest organizations are also influential in shaping the policy processes in sustainable urban logistic. Each actor category strategically leverages their power and network positions to prioritize their framing of sustainability. Where shared framings are present, these key actors collaborate in a recurring manner. Else, interest organizations and private sector also contest the local authorities' sustainability framings. These practices of collaboration and contestation are crucial in terms of whose sustainability gets prioritized, which in turn, shapes the direction that sustainability in urban logistics takes.

## **9.3 Governance and policy processes for transformative R&I: Mission policies**

# **A change of direction: Mapping and managing problem-solution constellations in mission-oriented innovation policies**

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Wednesday, 14th June - 15:45: (JUB-115) - Full paper presentation

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*Remi Elzinga (Utrecht University), Matthijs Janssen (Utrecht University / Dialogic), Simona Negro (Utrecht University), Marko Hekkert (Utrecht University)*

Missions prioritizing an ambitious and measurable societal goal are believed to provide the directionality needed to mobilize and align actors that may contribute to the development and diffusion of solutions. However, this proclaimed directionality stemming from merely a mission goal cannot be taken for granted. Directionality for transformation requires collective priorities, which do not always automatically emerge when public and private actors only follow their own interests. Moreover, it remains hard to properly understand how directionality or different innovation directions are shaped over time, and how they interact. New insights are needed to map the complex interactions between the mission, the societal problems it aims to tackle, the actors engaged, and the solutions proposed to contribute to mission fulfilment. This study draws multiple interaction archetypes illustrating different potential transition impasses. Sequentially, intervention strategies were identified for each archetype to overcome these impasses. This research analyzed the Dutch transition to a circular plastic chain focusing on bioplastics. Different archetypes were found and interventions were designed to accelerate the transition.

## **Pursuing a Mission-Oriented Twin Transition: Directionality for Systemic Digital Innovation**

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Wednesday, 14th June - 15:45: (JUB-115) - Full paper presentation

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*Daniel Wurm (Wuppertal Institute for Climate, Environment and Energy), Florian Wittmann (Fraunhofer Institute for Systems and Innovation Research ISI)*

While digital technologies carry significant transformational potential, anecdotal evidence suggests that the digital transformation might not be directed towards sustainable development sufficiently. Drawing on a modified and extended version of the framework proposed by Wanzenböck et al. (2020), we explore the cases of the circular economy and the transition towards a sustainable energy system in the twin transition. Making use of insights from 20 expert interviews and two expert workshops, we aim to investigate the convergence/divergence in societal views across different dimensions (technological, economic, socio-cultural, regulatory) and derive insights for integrated policy-making. Thereby the study contributes to bridging the existing gap between mission-oriented policies and the twin transition. Overall, our first insights indicate that while showing high similarities in the structure of problems and solutions across cases, the variety in wickedness (contestation, complexity, uncertainty) calls for differentiated policy-making: Significant parts of the relatively young twin transition might be in a state of disorientation where societal views on problems and solutions diverge. This would require policy makers to follow an “discovery-mode” (basic research, experiments and monitoring) with only selected diffusion-focused strategies. Further, we show that missions in the twin transition require highly flexible policy-making as different approaches need to be applied simultaneously. Finally, there are several options for exploiting synergies in policy-making due to some overlapping characteristics as well as learning opportunities between cases. We believe that particularly our holistic perspective on the twin transition can yield substantial guidance for researchers and policy makers in the field.

## **Tracing a policy development and implementation process: experimenting with mission-oriented research and innovation policies in Norway**

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Wednesday, 14th June - 15:45: (JUB-115) - Full paper presentation

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*Taran Thune (TIK Center, University of Oslo), Håkon Endresen Normann (Nordic Institute for studies in Innovation, Research and Education NIFU), Silje Marie Svartefoss (TIK Center, University of Oslo)*

This paper investigates the development and implementation of a mission-oriented innovation policy approach at a national level. The empirical case that forms the core of the paper is a policy process towards coordination of future research and innovation policies in Norway, referred to as the “Long-term plan for research and higher education” (LTP). The concept “mission-oriented research and innovation policy” was introduced in this white paper as an underlying perspective and steps were initiated to develop and implement missions as a new policy approach, taking a “careful” or experimental approach. Based on detailed empirical material about the policy process, the paper aims to illuminate the “inner life” of a policy process and the meanings, values and actions agents bring to it, and how this shapes policy design, decision-making and implementation processes.

## **9.4 Governance and policy processes for transformative R&I: Multi-System transformation**

## **Innovation policy selection, implementation and design. A mRNA case study of German R&I policy.**

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Thursday, 15th June - 09:00: (JUB-115) - Full paper presentation

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*Elina Pulkova (Freie Universität Berlin)*

Since the Covid-19 pandemic, mRNA technology has become an important component in the fight against infectious diseases and a technology that can potentially be used to fight cancer. An agile innovation policy is needed to address such challenges, respond to unforeseen events and provide guidance on how to achieve goals. The capabilities and capacities of state actors also have a substantial impact on addressing societal challenges. However, in order to understand dynamic processes, it is important to consider not only the role of government, but also the capabilities of the implementing actors and the coordination between them, as well as the institutional and regulatory conditions and the policy process behind them. Therefore, this paper examines the impact of German R&I policy by analyzing the dynamics of the innovation policy process, the design of innovation instruments and the governance of mRNA technology. By explaining the evolution of mRNA technology, the innovation policy process before, during, and after the pandemic is examined. The aim of this work in progress study is, in the context of the research project “Innovation Policy Orchestra”, to examine the operationalization from the strategic level to the instrumental level. This structuring provides an insight into the practitioner’s perspective and can be used to identify bottlenecks and improve the further strategy and design of instruments.

## Navigating the selection environment: Exploring the resurgence of battery swapping trajectories in China

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Thursday, 15th June - 09:00: (JUB-115) - Speed Talk

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*Qi Song (SPRU, University of Sussex), Adrian Ely (SPRU, University of Sussex), Karoline Rogge (SPRU, University of Sussex)*

Achieving rapid transformations of unsustainable socio-technical regimes requires closer attention to the design of innovation policies. Increasingly, these need to address multi-system interactions emerging from systemic transformative innovations. The massive deployment of charging infrastructures for electric vehicles, for instance, has been increasingly recognised as a key policy task at the intersection between mobility and energy systems – a task that underpins the global diffusion of electric vehicles. One contentious aspect of the proposed interventionist policy approaches in transition studies is finding a possible balance between promoting the diversity of technological alternatives and the limited resources available to governing entities and other actors for stimulating socio-technical transitions. On the one hand, following the evolutionary perspective, variety in niche solutions has been highlighted as important in the transitions literature. On the other hand, the amount of available administrative and financial resources is limited in real-world policymaking processes, as is resource mobilisation for focal technologies with high technology legitimacy. Recently, scholars have paid attention to the time-varying dynamics of a certain technology or the region-specific conditions that may lead to divergent choices on technological directions. However, the role of evolving policy dynamics in influencing the rise and fall of specific technological alternatives is still understudied. In order to address this gap, we combine two strands of innovation and transition literature: the co-evolution perspective on associating policy changes and socio-technical changes and the role of actors in shaping selection environments in socio-technical transitions. Taking the resurgence of battery-swapping trajectories in China as the focal case, this work addresses the following research question: Why has the battery-swapping technology regained popularity in e-mobility transitions in China, and how do governing entities interact with various actor groups in this resurgence? Methodologically, our case study follows a three-step empirical investigation. First, we conducted 10 semi-structured expert interviews with 9 Chinese experts to capture the underlying and recent contextual dynamics. Second, using the event history analysis approach, we reconstructed the history of the resurgence of battery-swapping technologies in China from 2012 to 2022. Third, we further explored a set of analytical variables, including industrial reports, statistics, and policy documents.

## **9.5 Governance and policy processes for transformative R&I: Navigating and learning**

## Understanding synergies between innovation and health policy – a typology and insights for future alignment.

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Thursday, 15th June - 10:50: (JUB-115) - Full paper presentation

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*Jelle Feddema (Vrije Universty Amsterdam), Eduardo Urias (Vrije Universty Amsterdam), Hans Schikan (none), Linda van de Burgwal (Vrije Universty Amsterdam)*

To contribute to the debate on industrial/STI policy the following research question was formulated: how can industrial policy support health policy objectives, and what types of linkages exist between both policy fields? We synthesised pre-covid literature on the types of linkages (Hirschman, 1958) that exist between health and industrial policy. We then compared these linkages with post-covid literature to better understand how vulnerabilities were addressed across countries and innovation systems. We propose three distinct types of linkages between health and industrial policy based on the synthesis of pre-covid literature configured. Type 1 is an implicit and indirect linkage from the industrial policy domain towards the health domain through a supply push. Health policy goals are achieved indirectly because of favourable innovation landscapes created by states through horizontal, macro-level policies (e.g., funding basic research, etc.). Type 2 linkages are more explicit and direct and are initiated from the health policy domain towards the industrial domain. A demand-pull triggers industrial innovation and states impose more targeted macro and meso-level policies that address innovation barriers and align industrial efforts with unmet health needs (e.g., funding early-stage development, patent policies). Type 3 is an explicit, direct, and integrative synergy between health and industrial policy, typically observed in contexts of industrial catch-up. Comparison of pre-covid and post-covid literature evidenced a marked change in the role of the state in HIC. While the active role of the state in innovation policies has been described in recent literature (Mazzucato, 2011), interventions in pre-covid literature were mostly framed as addressing market failures. During the pandemic, an interventionist approach with active market interference was pursued, going well beyond addressing market failures, changing innovation production directly. Under the guise of the COVID-19 pandemic, many HIC states implemented policies once perceived as unconventional, and which historically have been criticized and formally contested, especially countries with emerging and vulnerable innovation systems. Health problems require insights from industrial policy if they are to be addressed properly. Re-evaluation of the position of governments in supporting industrial innovation to address these needs could be argued for based on the results presented in this study.

## Monitoring transformative change in research systems: the case of Open Science

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Thursday, 15th June - 10:50: (JUB-115) - Full paper presentation

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*Ismael Rafols (Centre for Science and Technology Studies, Leiden University), Jordi Molas-Gallart (INGENIO (CSIC-UPV)),  
Ingeborg Meijer (Centre for Science and Technology Studies, Leiden University)*

Various analysts claim that in the last decade that have been a substantial change in the framing of science, technology and innovation (STI) policy with more initiatives aimed at fostering more collaborative practices, toward broader awareness of societal needs, and in some cases, with the explicit goal to transform sociotechnical systems to respond to social challenges. In this analysis, we propose that monitoring these policies requires to develop new analytical frameworks that are aligned with the logics and the goals of transformative policies. Taking Open Science (in particular as formulated by UNESCO) as an example of a transformation, we suggest strategies for monitoring transformative change. First, the focus of monitoring should not be volume of outputs but changes in outcomes, i.e. observed transformation in practices. Second, monitoring tools should consider the multidimensional nature of most transformative process, articulate specific notions of *directionality* and make them explicit in the monitoring. Third, issues *inclusion of participants* and management of *knowledge diversity* are seen as key for socio-technical transformations and thus need to be examined. Fourth, attention needs to be paid on description of the users/beneficiaries of the research and potential effects. Overall, we claim that monitoring transformative change in research requires broadening the focus of monitoring from the conventional actors of the innovation system (universities, public and private laboratories) towards the activities of users and beneficiaries.

## **Navigating transitions: A ‘reflexive navigation system’ for monitoring and learning in mission-oriented innovation policies**

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Thursday, 15th June - 10:50: (JUB-115) - Full paper presentation

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*Jakob Kofler (Austrian Institute for SME Research), Harald Wieser (Austrian Institute for SME Research)*

This article presents a novel approach to organising monitoring and learning processes in mission-oriented innovation policy. Mission-oriented innovation policy strives to overcome the pitfalls of fragmentation in R&I policy to solve societal challenges, but little is known about how to organise interactions and learning beyond the scope of individual projects. The proposed framework of a ‘reflexive navigation system’, developed in support of the Austrian R&I mobility strategy, aims to create spaces for collective learning between funded R&I projects and policy officers while creating systematic links between insights gained at the project level and decision-making processes in public policy. To this end, the reflexive navigation system directs attention of monitoring and learning processes from the results of individual projects towards the joint progress made at the level of selected, mission-oriented mobility solutions. Each mobility solution as well as the contributions of individual R&I projects to its advancement, are monitored from problem articulation to implementation along a generic theory of change derived from transition theories. Furthermore, to move beyond impact assessment and facilitate the navigation of sustainability transitions, the proposed framework structures reflection and learning by putting emphasis on the potential of mobility solutions, the readiness of system components, as well as the R&I and sectoral policy actions needed for their realisation. In sum, we propose that the reflexive navigation system offers a tool for engaging with R&I projects that allows collecting timely feedback, building legitimacy, encouraging participation, and generating synergies in mission-oriented innovation policy. We conclude with a reflection on the challenges associated with the implementation of the reflexive navigation system.

## **9.6 Governance and policy processes for transformative R&I: Place-based approaches**

## **Innovation policy driven to tackle Societal Challenges: insights from EU Border regions**

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Thursday, 15th June - 15:00: (JUB-115) - Full paper presentation

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*Francesco Cappellano (WSB University), Elvira Uyarra (Alliance Manchester Business School), Kieron Flanagan (The University of Manchester)*

This paper explores the phenomenon of place-based innovation policy directed towards Societal Challenges (SC) in EU cross-border regions. The urging pressure of tackling SC adds complexity to the making and implementing of innovation policy in practice. To avoid, directionality failure, this paper explores a place-based approach to challenge-oriented innovation policy, investigating the operationalization of policy directionality in terms of goal consistency as well as exploring the spatial dimensions of problems and solutions. The study focuses on cross-border regions as exposed to problems that do not stop at the border, although usually framed at the national level, and engaged in cooperation to tackle common challenges. The comparative analysis across two EU cross-border regions hinges on a theoretical framework binding together the trinity of agency scholarships and the multiplicity of border functions literature. This helps to illustrate how agents navigate the opportunity spaces generated in cross-border regions tapping into the favoring effects of the international border. The findings showcase that SC has been framed at different scales, bearing an opposite approach (top-down vs bottom-up), with ambivalent results in terms of consistency of policy goals. Framed through the trinity agency framework, actors interacted collectively to generate and transfer knowledge in the cross-border regions. In line with the multiple border functions literature, our findings support the enduring presence of international borders also in such highly integrated EU cross-border regions.

## **Local Strategies in the Face of National Policy Pressures: Isomorphic Difference in China's Autonomous Vehicle Sector**

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Thursday, 15th June - 15:00: (JUB-115) - Speed Talk

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*Armin Scheer (Copenhagen Business School), Alan Irwin (Copenhagen Business School)*

While global trends in Autonomous Vehicle (AV) technology and innovation appear similar, local contexts significantly shape the implementation and outcomes of these policies. In this paper, we examine the interplay of isomorphic commonalities and differences in China's AV ecosystem, using one regional case study to illustrate this dynamic. Drawing upon the conceptual lens of isomorphic difference as a means of symmetrically exploring relations of familiarity and distinctiveness, we analyze Shenzhen's unique innovation culture, governance practices, and technological landscape. Through the Shenzhen case study, we provide insights into the dynamics within China's AV ecosystem, highlighting the significance of each dimension in shaping the development of the Autonomous Vehicle industry. We also discuss the potential implications of our findings for understanding the interplay between local strategies and national policy pressures in the face of rapidly evolving technological landscapes. The paper concludes by considering the relevance of this study of isomorphic difference for larger debates over policy coordination and transformative change.

## Supporting competitiveness, transformation, and technology sovereignty through innovation procurement: A cross-country comparison on the role of pre-procurement market engagement in the European Union

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Thursday, 15th June - 15:00: (JUB-115) - Speed Talk

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*Pelle Berkhout (Copernicus Institute of Sustainable Development, Utrecht University), Anne Rainville (Copernicus Institute of Sustainable Development, Utrecht University), Matthijs Janssen (Utrecht University / Dialogic), Koen Frenken (Copernicus Institute of Sustainable Development, Utrecht University)*

Innovation policies such as public procurement can enhance the competitiveness of firms and overcome market and system failures (Edler & Georghiou, 2007). Such policies can also contribute to overcoming societal challenges, such as climate change (Wesseling & Edquist, 2018). Innovation procurement, however, is still not optimally used. Often, it fails to stimulate or capture innovation from the market as innovative firms and solutions are foreclosed (Rainville, 2021), for example when suppliers and their solutions are selected based on vested interests and technical specifications (Blind et al., 2020; Edquist & Zabala-Iturriagoitia, 2020). A potential solution to these issues is market engagement during the pre-procurement phase. Market engagement enables public procurers to better spot and accommodate innovative solutions. To our knowledge, no large-scale empirical research exists on what methods procurement authorities employ to organize market engagement and how these affect the procurement process within the European Union (EU), which leaves a research gap. Against a background of increased global technology-based and geopolitical antagonism recent studies have suggested *technology sovereignty* as a third rationale for demand-driven innovation policy, next to competitiveness and transformation (Edler et al., 2020, 2023). Technology sovereignty has been defined as “the ability of a state or a federation of states to provide the technologies it deems critical for its welfare, competitiveness, and ability to act, and to be able to develop these or source them from other economic areas without one-sided structural dependency” (Edler et al., 2023, p. 2). Being an important instrument in the policy mix of demand-side innovation policies, innovation procurement is a promising policy tool to secure or gain technology sovereignty. Market engagement can improve the effectiveness of this tool as it helps to understand the available firms and solutions in the market, helping detect opportunities and risks in the procurement process related to technology sovereignty. To fill the research gaps on both market engagement and technological sovereignty, this research aims to answer the following research question: *How does market engagement contribute to organizations’ practices to stimulate competitiveness, transformation, and technology sovereignty through innovation procurement, as an innovation policy measure?*

## **9.7 Governance and policy processes for transformative R&I: Policy Mixes**

## Institutional Barriers to Transforming Innovation Policy Mixes

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Thursday, 15th June - 16:40: (JUB-115) - Full paper presentation

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*Travis Southin (Carleton University)*

Innovation policy scholars have documented path dependent consistency in countries' mixes of innovation policy instruments over time, with successive governments adhering to what the policy mix literature calls 'national policy styles' (Acciai, 2021; Capano & Howlett, 2020; Edmondson, Kern, & Rogge, 2019). What is missing in this literature are comparative case studies illustrating *how* these national policy styles exert this constraining influence on instrument design and implementation (Capano & Howlett, 2020). This article's examination of Canada's Innovation and Skills Plan fills this gap via a case study of a government deliberately trying to reorient its innovation policy mix towards instruments that are inconsistent with its entrenched national policy style. Despite the rhetoric of transformational change, Canada's Innovation and Skills Plan nonetheless resulted in incremental change to the country's overall innovation policy mix (ISED, 2019; OECD, 2021). Over 143 interviews with policymakers, firms, and experts involved in this policy subsystem illustrate how the underdeveloped mechanisms for institutional coordination capacity at the heart of Canada's national style of innovation policymaking functioned to hinder intentional policy reform efforts aimed at transforming the innovation policy mix towards targeted deployment of direct grants and demand-side procurement. These 'mission-oriented', targeted, and demand-side policy instruments require more institutional coordinating capacity to design and deploy at scale than was possible with Canada's fragmented innovation policymaking apparatus, which was attuned for delivering the 'diffusion-oriented', neutral, and supply-side R&D tax credits and research funding that have long dominated the innovation policy mix. Specifically, the article reveals how three institutional coordinating capacity elements, comprising Canada's perennial national policy style for innovation policy, produced this incremental outcome: 1) low coordination across institutional silos within the government; 2) ad hoc institutional mechanisms for private-public policy coordination; and 3) the uncoordinated politics of regionalism, as institutionalized in Canada's Westminster system.

# The Role of Public Financial R&D Support in Sustainable Development Transition: An Empirical Analysis of RDI Projects by Finnish Firms

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Thursday, 15th June - 16:40: (JUB-115) - Full paper presentation

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*Arash Hajikhani (VTT Technical Research Centre of Finland), Robert van der Have (Aalto University), Carolyn Cole (VTT Technical Research Centre of Finland)*

This paper examines the impact of public financial support for Research, Development, and Innovation (RDI) projects on sustainable development within Finland's innovation ecosystem. It critically analyzes the role of public funding mechanisms, such as R&D subsidies, in transitioning business sectors towards sustainable development. With the rise of Public-Private Partnerships (PPP), the study explores how these models can support sustainable innovation and address the challenges of sustainable R&D financing. However, it also highlights the complexities of measuring the impact and efficiency of such policies, and the potential for 'crowding out' private investment. The study emphasizes the need for robust evaluation of funding policies and the development of new measurement tools that can effectively track sustainable development-related activity within businesses. By providing new insights into the relationship between public funding and sustainable development, this paper aims to contribute to policy-making evidence base and inform the design of more effective funding programs for sustainable innovation. It also seeks to address gaps in empirical research on the impact of public funding mechanisms on sustainable development activities within businesses.

## **9.8 Governance and policy processes for transformative R&I: RDI Policy Instruments**

# **The European Framework Programme for Research and Innovation: how transformative is it ? Analysis of its evolution over 2002-2023**

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Friday, 16th June - 13:30: (JUB-115) - Full paper presentation

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*Bianca Cavicchi (European Commission), Oceane Peiffer-Smadja (European Commission), Julien Ravet (European Commission)*

This paper analyses how the European Framework Programme for R&I has evolved over the past twenty years to integrate the elements of Transformative Innovation Policy (TIP). With this, we aim to contribute to a better understanding of how-to analysis TIP and provide methodological and policy recommendations for strengthening the FP's transformative capacity. We use the TIP framework and systems thinking to carry out this analysis within each FP from FP6 to Horizon Europe and run cross-FP comparison. We demonstrate that despite a continuous evolution of the FP towards integrating transformative elements, such as demand-articulation and policy coordination, some key aspects, such as directionality and reflexivity, partly integrated in the last two FPs analysed, could still be improved to ensure that the future FPs are fit to promote systemic change and deal with the complexity of societal transformations. We also conclude on a strong interdependency of the transformative features, implying progressive changes on each step of the policy cycle to embed reinforce the FP's transformative nature.

## **Legitimations for government intervention in venture capital markets: the case of the Netherlands**

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Friday, 16th June - 13:30: (JUB-115) - Full paper presentation

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*Jan Jacob Vogelaar (Utrecht University), Chris Eveleens (Advisory council for science, technology and innovation), Frank van Rijnsoever (Copernicus Institute of Sustainable Development, Utrecht University)*

When should governments intervene in venture capital markets? While market failure theory has dominated the scholarly discussion about the appropriateness of venture capital policies, the broader innovation and industrial policy literature has suggested alternative rationales for policy: system failures, transformational failures and related mission-oriented policies. This paper studies the empirical fit of these alternative theoretical rationales for government intervention in the context of venture capital policies. In semi-structured interviews with 30 actors in the Dutch venture capital sector, we explore the goals, means and failures associated with government intervention in venture capital markets. From our preliminary analysis three themes emerge that contribute to the literature on venture capital policy. Firstly, our analysis suggests that venture capital policy is in flux: venture capital is increasingly considered a means to achieve goals beyond purely economic ones. Secondly, our findings suggest that role in venture capital markets is inherently dynamic. Finally, our findings indicate that there is little consensus on what venture capital policy approaches fit the diversity of policy goals.

# **11.1 Advancing Networks of Power: carrying Large Technical Systems theory to the future**

## Energy Information Infrastructure: The Limits of Systems Perspectives in Science and Technology Studies

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Thursday, 15th June - 09:00: (JUB-G36) - Full paper presentation

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*Antti Silvast (DTU), Sampsa Hyysalo (Aalto University), Robin Williams (University of Edinburgh), Kjetil Rommetveit (University of Bergen)*

The concept of Information Infrastructure (II) has stimulated a body of research from an interest in examining systems that are strongly interconnected, complex, and geographically dispersed. These kinds of dynamics have particular salience in current sustainable energy systems, especially with renewable energy, in which variations in generation and consumption according to weather and season and energy may be moderated by the behavior of energy users as producers as well as consumers of energy. In this provocative paper, we develop the concept of Energy Information Infrastructure (EII) to contribute to the study of these new energy issues. Energy social research and transition research have increased manifold over the last years without acknowledging the foundational and important conceptual work in II. The paper explores the reasons for this lack of conceptual development, linked to the dominating influence of transitions and systems theories on energy issues, asking what possible impacts the knowledge gap has. We demonstrate the new approach in empirical field studies on smart energy systems, heat pumps, and energy market trading. The paper concludes by suggesting an agenda for studies of EII.

## **11.2 Advancing Networks of Power: carrying Large Technical Systems theory to the future**

## Use of large technical systems theory in risk management for the UK energy infrastructure transformation

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Thursday, 15th June - 10:50: (JUB-G36) - Full paper presentation

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*Rachel Freeman (University College London)*

This paper provides background on viewing the energy infrastructure transformation through the lens of LTS theory. It identifies eight parts of the energy system that can be classed as LTSs that are vital to the energy infrastructure transformation and are expected to go through a change in LTS phase between now and 2050. The dependencies between LTSs are identified, as well as some of the risks associated with the expected phase changes. Concepts from the field of systems engineering are provided that could be applicable in dealing with an expected increase in complexity in general in the energy system. LTSs that are starting at an earlier phase now, such as for CCUS and new fuels production, have different risks compared to those existing LTSs undergoing transformation. System interdependencies are lower, there is no risk of stranded assets or resistance to change from user-citizens, user-intermediaries, or user-consumers. However, early phase LTSs carry the risks that all new technologies face, such as not achieving economy of scale or there not being enough demand due to their novelty. The implications for policy are in the need to not only to put in mechanisms for coordination of system transformation activities, to keep simultaneous changes that are interdependent, across the energy system, in step with each other. And at the same time to put in place policy instruments that support private and public organisations to innovate, develop technologies, and build the required infrastructure such as transmission and distribution and new power generation capacity. While the issue of finance and cost-competitiveness is pertinent right across the energy system for the changes planned for by government, for the evolution of some LTSs it is less important than getting the voluntary participation of those user actors with the agency to make the changes – including households and businesses. It is important for policy design to, as much as possible, ensure that there are net gains for actors active in each identified LTS from the changes being planned.

# **Economic framings of reverse salients - An analysis of electricity transmission network projects in remote regions of Europe**

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Thursday, 15th June - 10:50: (JUB-G36) - Speed Talk

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*Andreas Lindemann (University of Edinburgh), Ronan Bolton (University of Edinburgh), Mark Winskel (University of Edinburgh)*

Wind energy is a decisive element for the energy transition, but the integration of decentralised plants poses a significant problem for existing transmission networks. Historically weak network connections from windy regions mean that on many days generation already is reduced at high compensation cost. New cable routes with high-voltage direct current (HVDC) technology offer low transmission losses and could be part of a solution. but projects are either not realised or are implemented with significant delays. While the matter has hardly been considered within socio-technical research, a suitable tool is available with Large Technical Systems. Related studies offer a whole systems perspective, which appears promising for regulated and central policy governed large-scale electricity network projects. This research considers low transmission capacity from locations with high wind speeds as reverse salient for decarbonisation of electricity supply and investigates how decision-making is mediated through economic tools.

# **12.1 Gender inclusion and diversity in innovation structures**

# Integration of gender in international science, technology and innovation (STI) collaboration: learning from international feminist policies

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Friday, 16th June - 09:00: (FUL-203) - Full paper presentation

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*Riina Bhatia (VTT Technical Research Centre of Finland), Nina Rilla (VTT Technical Research Centre of Finland), Essi Laitinen (VTT Technical Research Centre of Finland), Gabriela Ferreira (Universidade de São Paulo), Catarina Milhazes (University of Coimbra)*

Science, technology and innovation (STI) is increasingly characterized by its international nature (Griset, 2020). The rising internationalization of STI is argued to be due to the growing importance of the knowledge economy, and the role of STI in finding solutions to wicked problems, such as climate change (Leijten, 2017; Schot and Steinmuller 2018). Yet, both international affairs and STI institutions that have impact on STI policies continue to be masculinised spaces, where overall resistance to women's meaningful participation remains standard practice. This has not only shaped the ways in which international STI policies and programmes influence different segments of the population, but also demarcated the group who makes decisions at the international sphere, what kind of questions are being raised and addressed, and who primarily benefits from international STI agreements and its outputs, including funding. Following the gendered organizations theory's notion of (STI and international) institutions "as sites that (re)produce gender dynamics and the gender order" (Rodriguez and Guenther 2022), we explore through a comparative case study organizations that have either implemented feminism into official (foreign) policy principle, or work as forerunners in integrating gender into STI related projects and ask "*how can feminist (foreign) policy principles guide integration of gender dimension into STI diplomacy?*".

## Public funding and equity, diversity, and inclusion in entrepreneurship and innovation ecosystems

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Friday, 16th June - 09:00: (FUL-203) - Full paper presentation

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*Karen Esteves Fernandes Pinto (InSySPo - Unicamp), Bruno Fischer (School of Applied Sciences - Unicamp), Yohanna Juk (University of Campinas (Unicamp)), Vanessa Avanci (InSySPo - Unicamp), Sergio Queiroz (InSySPo - Unicamp)*

Access to funding is critical for emerging and consolidating new innovative ventures. Several studies mention funding as one of the pillars on which Innovation and Entrepreneurship Ecosystems (EIEs) are based. However, there still needs to be more systemic knowledge about funding sources and their effects on ecosystems. Although there are several types of private funding, such as venture capital and business angels, here we focus on discussing the role of government funding in developing ecosystems. Public funding dedicated to supporting scientific research - either applied research aiming at innovation directly or more basic research - triggers innovation and the creation of new knowledge-intensive companies. First, this article aims to show how non-reimbursable funding from public sources affects the dynamics of EIEs, particularly in emerging economies, where other funding sources tend to be more abundant. Second, we intend to assess whether the presence of females on these companies' boards of directors affects the enterprise's funding source and other characteristics.

## **Gender diversity in the R&D team and the abandonment of innovation projects**

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Friday, 16th June - 09:00: (FUL-203) - Full paper presentation

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*Bettina Becker (Durham University)*

The lack of gender diversity remains an unsolved issue in firms' R&D teams. However, gender diversity influences strategic human and social capital and has been shown to be beneficial for firm innovation. At the same time, a large share of firms' innovation projects gets abandoned. This paper examines whether there is a link between gender diversity in the R&D team and the firm's abandonment of innovation projects. The 'value-in-diversity' perspective proposes that gender diversity will enhance the diversity of ideas as well as the quality of decision-making. We argue that, given an a priori fixed innovation budget, the increased innovation capability will lead to more innovation abandonment. Applying non-parametric matching methods to a sample of Spanish manufacturing firms during 2009-2016, we find evidence in support of our theoretical framework. The results are particularly robust if the increase in the R&D team's gender diversity takes place among the researchers, as compared with technicians and assistants. The positive association between the R&D team's gender diversity and abandonment is stronger at the conceptual stage of the innovation process than at the implementation stage. In the light of the learning-from-abandonment literature, these findings imply that gender diversity may improve firms' learning to prevent abandonment.

## **12.2 Assessing gender equality in research and innovation**

## **Do Stronger IPR Incentivize Female Participation in Innovation? Evidence from Chinese AI Patents**

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Friday, 16th June - 13:30: (FUL-203) - Full paper presentation

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*Sawan Rathi (Indian Institute of Management Ahmedabad), Shubhangi Agrawal (Indian Institute of Management Ahmedabad), Chirantan Chatterjee (SPRU, University of Sussex), Pavel Chakraborty (Lancaster University)*

Do stronger intellectual property rights (IPR) incentivize female participation in innovation? We provide some of the first evidence on this question using a unique database of Artificial Intelligence (AI) patents publicly shared by the USPTO. Our identification strategy leverages China's WTO TRIPs accession that led to stronger IPR in 2002 and finds a) a significant rise in the number of female inventors and b) an increase in the number of patents with females in the inventor team, vis-a-vis a control group of countries. Results are robust controlling for unobserved heterogeneity at country, technology class, and time. Additional robustness checks with synthetic control, coarsened exact matching, randomized inference and alternative control groups also support the benchmark findings. Our results also highlight that the quality of patents improved for Chinese AI patents that had female inventors in the team, post a stronger IPR. Policy and managerial implications are discussed.

## Do We Need a Feminist Bibliometrics?

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Friday, 16th June - 13:30: (FUL-203) - Full paper presentation

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*Claire Donovan (University of Greenwich)*

Bibliometrics is the scientific investigation of the quality or scientific impact of academic publications, based on data about research productivity and citation numbers. Bibliometric data are increasingly used by research managers, research funders, and the academic community to assess research excellence, and are assumed to be an objective basis for decisions about hiring, promotion, and awarding grants. However, empirical studies reveal that the concept of academic excellence is a social construct, is gendered, and discriminates against women. A literature search was conducted using Web of Science from the year 2000 onwards. Search 1 focused on the broader literature about gender and notions of academic excellence; Search 2 focused on specialised studies of gender and bibliometric data. The broader literature reveals systemic gender bias in the production and interpretation of data that shape notions of 'excellence'. This includes teaching evaluations, and data used in academic recruitment, granting promotion / tenure, and the awarding of funding. Studies on publication metrics report gender effects regarding research productivity, journal peer review decisions, the gender citation gap, and the lower visibility (and hence lower status) of feminist research and gender studies. There is conflicting evidence for and against bibliometrics being a technology that can harm or liberate women academics, and which can expand our understanding of the dynamics of gender studies and feminist scholarship within the wider research system. There is extensive evidence of gendered data collection and interpretation negatively affecting women's career progression. Bibliometric data are generally viewed as neutral, yet can amplify gender biases when used to inform judgements about research excellence. Following the example of feminist economics, there is a case for a feminist bibliometrics. Feminist economics is a gender-aware, inclusive approach to economic enquiry, which highlights the social construction of traditional economics and offers alternative methods and models. Feminist bibliometrics is a potential intervention for data suppliers and users, which accepts that bibliometric data are socially constructed, recognises the need for indicator design to be gender sensitive, and exposes and removes gendered assumptions and biases.

# **13.1 Learning to transform: Connecting urban experimentation and urban policy mixes better**

## **Reframing places, communities and identities: social learning in urban experimentation**

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Thursday, 15th June - 15:00: (JUB-G32) - Full paper presentation

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*Anna Baatz (Leibniz Institute of Ecological Urban and Regional Development), Franziska Ehnert (Leibniz Institute of Ecological Urban and Regional Development)*

A central promise of urban experiments is to create sites for social learning. However, research on such learning in sustainability transitions still lacks conceptual clarity and empirical evidence. This article helps to close this gap by analysing how social learning emerges from urban experimentation. It adopts a transactional understanding of learning induced by disruptions of everyday habits and distinguishes cognitive, normative and relational learning processes. Further, the additional dimension of socio-material learning is derived to account for changes in understanding or interpreting material realities. These concepts serve an analytical framework for a case study of two transition experiments of the transdisciplinary research project “Dresden – City of the Future”. The two urban experiments strive to initiate local sustainability transitions in the area of participatory governance of urban districts and co-creation of a liveable schoolyard. The empirical results illustrate how interventions by the two urban experiments induced learning in the sense of changes of cognitive understandings, norms, relations between people and also between people and their socio-material environments. The experiments encouraged individual and collective learning and in particular the formation of collective identities and interpretations of particular places. By comparing two urban experiments, the article further shows differences in learning with regard to the actor groups: The majority of learning processes in the first experiment dealt with bridging the gap between prevalent routines of the school community and novel habits introduced by the initiators of the experiment. Participants of the second experiment were socio-ecologically minded from the outset and therefore fewer learning processes took place in this regard.

## **Experimental learning: The role of intermediaries in creating robust learning ecosystems for urban transformations**

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Thursday, 15th June - 15:00: (JUB-G32) - Full paper presentation

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*Jonas Bylund (KTH Royal Institute of Technology)*

The paper explores what systemic learning vis-a-vis experimental governance and urban living labs is, could, and perhaps should be. A common issue among various kinds of experimental governance actions (placemaking urban acupuncture, city street experiments, urban living labs, Reallaboren, etc) is how the findings and results can be used to inform urban transformations. The underpinning theory of change implies 'learning' by different actors but this is often black-boxed or simply assumed to happen automatically in the context of experimental actions and projects. How is the move from experiments to transformations in urban and regional development contexts from the point of view of learning? Recent research focus in the field of urban transformations has pointed out that while governance learning is crucial, it is also a blind spot, particularly when it comes to local urban governance administration and policy making. The paper at hand aims to complement and further this call for better understanding by outlining the role of learning intermediaries in learning ecosystems and ask questions on the systemic character of learning in urban transformations to complement the more common focus on intra-organizational learning. The paper draws on ongoing research and aims to open up the black box of experimental learning by examining the roles of these intermediaries who facilitate learning exchanges among a wide range of urban stakeholders. It investigates the emergence of learning ecosystems that embody deliberate and explicit modes of knowledge production, translation and transfer. The findings highlight the opportunities and challenges of using learning to catalyse policy mixes for urban sustainable transformations, learning cultures and infrastructures, as well as a learning typology. Finally, the paper concludes by a question on the ecosystem orchestration.

## **13.2 Learning to transform: Connecting urban experimentation and urban policy mixes better**

# **Tracing the role of universities in urban regeneration, experimentation, innovation, and development – a systematic review**

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Thursday, 15th June - 16:40: (JUB-G32) - Full paper presentation

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*Debapriya Chakrabarti (The University of Manchester), Alina Kadyrova (The University of Manchester), Elvira Uyarra (Alliance Manchester Business School), Kieron Flanagan (The University of Manchester), Mabel Sanchez Barrioluengo (The University of Manchester)*

Universities and Higher Education Institutes (HEI) have historically had an impact on urban spaces, but there are now growing calls for institutes to play more active economic and civic roles in their cities and regions, sometimes known as the “third mission.” This change in how universities are viewed is particularly clear in the civic university commission’s commissioning, which aligns with the UK government’s place-based regeneration and development objectives. This paper through studying academic literature, conceptualises urban regeneration, experimentation, and other university-led civic roles by conducting a systematic review and meta-analysis. This paper builds towards a renewed understanding of the changing role of universities in urban settings and its relevant implications.

## **Navigating the Complexity of R&D Manipulation: Unraveling the Impact on Government Incentive Policies and Corporate Innovation in Smart City Pilots**

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Thursday, 15th June - 16:40: (JUB-G32) - Full paper presentation

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*Yao Qu (Nanyang Technological University), Jue Wang (Nanyang Technological University)*

This study investigates the influence of strategic R&D investment manipulation on the effectiveness of government R&D incentive policies, particularly subsidies, within the framework of smart city pilot policies and its implications for corporate innovation. Utilizing a moderated mediation model, we analyze data from publicly listed Chinese firms (2008-2020) to uncover the complex relationship between smart city pilot policy implementation, government subsidies, R&D manipulation, and innovation outcomes. Our findings reveal that the intended policy outcomes are not achieved due to R&D manipulation, which entails altering accounting items and fails to generate substantial innovations. We identify a higher prevalence of R&D manipulation among non-SOE, technology-intensive enterprises, leading to a more significant distortion of R&D incentives. Consequently, we advise policymakers to consider the interplay between subsidies and R&D manipulation when formulating smart city pilot policies, striking a balance between fostering innovation, and preserving business ecosystem stability.

# Transforming urban infrastructure maintenance through robotics innovation: Repairing fragmented policy mixes

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Thursday, 15th June - 16:40: (JUB-G32) - Full paper presentation

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*Carlos Cuevas-Garcia (Technical University of Munich)*

Robotics applied to the sector of infrastructure inspection and maintenance has gained momentum in innovation policy in Europe and around the world (Zillner et al. 2020). Since climate change increases the amount of rain and exposes construction materials to more extreme temperatures, it speeds up infrastructures' deterioration. The assumption is that autonomous robots and drones can produce information about infrastructure's decaying state more rapidly, accurately, and sustainably than current practices. By enabling rapid response to decay, infrastructure asset managers save economic and energy resources, and urban services and the urban order are less disrupted. Robotics also is meant to make a positive impact on occupational health and safety, since maintenance work usually takes place in or close to dangerous areas such as trafficked roads and railways, high scaffold structures, bridges and power lines, and dark and dirty sewers underground. It is estimated that infrastructure inspection and maintenance services represent a global market of 450 billion Euros, part of which could be channelled to the robotics community. However, to conquer this market and make technically feasible, democratically acceptable, and practically implementable robots is a challenging task, in part because of the high level of diversity and fragmentation of the sector. This paper presents an analytical framework that helps to examine the interrelations and co-evolving dynamics between the nascent field of inspection and maintenance robotics and the European policy mix.

# **14.1 Steering towards impact**

## Steering academics toward social impact. Can we avoid perverse incentives?

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Wednesday, 14th June - 09:00: (FUL-201) - Full paper presentation

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*Emanuela Reale (CNR IRCRES)*

The search for research quality and the development of activities toward producing social impact might be difficult to harmonize. Universities and public research organizations must answer to requirements deriving from government policies and their institutional strategies to preserve and possibly improve both quality and impact. At the same time academics struggle for career and reputation in order to gain visibility in their field/research area. The paper wants to deepen how the literature addressed the perverse effects that can derive from the difficult harmonization between pursuing impact and quality at institutional and individual level in the academic context. In this respect, the main research questions are:

- How the literature drafts the differences between assessing output, outcome and impact and methods to assess what you want to assess?
- What are the proposed approaches of assessing impact between different disciplines and how the approaches create conflicts with the epistemic communities?
- How can indicators of impact assessment and parameters of research strategies reinforce each other and how can you avoid the risk of perverse incentives at individual level?

## **14.2 New perspectives 1**

## How unpredictable is research impact? Evidence from the UK's Research Excellence Framework

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Wednesday, 14th June - 13:45: (FUL-201) - Full paper presentation

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*Ohid Yaqub (SPRU, University of Sussex), Dmitry Malkov (Elsevier), [Josh Siepel \(SPRU, University of Sussex\)](#)*

Although *ex post* evaluation of impact is increasingly common, the extent to which research impacts emerge largely as anticipated by researchers, or as the result of serendipitous and unpredictable processes, is not well understood. In this paper we explore whether predictions of impact made at the funding stage align with realised impact, using data from the UK's Research Excellence Framework. We exploit REF impact cases traced back to research funding applications, as a dataset of 2,194 case-grant pairs, to compare impact topics with funder remits. For 209 of those pairs, we directly compare their descriptions of ex-ante and ex-post impact. We find that impact claims in these case-grant pairs are often congruent with each other, with 76% showing alignment between anticipated impact at funding stage and the eventual claimed impact in the REF. Co-production of research, often perceived as a model for impactful research, was a feature of just over half of our cases. Our results show that, contrary to other preliminary studies of the REF, impact appears to be broadly predictable, although unpredictability remains important. We suggest that co-production is a reasonably good mechanism for addressing the balance of predictable and unpredictable impact outcomes.

## **14.3 Evaluating Impact**

## Assessing and monitoring the impact of research projects on sustainability goals

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Thursday, 15th June - 09:00: (FUL-201) - Full paper presentation

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*Susanne Buehrer (Fraunhofer Institute for Systems and Innovation Research ISI), Florian Roth (Zurich University of Applied Sciences)*

The aim of this paper is to present an evaluation and monitoring framework to determine the contributions of research projects to solving the major challenges associated with the Sustainable Development Goals (SDGs). This framework allows to identify factors that promote or hinder the generation of impact, which can then be used to make strategic adjustments to research projects at an early stage. In recent years, the requirements for monitoring and evaluating research projects have changed considerably. Following Pasanen & Shaxson (2016), the main drivers for this are: 1) growing expectations by stakeholders towards research to make a direct and tangible contribution to solving major challenges, 2) a stronger orientation of research institutions towards stakeholder interests, leading to an increased demand-orientation of research, 3) the embedding of individual research projects in larger contexts, such as the SDGs or other international agendas, 4) the ability to deliver results in complex and dynamic contexts. In combination, these developments have led to a re-orientation of the evaluation approaches and the emergence of different impact-centred theoretical frameworks and guidelines. At the same time, few approaches allow the assessment and monitoring of sustainability impacts on the level of specific research projects. Specifically for smaller research projects, there is a lack of feasible instruments to identify potential challenges on the journey towards sustainability impacts at an early stage. Against this background, our main research objective is to present a simple and easy-to-use monitoring tool that takes up the central discussions from evaluation and impact research and presents practical solutions for addressing them.

## Investigating and improving the use of societal impact assessment approaches

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Thursday, 15th June - 09:00: (FUL-201) - Full paper presentation

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*Stefan de Jong (Erasmus University Rotterdam), Adrián Diaz-Faes (INGENIO (CSIC-UPV)), Richard Woolley (INGENIO (CSIC-UPV)), Jordi Molas-Gallart (INGENIO (CSIC-UPV))*

In 1945 Vannevar Bush argued that science would result in health, security, and welfare benefits for society if science was granted stability of funds and autonomy. Although present-day governments still expect science to result in benefits for society, the perspective on how to ensure these benefits has changed radically. A core element of the newly changed perspective on societal benefits of science is the monitoring and evaluation of these benefits, or ‘societal impacts.’ Science, Technology and Innovation Policy Studies (STIPS), a scholarly community that studies and designs societal impact evaluation, arguably has a responsibility in contributing to the improvement of societal impact evaluation practices. One of its major contributions is shifting the focus from quantitative and result oriented assessments to qualitative and process oriented (QaPo) assessments. To obtain insights into how some of the most well-known QaPo approaches contribute to the improvement of societal impact assessment practices and how to improve the contribution of these and future approaches, in this working paper we ask the two following research questions: 1) How have QaPo impact assessment approaches been used to assess impact? and 2) what can we learn from this use to improve current and future impact assessment approaches? We aim to answer these questions by employing distinguish three perspectives on research use: how it is used, to what extent it is used, and who uses it. We use four well-known QaPo’s (ASIRPA, Contribution Mapping, Public Value Mapping and SIAMPI) to investigate use quantitatively and qualitatively in scholarly and grey literature. We find that 1) the use of the four selected approaches concentrates within the regions and disciplines to which the authors of the introductory papers are affiliated and 2) evidence for instrumental use in the sense of integrally using the QaPo assessment approaches is limited. Yet, we do find evidence for conceptual use, as the inclusion of elements of the approaches in new assessment exercises indicate. We also find ample evidence for symbolic use. Often the approaches are cited to support generic statements about the availability of QaPo assessment approaches statements that emphasize that impact is a process.

## **14.4 New Perspectives 2**

## Societal impact, Language and Ideology

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Thursday, 15th June - 10:50: (FUL-201) - Full paper presentation

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*Lise Moawad (Robert K. Merton Center for Science Studies - Humboldt-Universität zu Berlin), Cornelia Schendzielorz (Robert K. Merton Center for Science Studies - Humboldt-Universität zu Berlin), Martin Reinhart (Robert K. Merton Center for Science Studies - Humboldt-Universität zu Berlin)*

This paper addresses the question of how the reciprocal relations between societal impact, the ways it is expressed, and the systems of ideas surrounding it are organised. We argue that semantic as well as literary criticism, as a method of investigation, is well suited to provide tools for this inquiry. The theoretical objective of this analysis is to highlight the performative and ideological aspects of science policy language as it pertains to the societal impact of academic research. We proceed in five steps: After a brief outline of the state of research on societal impact, we present how the topos of societal impact can be approached with tools of literary criticism. We then explain definitions of ideology relevant to our analysis and introduce the techniques and methods for reconstructing the ideological aspects of societal impact. The following analysis carries out a literary discourse analysis applying lexical-semantic techniques, sentence and text-semantic procedures, pragmatic text-linguistic techniques, and semiotic techniques. We thereby examine impacts in its (e)valuating effect, impact as a linguistic device, impacts rhetoric as well as impact as a pervasive paradigm. We finally sum up our findings in the conclusion and reflect on societal impact as a nodal point of debate both in the academic and political spectrum. This contribution thus aims to serve as an introduction to linguistic tools that can be useful for research on science policy concepts such as societal impact.

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## Moral Panic and the Impact Agenda

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Thursday, 15th June - 10:50: (FUL-201) - Full paper presentation

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*Claire Donovan (University of Greenwich)*

In policy circles, the need to assess research impact has increasingly become regarded as an important obligation in the social contract between science and society, namely to demonstrate that publicly funded scientific research addresses topics of pressing national concern. Assessment of research impact has been sought at the level of individual research projects, the analysis of funding programmes, and at the level of national research assessment exercises. This assessment may be *ex ante*, *ex nunc*, or *ex post*; may be premised on returns to industry and the economy, or on broader societal and public value; and may be based on simple metrics, peer or ‘end-user’ review, or sophisticated mixed-method approaches. This paper surveys policy documents ((international research policy, publicly funded research organisations) to trace the evolution of reasons for, and approaches to, assessing research impact. In so doing it provides a meta-analysis of philosophical approaches and audit typologies. In counterpoint, the paper will also systematically analyse academic literature on research impact for narratives of resistance (or ‘moral panics’) within the research community about what has been pejoratively labelled the ‘impact agenda’, or a philistine economic rationalisation of the returns from research. However, the meta-analysis will demonstrate that the evolution of approaches to assess research impact follow a ‘social democratic’ trajectory that aims to: (i) illustrate the public value of basic and applied research; (ii) support the importance of the humanities, creative arts, and social sciences in their own terms; and (iii) provide a post-positivist antidote to New Public Management audit regimes. The paper will conclude that despite these developments, broadly speaking, policymakers have failed to dispel the idea of a narrow ‘impact agenda’, while many academics have not sought to advocate the importance to society of ‘blue-skies’ and apparently esoteric research areas. In this respect, we need a ‘cynical-sentimental’ science policy that combines economic and broader public benefits: in this way research impact assessment will allow us to know the *price* of everything and the *value* of everything.

## **The use of research in a formal policy-making process: governing gambling in Norway**

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Thursday, 15th June - 10:50: (FUL-201) - Full paper presentation

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*Richard Woolley (INGENIO (CSIC-UPV))*

This paper describes the use of research in submissions to public hearings on new gambling law and regulations in Norway. In contrast to most analyses of research use in policy making, it focuses on stakeholders as research users rather than policy makers. Around one third of submissions to the two public hearings include research. The paper analyses the main uses that stakeholders make of research in advocating certain positions with regard to proposed laws and regulations.

## **14.5 Different forms of research and impact**

## Predicting the scholarly impact of manuscripts before their publication

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Thursday, 15th June - 15:00: (FUL-201) - Full paper presentation

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*Giovanni Abramo (National Research Council of Italy), Ciriaco Andrea D'Angelo (University of Rome "Tor Vergata"), Leonardo Grilli (University of Florence)*

Knowledge production has no socioeconomic value until it is used in the further advancement of knowledge itself (scholarly impact), or to improve practices, goods, or services through incorporation in product or process technologies (social impact). For diffusion of their research results, scholars encode them in written forms, mostly intended for publication in scientific journals. For assessment of the manuscripts, journal editors recur to peer reviewers, who are asked to provide recommendations based on the quality of the manuscripts (e.g. originality, significance, rigour). These assessments are inevitably subjective, as evidenced by frequent divergences among peers considering a single paper. While quality is the main determinant of future impact, non-scientific factors concur. But, if it is impact that is the ultimate aim of research, then the selection of manuscripts for publication should also be based on those potentially influential non-scientific factors. We analyse nearly two million 2017 publications and their impact, measured by normalized citations accrued to 2022. Based on theory and previous literature, we extrapolate the publication traits of text, byline, and bibliographic references that are expected to relate to future citations. We then fit a regression model with the outcome variable as the scholarly impact of the publication, and the independent variables as the above non-scientific traits, controlling for fixed effects at journal level. Overall, such variables explain more than 20% of the paper's impact, with little variation across disciplines. The remaining 80% is evidently explained by the inherent quality of the manuscript, but also the marketing activities by the authors, and some non-scientific factors not included in the statistical model. Our bibliometric system could assist editors, complementing the recommendations from peer review. In particular, in case of divergent recommendations, the bibliometric system would suggest not rejecting a paper with expected non-negligible future impact, or conversely, rejecting one that would not receive adequate scholarly attention. This avoids the need for recourse to an additional reviewer, with evident advantages in expenses (opportunity cost of additional reviews), and time (delay in diffusing new knowledge to potential users).

## There's a Railroad in my Backyard: Building trust in Policy-Relevant Science through Citizen Science

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Thursday, 15th June - 15:00: (FUL-201) - Speed Talk

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*Kirsten Vegt (National Institute for Public Health and the Environment (NL: RIVM)), Laurens Hessels (Rathenau Instituut),  
Janneke Elberse (National Institute for Public Health and the Environment (NL: RIVM))*

Noise pollution has become a serious concern in many communities worldwide, and it is essential to measure its effects on residents' health and well-being for effective policy making. However, the current scientific approaches to determine noise pollution are often disputed and distrusted by citizens for various reasons. This study aims to explore the potential of citizen science to enhance the *trustworthiness of* policy-relevant science on noise pollution, and provide greater clarity on how citizen science could foster *trust in* policy-relevant science. A case study was conducted in a Dutch village to monitor noise levels from passing freight trains, using a citizen science approach. Citizen scientists and 'professional' scientists collaborated to design a measurement plan and monitor the project's progress through project meetings. Citizen scientists placed sound level meters outside residential buildings and used an app to document noise events, of which the data is immediately and publicly available on an online platform hosted by the Dutch National Institute for Public Health and the Environment (RIVM). Additionally, a survey was conducted to provide a comprehensive picture of how noise pollution impacted the whole village. Interviews with the citizen -and professional scientists that are involved in the project are being conducted to gather data on their perspectives on how citizen science influences trust and trustworthiness of policy-relevant science (data collection is ongoing during the writing of this abstract). This case study contributes to the growing literature on citizen science and its potential impact on society. The preliminary patterns in the collected data indicate that citizen science noise monitoring can foster trust and trustworthiness regarding policy-relevant science. The data collected by citizen scientists fill in knowledge gaps and increase the relevance of the research findings, potentially enhancing the trustworthiness of policy-relevant science in various ways. Furthermore, citizen science seems to fulfill the promise that it can foster trust in policy-relevant science, reducing the distance between science and society. Finally, this study provides insight into the ways policy-relevant citizen science can have a meaningful impact on policy.

## Academic Awards and Firms Technological Innovation in China: The View of Institutional Logics

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Thursday, 15th June - 15:00: (FUL-201) - Speed Talk

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*Yutao Sun (Dalian University of Technology), Lingzhi Chen (Dalian University of Technology)*

Although many recent studies have emphasized the influence of market logic on academic research in the science field, whether and how academic logic draw on Merton's reward system of science influencing on firms' technological innovation (FTI) is undertheorized. From the perspective of academic logic, the paper investigates the influence of academic awards on FTI, the influence of the interaction between academic logic and market logic on FTI, and explores the moderating effect of firms' ownership. Taking the Chinese State Science and Technology Progress Award (SSTP Award) as an example, this paper empirically tests our arguments using the propensity score matching (PSM) strategy and difference-in-differences (DID) method and a longitudinal dataset on firms from 2008 to 2020. Our results show that the academic awards can promote the FTI capability following the academic logic, however the economic rewards following the market logic and the honor incentives followed by academic logic are conflict in periods of China institutional transition. We also find that the influence of the SSTP Award on technological innovation of state-owned enterprises (SOEs) is better than that of non-SOEs, but the academic logic of neither SOEs nor non-SOEs fully merge with market logic.

# **15.1 Growth, post-growth, science, policy and flourishing ecosystems**

## **Fifty years since innovation scholars criticised “The Limits to Growth”: how much has changed in the environmental politics of science and technology policy?**

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Wednesday, 14th June - 13:45: (FUL-213) - Full paper presentation

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*Adrian Smith (SPRU, University of Sussex), Adrian Ely (SPRU, University of Sussex)*

This paper approaches the question of aligning technology policy with ecological values from a long-term perspective. We take the fiftieth anniversary of the Limits to Growth (LtG) model of environment-economy relations to look at the debates it generated about technology, social values and ecosystem flourishing. Specifically, we look at critical responses to LtG made in the 1970s by innovation scholars in SPRU and Fundación Bariloche. Their critical analyses of the LtG modelling and the arguments they counter-posed about technology development provides helpful historical perspective on arguments for realignments today. The paper summarises the critique in terms of the role of models in policy, ideologies of development, the scope for greener industrialisation, and the centrality of social and political change in any future-oriented strategy. In taking the longer view, we discern three different approaches to the environmental politics of science and technology policy: green growth; degrowth; and pluriverse. In the second half of the paper, we discuss how protagonists in each approach understand technology and ecology very differently and recommend different methods for their alignment. Future technology policies would do better by learning to listen carefully to these different approaches, supporting them more equitably by opening space for material demonstrations of degrowth and pluriverse realignments, and facilitating dialogue and democratic deliberation across each approach.

## Advancing sustainable health research

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Wednesday, 14th June - 13:45: (FUL-213) - Full paper presentation

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*Susan Guthrie (RAND Europe), Pamina Smith (RAND Europe), Chryssa Politi (RAND Europe), Cecilia Ang (RAND Europe)*

Health research is conducted with the ultimate goal of improving global health and yet its practices and procedures contribute to one of the greatest health challenges of today: the climate crisis. Although not traditionally recognised as a health issue, climate change contributes to critical global health risks today, including the expansion of vector-borne disease and heat-related illnesses. The aim of this study is to explore mechanisms through which the environmental impact of conducting health research can be measured and reduced. We have conducted a landscape review and have identified 85 interventions which aim to address the environmental impact of health research, spanning networks, campaigns, calculators and measurement tools, guidelines, education programmes, standards/certifications, funding schemes and sustainable service providers. We also identify some key gaps in the evidence demonstrating a need for further investment and reflecting the limited resources committed to date. Action needs to be taken at a sector level to establish consensus and progress sustainable practices as part of a wider consideration of research culture and ethical research.

## **15.2 Foresight on STI and flourishing ecosystems**

# The interface of science and technology policy and sustainable land-use: Exploring the implications of three different perspectives on human nature relationship

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Wednesday, 14th June - 15:45: (FUL-213) - Full paper presentation

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*Nikos Kastrinos (European Commission), Totti Könnölä (Insight Foresight Institute (IFI)), Philine Warnke (Fraunhofer Institute for Systems and Innovation Research ISI)*

Science, technology and innovation policy is increasingly associated with the pursuit of high-level goals and with providing solutions to societal challenges. While research can be targeted to particular problems, its contributions to solving them are serendipitous and probabilistic depending on a shared definition of the problem and a shared understanding of the search space for solutions, between research funders, researchers and other stakeholders in society. We see foresight as a means of developing and exploring such shared understandings. The concern with directing innovation towards sustainability and flourishing ecosystems is shared across the spectrum of green growth and de-(post)-growth perspectives. Both perspectives provide directions for science, technology and innovation policy aiming at human flourishing, in an environmental context, often under-appreciated and defined by prices or regulations. We argue that it is important to develop views of human flourishing in flourishing ecosystems, where the emphasis is on the latter. Land use is critical for both human and ecosystem flourishing and lies at the centre of current environmental crises especially as regards biodiversity and combating climate change. We develop three scenarios of flourishing ecosystems from three different ethical perspectives: a) separation of humans from nature: protecting and restoring ecosystems; b) integration of nature to human society: co-shaping socio-ecological systems; and c) integrating of human society into nature: caring within hybrid collectives. These scenarios are used to derive and discuss agendas for science, technology and innovation and how such agendas could contribute to flourishing ecosystems.

## **Convergence of Science and Policy: The case of livestock breeding and biodiversity in India.**

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Wednesday, 14th June - 15:45: (FUL-213) - Full paper presentation

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*Debanjana Dey (Indian Institute of Science, Bangalore)*

The assumption that the relationship between science and policy is linear, leads to believe that either scientific evidences are directly used for policy making or policies demand certain evidences or technologies from the sciences which they then deploy. However, there exists a complex relationship between the two. This paper tries to determine the relationship between science and policy by analyzing how policy change occurs and how such changes influence scientific research. This has been explained by using two aspects of livestock sector in India i.e., breeding and biodiversity. We find that the relationship between science and policy indicated an 'agenda setting relationship' where science complied with the policy agenda of 'increasing yield' and 'increasing utility' for economic benefits. Scientific research can and should cater to policy goals. But sciences should maintain a much larger and diverse knowledge agenda without being limited to particular agenda setting framework for acceptance by the policy. The paper also tries to capture the real-life experience of knowledge and policy convergence for livestock breeding and biodiversity in a pastoral community setting. This was done with the objective to determine whether the real-life practices were same or different from the relationship observed for formal science and policy. The findings from the field (Maldhari community in Banni grasslands, India) showed that the convergence of knowledge and policy in the field was different from the formal codified science and policy convergence. Their relationship revealed a co-evolutionary mechanism with ecological understandings and socio-cultural values. The convergence of knowledge and policy within the community setting was not just for one instrumental value like milk yield or breed conversation, but for a balance between different variables within an ecosystem, with space for the environment to play its own evolutionary roles. Such community level knowledge-policy relationships provide an alternative relationship and offer lessons that both science and policy should learn from and with informal local knowledge systems; they should consider the co-evolution of mutually dependent systems, especially for the conservation of biodiversity; and they should engage in consultation and open dialogue with all the stakeholders for any decisions to be taken.

## **STI futures of deep-sea mining and human-nature relationships**

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Wednesday, 14th June - 15:45: (FUL-213) - Full paper presentation

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*Susanna Bottaro (AIT - Austrian Institute of Technology)*

With deep-sea mining closer than ever to becoming a reality and many questions still unanswered about the practice, policymakers are in a key position to direct the future of this practice towards sustainability. To create and govern this future, policies in the realm of Science, Technology and Innovation (STI) must be put in place with attention and purpose. The aim of this paper is to spur imagination about what sustainable deep-sea mining could be and how to reach it by looking into humans' relationship with Nature and the consequent STI developments. Utilizing the framework developed by Warnke et al. (2021) on the perspectives on ecosystem performance and a STEEPV analysis, three future scenarios of sustainable deep-sea mining (DSM) operations are developed: from a centralized and stringently enforced system of highly efficient AI-powered marine robotics, to a polycentric system of controlled exploitation of seabed resources with biomimetic machinery, and to a network of localised interspecies collectives where humans with the help of deep-sea fauna can themselves harvest minerals. Each of this scenarios leads to a variety of policy directions that policymakers today can consider in working towards the future that they imagine for deep-sea mining.

# **16.1 Foresight for policy**

## Foresight on Demand: Lessons from Responsive Foresight on Emerging and Complex R&I issues

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Thursday, 15th June - 15:00: (JUB-G36) - Full paper presentation

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*Dana Wasserbacher (AIT Austrian Institute of Technology), Karl Matthias Weber (AIT Austrian Institute of Technology), Kerstin Cuhls (Fraunhofer Institute for Systems and Innovation Research ISI), Totti Könnölä (Insight Foresight Institute & University of Alcalá), Giovanna Giuffrè (ISINNOVA), Tanja Schindler (Astrat), Nikos Kastrinos (European Commission)*

While facing ongoing multiple crises, the interest in and demand for Foresight to support STI policy has been growing over the past years. At the same time, the crises have eroded people's trust in governments, as markets fail, ecosystems deteriorate, and technological dependencies grow. This has raised high expectations, nurtured by the scientific communities, regarding a more effective and 'transformative' STI policy enhancing future preparedness and addressing emerging societal challenges. We - as practitioners in these processes - reflect on these challenges and how they have been addressed in recent Foresight practice at the intersection of science and policy. We conduct a cross-cutting analysis of FoD Foresight projects to highlight new governance needs. We want to show how these emerging needs were addressed through the participatory design and implementation of specific Foresight activities by analysing a set of strategic features at the level of specific Foresight projects, such as key design elements (i.e. purpose and objectives, targeted audience, Foresight knowledge sources, methods, participation, outputs, alleged impacts) and how they relate to context-specific needs and requirements (i.e. the characteristics and culture of the innovation policy governance sub-system, embedding in policy-preparing processes, interactions and power relationships in the institutional environment, client expectations and needs, etc.) as well as to features characterising the success/failure (e.g., in terms of generating usable knowledge, building of actor networks, triggering conflict, etc.) and impact of the respective Foresight projects. The findings will contribute to a better understanding of how to address governance needs without compromising on key characteristics of Foresight, as well as help to sharpen the view on appropriate entry points for Foresight in policy-making processes.

## Anticipating disruptions and building scenarios to underpin EU R&I policies: Foresight for the 2nd Strategic Plan of Horizon Europe

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Thursday, 15th June - 15:00: (JUB-G36) - Full paper presentation

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*Attila Havas (AIT, Austrian Institute of Technology, Center for Innovation Systems and Policy & Institute of Economics, Centre for Economic and Regional Studies), Karl Matthias Weber (AIT Austrian Institute of Technology), Kerstin Cuhls (Fraunhofer Institute for Systems and Innovation Research ISI), Nikos Kastrinos (European Commission)*

With a major foresight project on the future orientations for the 2<sup>nd</sup> Strategic Plan of Horizon Europe, the European Commission has opened a new page in making use of foresight for underpinning the development of large-scale strategic policy initiatives. The project has supported forward-looking thinking and anticipatory capacity-building in public sector organisations by creating new foresight infrastructures, building inter-organisational networks, and mobilising futures literacy and domain expertise around selected themes to underpin the definition and adaptation of policy strategies and actions. The first component of the project has focussed on potentially disruptive developments in the global and EU context. We have explored possible future changes in these contexts for EU R&I policies to identify those areas of change that might have disruptive impacts on the EU's ability to achieve its overarching policy goals. The multi-level context scenarios have shown the added value of this method for selecting and framing policy issues. Horizon scanning and the "deep dives" on disruptive trends and drivers have deepened our understanding of disruptive developments in research and innovation as well as in society. With these methods we have identified candidate areas for inclusion in the 2<sup>nd</sup> Strategic Plan. Drawing on these two components, a visionary outlook and possible suggestions for the 2<sup>nd</sup> Strategic Plan have been derived in interaction with the different communities of practice, supported by an online consultation to sharpen and select candidate fields of R&I for the second phase of Horizon Europe and the next framework programme. The paper presents *policy implications* distilled from prospective analyses: how to tackle the disruptive factors at context and area levels, e.g., how to take advantage of the favourable ones; how to prevent or 'amend' the unfavourable ones; and how to adapt to the unstoppable ones. As a *methodological conclusion*, we claim that a carefully designed set of processes, approaches, and methods are needed for selecting and framing issues when setting R&I policies in an increasingly volatile environment characterised by multi-level governance and interactions among policy tools devised and used in different policy domains.

## Challenging Anticipatory Assumptions in STI policy - a door opener for next generation STI policy?

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Thursday, 15th June - 15:00: (JUB-G36) - Full paper presentation

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*Philine Warnke (Fraunhofer Institute for Systems and Innovation Research ISI), Nikos Kastrinos (European Commission), Totti Könnölä (Insight Foresight Institute (IFI)), Ralph Gutknecht (Fraunhofer Institute for Systems and Innovation Research ISI)*

We consider STI funding programmes as an expression of dominant collective expectations about the future within the STI community and, in particular, among the respective STI policy actors. Extracting these expectations and subjecting them to a critical dialogue with actors, within and beyond the STI community, can add value to Foresight practice that has primarily targeted individuals' expectations through interactive dialogue. We demonstrate this approach by relating insights from a recent investigation of expectations and future assumptions within the Horizon Europe Work Programme 2021-2022[1]. In this study we have screened 13 Work Programme Documents with a total number of 2890 pages. Through a qualitative software supported content analysis we identified 202 assumptions about the future across all documents. After the phases of analysing and classifying, we submitted a selected set of 56 assumptions and expectations to expert validation using an argumentative Delphi Survey. The results of the screening indicate strong assumptions about the future world and about causal relationships within this world underlying the Horizon Europe work programme. The assessments of the experts from the Delphi survey often question these assumptions. Our analysis of their responses points to three ways in which anticipatory assumptions may critically interfere with the potential impact of the R&I activities. We venture to conclude that critiquing assumptions through work programme analysis could become a highly pertinent contribution of Foresight to STI policy and well worth to be added to the set of six aspects listed in the track description. We feel that better harnessing this potential may help open the door for the "next-generation STI policy" targeted in this session and even in a wider sense "research with impact" addressed by this conference. [1] The study was financed by the European Commission DG Research & Innovation RTD G1: Common R&I Strategy & Foresight Service through the Framework Contract Foresight on Demand Impact Assessments, Evaluations, Foresight and Strategic Analyses of Research and Innovation policies and programmes. The views presented in this paper are views of the authors and do not necessarily reflect the views of the European Commission, nor engage it in any manner.

## **16.2 Eco-foresight**

## **Ingredients for future oriented collective intelligence. Lessons learned from an exploration of STI's potential to contribute to ecosystems' flourishing**

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Thursday, 15th June - 16:40: (JUB-G36) - Full paper presentation

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*Radu Gheorghiu (Institutul de Prospectiva), Bianca Dragomir (Institutul de Prospectiva)*

Identification of the Science, Technology & Innovation (STI) directions with the highest potential to contribute to the capability of planetary ecosystems to flourish from now to 2050 stays at the core of the R&I policy in the context of the current ecological pressure. A recent EC funded project (“S&T&I FOR 2050. Science, Technology and Innovation for Ecosystem Performance – Accelerating Sustainability Transitions”) took the challenge of both broad and deep mapping of promising STI directions. To this end, the authors used results from a horizon scanning system as starter directions and examples in a Dynamic Argumentative Delphi, engaging over 600 highly cited scientists into a process of enriching and assessing STI directions. This paper explores the challenges of combining the two methods and their potential to nurture more stable forms of collective intelligence.

## Exploring alternative climate change scenarios: reflecting innovation and precaution

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Thursday, 15th June - 16:40: (JUB-G36) - Full paper presentation

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*Totti Könnölä (Insight Foresight Institute & University of Alcalá), Duncan McLaren (University of California), Sirkku Juhola (University of Helsinki), Benjamin Sovacool (Sussex University), Kerstin Cuhls (Fraunhofer Institute for Systems and Innovation Research ISI)*

STI policy is facing growing challenges to address normative and ethical considerations. The paper responds to this challenge by exploring how scenario work could offer a safe discursive space for stakeholders to explore future developments, to combine related value-driven and normative perspectives, and help distil recommendations for STI policy. In the realm of mitigation and adaptation to climate change symptoms, such scenario processes facilitate exploring value-driven perspectives even on very controversial topics without forcing participants to prioritise or vote for “the best” path for action. We consider how to responsibly explore the role of radical societal changes and new technological options, including the most controversial ones like geoengineering. We introduce a case study of an expert group for the project “Foresight on Demand. Preparation of the 2nd Strategic Plan” on behalf of the European Commission, conducted to contribute to EU R&I policy-making. Four scenarios were constructed to support exploring what kind of radically new research and innovation (R&I) activities could be developed in the second part of the framework programme Horizon Europe (2024-2027). The process developed ensures attention is not only given to novel technologies and practices, but also to ways in which to overcome existing techno-institutional lock-ins and phase out or scale down unhelpful practices. A review of the scenarios allows attention to be paid to governance challenges, alongside diverse values-based normative reflections, for instance, considering the ethics of non-action vs. risky experimentation. Considerations of the European Commission members themselves were taken into account during the process - potentially paving the way for the uptake of the findings in the policy-making system.

## Appropriate Governance of Global Commons: Impact through Mobilising R&I Efforts

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Thursday, 15th June - 16:40: (JUB-G36) - Full paper presentation

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*Jennifer Casingena (consultant), Luke Georghiou (The University of Manchester), Keith Smith (Centre for Innovation Management Research, Birkbeck College, University of London), Cristiano Cagnin (ETF), Luk Van Langenhove (VUB), Dana Wasserbacher (AIT Austrian Institute of Technology), Philine Warnke (Fraunhofer Institute for Systems and Innovation Research ISI), Kerstin Cuhls (Fraunhofer Institute for Systems and Innovation Research ISI)*

The concept of the global commons refers to resource domains that fall outside national jurisdiction, and to which all nations have legal right of access. Five are recognized by international law: the Atmosphere, Outer space; Antarctica; the Deep Seabed and the High Seas. Other natural phenomena such as the permafrost and tropical rain forests share many characteristics in terms of their ecological significance but do not have the same formal recognition of global governance. Other domains such as scientific knowledge and digital space also share characteristics with the geophysical commons listed above. For the natural systems that make up the biosphere, the five domains cited above are necessary to and accessible by all, yet are beyond the jurisdiction of local, regional or national governments. As resource domains in which common pool resources are found, the physical commons in particular are fragile and vulnerable. There is potential for overuse to mis-use and/or over- exploitation through human activity, by both state and non-state actors, resulting in irreversible damage to the environment/ecology. Ongoing geopolitical developments, in particular the division caused by the war in Ukraine and its fallout, and growing concerns over strategic autonomy, have made global consensus more difficult. The security perspective - strategic access and use of these resource domains for military/commercial purposes puts pressure on their status. This is primarily due to a weak and insufficiently specified legislative framework and the lack of an effective monitoring and enforcement capability, to discourage rogue behaviour. These developments highlight the need for exploring appropriate forms of global governance or stewardship, to ensure responsible (sustainable) management to benefit present and future generations. The presentation describes how foresight scenarios were used to explore possible futures for the global commons, on a timescale to 2040.

## **16.3 Building Embedded Foresight Competencies**

## **Foresight Competence and Responsible Innovation in Industry: interrelations and policy implications**

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Friday, 16th June - 09:00: (JUB-G36) - Speed Talk

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*Lukasz Nazarko (Bialystok University of Technology), Rafael Popper (Manchester Institute of Innovation Research)*

Foresight orientation is viewed as (the element of) a company's dynamic capability. It is a management competence that involves a systematic reflection on the long-term future. It is considered a significant factor influencing corporate performance (and ultimately survival) in the long run. Responsible Research and Innovation – defined as a process that leads to the development of ethically acceptable, socially desirable, and sustainable products, services and processes – is a relatively new framework promoted by the European Union for governing innovation activity. It is manifested by anticipation in innovation governance, deliberation/inclusion of new voices, responsiveness in the innovation activity. In this study, 100 large (over 250 employees) Polish enterprises from the production and service sectors were diagnosed with regards to their foresight competence and commitment to the principles of Responsible Research and Innovation. One respondent from each company (representing high-level management, R&D staff, or product development department) was surveyed. The survey included questions on the use of foresight tools in the enterprise's operation and the perceived need to increase staff competences in the application of future-oriented methods and tools. Concerning the RRI diagnosis, the following aspects were studied: company activity related to tackling the grand societal challenges was probed. The involvement of stakeholders in product development, the assessment of the product impact throughout the full life cycle and the readiness to act upon feedback from the stakeholders. The analysis of the results shows that there is no simple correlation between the constructs of foresight competence and Responsible Innovation. It rather points at the existence of various types of companies that have different mixes of approaches towards responsibility and the future. There exist enterprises with low foresight competence but high regard of the RRI principles, enterprises with high foresight competence but low regard of the RRI principles, as well as the enterprises with both characteristics at the high (or low) levels. What may be the policy implications of those findings? It might appear that boosting companies' foresight competences would not necessarily lead to more responsible innovation. More sophisticated and specialized policy tools would be needed to effectively address the RRI challenge.

## Widening participation in foresight: Exploring pathways towards the EU Retail Ecosystem 2040

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Friday, 16th June - 09:00: (JUB-G36) - Speed Talk

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*Totti Könnölä (Insight Foresight Institute & The University of Alcalá), Susanne Giesecke (AIT Austrian Institute of Technology),  
Dana Wasserbacher (AIT Austrian Institute of Technology), Daniel Cassolà (ISINNOVA)*

We explore how to organise a wider participation and engagement of heterogeneous groups of stakeholders in Foresight activities facilitated by online techniques. Furthermore, we also address how growing attention to normative and ethical considerations can be included in the foresight activities. Participation is an inherent part of the foresight activities to enable the inclusion of diverse perspectives in the sense-making of future developments. The paper presents the case study on the recent foresight project conducted for the DG GROW of the European Commission. The use of foresight methods and strong engagement of a large number of actors and stakeholders form the basis for recommendations for policy interventions conducive to the expected dramatic changes in the sector. The online engagement of a wider set of stakeholders to explore long-term developments is particularly difficult when urgent matters (in particular the COVID-19 pandemics) get the attention of participants. Adapting the topics to the immediate environment of the respondents (in our case especially the SME leaders) helps engage them. Using different methods to engage with different participants can help reach out to a more diverse set of stakeholders and thus bring in wider perspectives of future developments.

## **Generating strategic policy intelligence through a futures-oriented co-creation process: lessons from the case of anticipatory innovation ecosystems in Latvia**

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Friday, 16th June - 09:00: (JUB-G36) - Speed Talk

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*Jack Orlik (OECD), Julia Staudt (OECD), Cristian Matti (European Commission)*

The challenge of developing an anticipatory system to catalyse transformative change for global transitions requires the capacities of multiple stakeholders and multiple levels of governance. As networks of heterogeneous actors, innovation ecosystems represent a promising space for generating knowledge about the future, enabling both ecosystem partners and government to become more proactive and resilient. Governments and public authorities can play a crucial role in creating the conditions for different actors to generate and use this knowledge together. By promoting effective governance and enabling co-creation processes, they can help ecosystems better anticipate and respond to the future. In doing so, public administrators and stakeholders involved in the co-creation process can develop new skills to understand the context and grasp the key principles for collaboration in participatory policy design and implementation. Anticipatory approaches can help ecosystem partners leverage complementary knowledge areas and expertise, align with long-term goals, identify threats and opportunities, and think creatively about strategic areas of innovation. However, such methods are rarely used regularly and systematically by innovation ecosystem actors, nor are there ways in which the knowledge they generate can inform government policy. Based on work carried out in Latvia, this paper provides an illustrative example of how strategic policy insights can be gained and lays the groundwork for ongoing forward-looking collaboration by developing and testing an approach to foster anticipatory innovation ecosystems. This paper aims to provide new insights into the use of stronger participatory methods such as co-creation models to shape governance processes for collective anticipation at the level of innovation ecosystems. In doing so, it also offers insights into the joint learning process in which two partner organisations are identifying conceptual and methodological building blocks for co-creating anticipation capacity in a multistakeholder environment.

## **Rapid Exploration – The example of “The interpenetration of criminal and law-ful economic activities”**

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Friday, 16th June - 09:00: (JUB-G36) - Speed Talk

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*Elisa Wallwaey (Fraunhofer Institute for Systems and Innovation Research ISI), Kerstin Cuhls (Fraunhofer Institute for Systems and Innovation Research ISI), Attila Havas (AIT Austrian Institute of Technology & Institute of Economics, CERS)*

As the world economy operates more and more through computerised transactions, new possibilities for intertwining criminal and lawful economic activities open up, as well as new opportunities for law enforcement agencies to fight crime. Considering the tremendous and potentially devastating damages caused by criminal economic activities, the issue should be high on the agenda of policy-makers, including R&I policy-makers. The race between criminal actors and the state trying to protect companies and citizens will be a permanent one. The paper provides an overview of trends and drivers in these domains, highlighting potential disruptions. It also presents four scenarios with a time horizon of 2040 to explore the role of R&I activities and regulations in shaping the possibilities for the interpenetration of criminal and lawful economic activities and derive policy implications. The complex nature of criminal economic activities, their detection, investigation, and prosecution are related to research and innovation in at least three areas. First, research in, and the development and improvement of, information and communication technologies necessary to monitor, track and analyse criminal activities. Second, regulatory techniques for preventing innovators from i) moving outside the sphere of lawful activities; ii) moving too far and entering a grey zone where regulation is missing; and iii) settling on clear-cut criminal behaviour. Third, research in, and the development and improvement of, forensic techniques of reconstructing what actually happened, and thus attributing responsibility for crime.

## **16.4 Long-term futures**

## Mission-Oriented Transition Assessment

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Friday, 16th June - 13:30: (JUB-G36) - Full paper presentation

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*Tom Coenen (University of Twente), Martijn Wiarda (TU Delft), Klaasjan Visscher (University of Twente), Leentje Volker (University of Twente), Caetano Penna (TU Delft)*

The renewed interest in Mission-Oriented Innovation Policies (MOIP) requires anticipatory, participatory, reflexive, and adaptive governance modes to deal with the wickedness associated with mission-oriented transitions. Existing approaches, however, do insufficiently account for the systemic and mission-oriented nature of MOIP. To address these gaps, this paper introduces a Mission-Oriented Transition Assessment (MOTA) as a novel approach to mission governance. MOTA involves the creation of a microcosm where system representatives collectively anticipate and reflect upon current and future mission-transition dynamics using explorative socio-technical scenarios. It aims to provide at least two outcomes. First, it supports participants with reflecting on their role in a transition, and second, it informs policymakers on how to govern missions. The MOTA approach was tested in the context of the Dutch mission 'Circular infrastructure by 2050' with 17 stakeholders. Insights were obtained about their strategic positioning and to-be-taken actions toward a circular sector. The MOTA furthermore resulted in insights regarding standstills and politics, all of which could support policymaking.

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## Futures of foresight

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Friday, 16th June - 13:30: (JUB-G36) - Speed Talk

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*Attila Havas (AIT, Austrian Institute of Technology, Center for Innovation Systems and Policy & Institute of Economics, Centre for Economic and Regional Studies), Wenzel Mehnert (AIT Austrian Institute of Technology)*

Given the complexity, urgency, and likely fundamental impacts of the already known challenges (climate change, geopolitical tensions, migration, emerging disruptive technologies, social conflicts), foresight would be even more in demand to support policy-makers, business people, and other actors. Can current foresight approaches and methods meet these challenges in the next 10–15 years? What new factors might reshape i) the context, in which foresight is used, and ii) foresight itself? How do foresight practices (need to) adapt? Which drivers and trends influence these change processes? What new opportunities would emerge to improve the current approaches and methods, and thus increase the chance for wider and more effective use of the insights generated by foresight processes? We tackle these questions in three steps. *First*, we identify some major trends and drivers that might have disruptive impacts on the ‘demand’ for, and ‘supply’ of, foresight, as well as on its environment (‘external’ factors), following the STEEPV approach. *Second*, we will conduct qualitative, semi-structured interviews with foresight practitioners, policy analysts, policy shapers, and preferably with decision-makers as well, to explore how these trends and drivers might change three important “ingredients” of foresight:

- Exploration: How would the ways we explore possible futures change? Which new methods are evolving? Which new demands necessitate the development and use of new methods?
- Orientation: Why and how clients would redefine their needs while searching for orientation to underpin their decisions and strategic actions? What type of new clients might emerge with which needs for orientation? How to support these orientation and re-orientation processes by foresight?
- Participation: What stakeholder groups need to be involved for more fruitful foresight processes? What new types of stakeholders might need to be ‘represented’? Would we need new approaches and methods to express, include and reflect upon their aspirations and visions? Would we need new, ‘low-threshold’ participation methods to involve lay persons as active, committed participants?

*Third*, we devise scenarios to describe some possible futures of foresight to spark fruitful dialogues with foresight practitioners and potential clients of foresight to reflect on the current practices and the possible new requirements and opportunities.

# **17.1 Research ecosystems**

# Culture of Impact in Agricultural Research Organizations: What for and how? – Insights from a cross-analysis of Cirad, Embrapa, and Agrosavia institutes

Thursday, 15th June - 09:00: (JUB-G22) - Full paper presentation

*Marie Ferre (UMR Innovation, Cirad, Montpellier), Maria Margarita Ramirez Gomez (Corporación Colombiana de Investigación Agropecuaria (AGROSAVIA). Km 14 Vía Mosquera, Bogotá, Cundinamarca, Colombia), Graziela Luzia Vedovoto (Supervisão de Monitoramento e Avaliação da Estratégia (SMAE) - Superintendência de Estratégia (SUEST), Empresa Brasileira de Pesquisa Agropecuária – Embrapa, Brasília, Brazil), Genowefa Blundo Canto (UMR Innovation, Cirad, Montpellier, France), Beatriz ELena Agudelo Choconta (Corporación Colombiana de Investigación Agropecuaria (AGROSAVIA). Km 14 Vía Mosquera, Bogotá, Cundinamarca, Colombia), Daniela Vieira Marques (Supervisão de Monitoramento e Avaliação da Estratégia (SMAE) - Superintendência de Estratégia (SUEST), Empresa Brasileira de Pesquisa Agropecuária – Embrapa, Brasília, Brazil), Gonzalo-Alfredo Rodríguez-Borray (Corporación Colombiana de Investigación Agropecuaria (AGROSAVIA). Km 14 Vía Mosquera, Bogotá, Cundinamarca, Colombia), Mirian Oliveira de Souza (Supervisão de Monitoramento e Avaliação da Estratégia (SMAE) - Superintendência de Estratégia (SUEST), Empresa Brasileira de Pesquisa Agropecuária – Embrapa, Brasília, Brazil), Angela Rocio Vasquez Urriago (Corporación Colombiana de Investigación Agropecuaria (AGROSAVIA). Km 14 Vía Mosquera, Bogotá, Cundinamarca, Colombia), Geraldo Stachetti Rodrigues (Supervisão de Monitoramento e Avaliação da Estratégia (SMAE) - Superintendência de Estratégia (SUEST), Empresa Brasileira de Pesquisa Agropecuária – Embrapa, Brasília, Brazil), Juliana-Ivonne Sánchez-Lozano (Corporación Colombiana de Investigación Agropecuaria (AGROSAVIA). Km 14 Vía Mosquera, Bogotá, Cundinamarca, Colombia), Gregorio-Salomón Zambrano-Moreno (Corporación Colombiana de Investigación Agropecuaria (AGROSAVIA). Km 14 Vía Mosquera, Bogotá, Cundinamarca, Colombia), Maria Aide Londono Arias (Corporación Colombiana de Investigación Agropecuaria (AGROSAVIA). Km 14 Vía Mosquera, Bogotá, Cundinamarca, Colombia), Cristóbal-Alfonso Zapata-Tamayo (Corporación Colombiana de Investigación Agropecuaria (AGROSAVIA). Km 14 Vía Mosquera, Bogotá, Cundinamarca, Colombia), Frédéric Goulet (UMR Innovation, Cirad, Montpellier, France), Claudio Proietti (UMR Innovation, Cirad, Montpellier, France), Aurelle de Romémont (UMR Innovation, Cirad, Montpellier, France)*

Research institutes experience increasing demands to analyze the multidimensional societal impacts of their research activities. This leads to more and more reflection around the integration of institutional strategies devoted to impact monitoring and evaluation of research. Such strategies aim to answer societal and funder's demands, but also improve research practices and make research and innovations more transformative to society. For some organizations, this trend has resulted in the establishment of a "culture of impact" whereby there is a general recognition within the organization that research needs to be thought through the eyes of the impacts it aims to generate. Understanding what motivates agricultural research institutes to develop a culture of impact, and the consequences of this culture on research practices is key to support change and improve how impacts are generated. A comprehensive reflection on organizational learning and structuring targeted to improving societal impacts within agricultural research organizations, and on how this can influence the essence and trajectory of an institution has, however, not been undertaken. Moreover, no work has focused on examining the changes that a culture of impact in agricultural research organizations generates. In this study, we aim to take stock of experiences in developing a culture of impact in three agricultural research organizations (the Brazilian Agricultural Research Corporation (Embrapa), the French Agricultural Research Centre for International Development (Cirad), the Colombian Agricultural Research Corporation (AGROSAVIA)), and critically assess the changes it entails. We compare their respective trajectories of development of a culture of impact including key drivers to its establishment. We conducted a survey among the population who has been in close interaction with the development of such a culture in order to understand the various changes this culture tends to generate at individual levels, in terms of perceptions, capacities, and practices. This way, we highlight common and diverging drivers and patterns in the way of building a culture of impact. This helps to

draw lessons on what makes “a conducive environment” for the development of a culture of impact, which will be of benefit to other research institutions having this impact ambition.

## **Bridging the Gap: Genetically Engineered Crops and Socio-Economic Assessment in Africa**

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Thursday, 15th June - 09:00: (JUB-G22) - Full paper presentation

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*Brian Dowd-Urbe (UMR Innovation, Cirad, Montpellier, France), Joseph Batiemo (INERA), Genowefa Blundo Canto (Cirad), Klara Fischer (Swedish University for Agricultural Sciences), Dominic Glover (IDS, University of Sussex), Pierre-Benoît Joly (INRAE), Enoch Kikulwe (Alliance Bioversity - CIAT), Sélim Louafi (Cirad), Joeva Rock (University of Cambridge), Helena Shilomboleni (University of Waterloo)*

The use of genetic engineering (GE) techniques to breed crops for African farmers is one of the most important contemporary agricultural development interventions with the objective of achieving multiple social goals. Recent research, however, has identified a disjuncture between the lofty goals of GE crop programs in Africa and the approaches used to assess their impacts. The research presented in this paper identifies the socio-economic assessment gaps of African GE crop interventions and suggests ways to adopt more appropriate assessment approaches in line with their broad social goals. We characterize socio-economic assessments of GE crops by drawing from four definitive reviews and a growing literature critical of the methods and approaches used to assess their impacts. We identify three assessment gaps, (a) insufficient and maladapted approaches, (b) lack of inclusion, and (c) insufficient attention to differential impacts. We then draw from the research impact assessment literature to characterize assessment approaches that are being used in other agricultural development programs, and which could be adapted to better address these gaps. We conclude with a discussion of what would need to be in place such that more diverse and better-fit assessment approaches are utilized. We argue that the adoption of such assessment approaches can improve the development of more appropriate GE crop technologies better equipped to reach their broad social goals.

## Analysis of the relationship between the attributes of external evaluators and evaluation

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Thursday, 15th June - 09:00: (JUB-G22) - Speed Talk

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*Shumpei Miyajima (New Energy and Industrial Technology Development Organization), Nobuhiko Yoda (New Energy and Industrial Technology Development Organization), Shin Uesaka (New Energy and Industrial Technology Development Organization), Toshihiro Yamamura (Applied Research Institute, Inc.), Miharu Kishioka (Applied Research Institute, Inc.), Hirokazu Yonezawa (Knowledge Communications, Inc.)*

This study aimed to find ways to support impact-oriented research and innovation policies through evaluation. It analysed national projects by New Energy and Industrial Technology Development Organization (NEDO) to realise a more transformative and formative evaluation of research projects. The results showed whether the selection of the evaluators in the past had enough fairness and validity, together with policy implications for more formative future evaluation processes. NEDO has established an evaluation system: ex-ante evaluation, mid-term evaluation, closing evaluation, and follow-up monitoring. Since the aim of this study is to find a direction to support impact-oriented research and innovation policies through analyses of NEDO's evaluation system, two of the above stages are analysed: the closing evaluation, which measures the outputs, and the ex-post follow-up survey, which measures the outcomes of the project. This study focuses on the selection of evaluators and the relationship between the evaluator's characteristics and evaluation results. We analysed the results of ex-post evaluation done between 2005 and 2021 in terms of evaluators' characteristics, evaluated ratings and comments. A series of quantitative statistical analyses were conducted to clarify the existence of bias in the evaluation results influenced by the characteristics of the evaluators and also to see how the bias relates to evaluators' characteristics. Text-mining analyses of the comments were also conducted on the evaluation comments to see the relationship between the tendency to use specific words in the comments and the evaluators' characteristics. The distribution of the evaluated rating differed considerably depending on the evaluators' characteristics. For example, panel chairpersons rated higher than panel members at large, while company managers rated lower than university professors. Looking at the correlation of the ratings between four evaluation aspects by the same evaluator, the correlation coefficients were lower for members in the humanities and social sciences fields, meaning they give a significant degree of independence in evaluating each item than others. These results showed that including the humanities and social sciences committee members, in addition to the natural science and the business-oriented members, would lead to a more formative but balanced evaluation.

## **17.2 Changing societal needs and STI policy objectives**

## **From Technocracy to Democracy in Evaluation Cultures Around Research and Innovation**

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Thursday, 15th June - 10:50: (JUB-G22) - Full paper presentation

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*Andy Stirling (SPRU, University of Sussex)*

This paper discusses some neglected implications of the much-heralded importance of sustainability for research evaluation practices worldwide – for instance around ‘transformative innovation’. First, it explores the longstanding (often neglected) central role of democratic struggle in processes of sustainable development. Then it reviews more general issues around the property of directionality in research and innovation, that – although also frequently mentioned – remain similarly under-attended to in their full connotations. In order to address these intersecting imperatives in research evaluation, particular attention is paid to a framework for distinguishing contrasting methods and cultures that act alternatively to ‘close down’ or ‘open up’ the picture given to wider politics of the diverse possible pathways for research and innovation typically available in any given area. It is noted that powerful political pressures prioritise misleadingly precise technocratic methods that yield spuriously assertive justifications for those pathways most favoured by incumbent interests in particular settings. Examples are given of a range of general qualities and specific methodological options that can help to address these challenges and deliver research evaluation practises and outcomes that are at the same time more technically rigorous and more democratically legitimate.

## Evaluating inclusion as a multidimensional science, technology and innovation policy objective

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Thursday, 15th June - 10:50: (JUB-G22) - Full paper presentation

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*Helka Kalliomäki (University of Vaasa), Jari Kuusisto (University of Vaasa), Leena Kunttu (University of Vaasa)*

Inclusion as a policy objective has been increasing its significance in STI policy agendas globally. The OECD has recently raised inclusive innovation policies into discussion as “policies that aim to remove barriers to the participation of individuals, social groups, firms, sectors and regions underrepresented in innovation activities” (Planes-Satorra & Paunov 2017, 6). Here, the goal is to provide equal opportunities for different members of society to benefit from, and to participate in innovation. However, the concept’s usage in both practitioner, policy and research language is ambiguous. The operationalization of inclusion as STI policy objective has met various challenges, dealing, for example, with problems to design and implement inclusive policies. As conceptual ambiguity can be harmful for goal oriented STI policy development and evaluation, this paper aims at unpacking the different dimensions of inclusion, and presenting a schematic conceptual framework of the different approaches that can be used to steer evaluation practice. The objective is, first and foremost, to contribute to the evaluation theoretical debates on conceptualizing and approaching inclusion as a multidimensional STI policy objective, as conceptual clarity is needed in order to focus evaluation practice on intended goals.

## **Tentative signals of change: How the recent STI policy shift takes shape in the EU research framework programme Horizon 2020 and what this entails for the evaluation culture**

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Thursday, 15th June - 10:50: (JUB-G22) - Full paper presentation

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*Stephanie Daimer (Fraunhofer Institute for systems and innovation research ISI), Karl Matthias Weber (AIT Austrian Institute of Technology), Sarah Seus (Fraunhofer Institute for Systems and Innovation Research ISI)*

With the policy shift towards challenge-oriented (and most recently transformation-oriented) interventions the EC had to reconsider its evaluation approach and start to align it with the higher ambitions associated with H2020. We argue, this is - at least in its beginnings - reflected in the recent ex-post evaluations of the Horizon 2020 FP (2014-2020), which reveals some features which depart from the prevailing evaluation culture. The “shift” in R&I policy towards addressing societal challenges (discussed as mission-oriented innovation policy and transformative innovation policy and transformative mission-oriented innovation policy, was triggered by H2020 in EU R&I funding, although it remains to be debated how it actually was developed and realised in Horizon 2020. Against this backdrop this paper addresses emerging requirements for the evaluation of EU R&I policy and the potential consequences this may entail for the EC evaluation practices (and maybe even culture) more generally. More precisely, the overarching question we want to answer is, *what requirements and implications does the substantial programmatic re-orientation of a (framework) programme entail i) for the portfolio of policy instruments and the processes of policy development and policy learning, and following on this ii) for the evaluation approach. In addition, we ask whether and to what extent the changes in evaluation requirements are actually reflected in (first) changes in evaluation practices.*

## **17.3 Evaluation of transformative innovation policy**

## **When theory meets practice in transformative innovation policy evaluation: experiences from Sweden**

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Thursday, 15th June - 15:00: (JUB-G22) - Full paper presentation

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*Carolina R. Haddad (Chalmers University of Technology), Emily Wise (Lund University), Erik Arnold (Technopolis Ltd)*

Considering the increased need to adapt evaluation strategies to transformative innovation policy (TIP), this paper focuses on two research questions: (i) to what extent does current innovation policy evaluation practice match theoretically derived characteristics of a TIP evaluation strategy? (ii) what are the main challenges involved in adapting current innovation policy evaluation practice to TIP? In order to address these questions, we adapt the evaluation dimensions proposed by Edler et al. (2012), evaluation set-up, main questions and methodology, to develop an analytical framework that describes what an 'ideal type' TIP evaluation strategy could look like. We then take three Swedish innovation programmes, Vinnväxt, Challenge-driven Innovation, and the Strategic Innovation Programmes, funded by Vinnova, the Swedish Innovation Agency, to analyse their evaluation practices and perform a cross-case analysis related to their alignment to the TIP evaluation strategy dimensions. Lastly, we list three challenges evaluators and policymakers should consider towards making evaluations more transformative-oriented, including developing transformative theories of change, conceptualising systems, and addressing system-level additionality and directionality.

## **Well begun is half done: A formative toolbox for implementation and impact assessment of MOIP: Conceptual insights and practical learnings**

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Thursday, 15th June - 15:00: (JUB-G22) - Speed Talk

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*Miriam Hufnagl (Deutsches Elektronen-Synchrotron DESY), Florian Roth (Zurich University of Applied Sciences), Florian Wittmann (Fraunhofer Institute for Systems and Innovation Research ISI), Ralf Lindner (Fraunhofer Institute for Systems and Innovation Research ISI)*

Mission-oriented policies (MOIP) have become important means to foster transformative change in many countries. Yet, approaches for assessing these policies' impacts are still in their infancy, not least due to the complexity of MOIP. To address this gap, we propose a toolbox approach that supports policy-makers during policy design and implementation, and allows for a identification of potential impacts by a theory-based approach. To disentangle the complexity of missions, we first conceptualize MOIPs as multiple translation processes from mission formulation and design to implementation. Each translation step shapes the policies' impacts. Based on this framework, we develop a set of specific analytical tools that are intended to support the process of bringing missions into realization, but also help to assess whether missions contribute to the postulated goals. These tools include a mapping of the socio-technical systems, a typology to explore the transformative ambition of missions, a process to develop impact pathways, an inventory of policy instruments to support the mission design, and indicators to measure mission progress along the developed pathways. Finally, we propose several analytical questions to explore the context for the development of potential impacts.

## Designing and Implementing a New Evaluation Approach for Agricultural Research Programmes in Ireland

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Thursday, 15th June - 15:00: (JUB-G22) - Speed Talk

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*Kevin Heanue (Teagasc), Boru Douthwaite (Selkie Consulting Ltd)*

Teagasc (Irish Agriculture and Food Development Authority) is an integrated provider of research, advice and education to the Irish agri-food sector yet up to now, its impact on the sector has been somewhat separately assessed in terms of research, advice and education. This paper briefly outlines the process to design a new approach to evaluating Teagasc's research activities and then outlines the results from using that new approach in the evaluation of two of its four research programmes – Crops Environment and Land Use Programme (CELUP) and Rural Economy and Development Programme (REDP) in 2021 and 2022 respectively. Underlying research questions are: How does Teagasc define agricultural research impact? How has this determined the evaluation question(s) addressed and the methods used? How is complexity addressed in these methods?

## **Evaluating transformative innovation policy instruments with the example of the Austrian program INNOVATORINNEN**

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Thursday, 15th June - 15:00: (JUB-G22) - Speed Talk

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*Verena Régent (WPZ Research GmbH)*

This paper deals with the evaluation of transformative innovation policy (TIP) instruments using the case of the Austrian program for the advancement of women in applied research and innovation INNOVATORINNEN. To embed the empirical case, the paper traces the development of innovation policy and notably of Austrian instruments to promote female researchers and gender equality and their evaluations, and argues for the INNOVATORINNEN program as a case of a potentially transformative innovation policy. Using a deductive content analysis, the evaluation concept and practise of the INNOVATORINNEN program are analysed against the requirements of TIP-evaluations proclaimed in recent literature, notably with a view to evaluation strategy, the role of the evaluation, theory of change and methodology. Results suggest that there is high accordance between the program evaluation and TIP-evaluation requirements, in particular with a view to program learning and reflection as well as the evidence-based advancement of the program. The INNOVATORINNEN evaluation goes beyond the requirements for TIP-evaluations with a view to content-oriented co-creative processes with program participants and program owners. Notably, a triangle of knowledge exchange between evaluators, program owners and program participants is found, which benefits the ongoing development of the INNOVATORINNEN program. In contrast, some of the methodological details required in TIP-evaluations are not met in the INNOVATORINNEN evaluation. The paper concludes with an elaboration on the learnings of the evaluation process, which involves a high degree of openness, flexibility, eagerness to learn and respect for boundaries in all parties concerned.

## **17.4 New roles of evaluators**

## **Embracing institutional dissonance: Institutionalizing a reflexive evaluation culture at the science-policy interface**

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Thursday, 15th June - 16:40: (JUB-G22) - Speed Talk

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*Eva Kunseler (PBL Netherlands Environmental Assessment Agency), Anne Loeber (VU Athena Institute), Kris Kok (VU Athena Institute), Hidde Boonstra (VU Athena Institute)*

Evaluators and policy makers bridge different authority claims when confronted with new, non-modernist forms of evaluation by practically embracing the institutional dissonance between different authority claims. This paper brings to light how reflexive evaluations stretch the efforts of evaluators and policy makers in legitimizing the goal, design and impact of their evaluation programs. They effectuate authority claims that reflect modernist and reflexive logics, while not fully capturing the one or the other. Our analysis of reflexive evaluations demonstrates the hands-on messiness of the effort that those involved must deal with in combination with the tensions they encounter during evaluation processes. It shows how the institutional dissonance helps to bring out the hitherto un-problematized framing of evaluators' and policy makers' own role and perspective as knowledge providers and knowledge clients. As a result, it gives way to a search for explicating what legitimate roles are of reflexive professionals at the science-policy interface to create new evaluation practices collaboratively, in a way that enables them both to maintain (or re-establish) their authoritative position.

## A Change in Visions: the Role of Formative Evaluation in the Responsibilisation of Researchers in a Mission-Oriented Context

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Thursday, 15th June - 16:40: (JUB-G22) - Full paper presentation

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*Renee van Dis (LISIS, INRAE), Allison Loconto (LISIS, INRAE), Mireille Matt (LISIS, INRAE)*

To what extent can we responsabilise researchers to respond to societal challenges? Within Europe, governments are seeking to achieve societal missions through policy programmes that support alternative ways of conducting research and innovation (R&I). This policy innovation emphasises governments' belief in the capacity of researchers to address ambitious societal goals. However, directing research to address societal challenges requires a different understanding and means of assessing the societal impact of research. In this regard, formative evaluation is a potential means to support the responsibility of researchers, which involves the evaluation of real-time impact as a learning process involving all actors in the R&I programme. Therefore, responsabilisation of researchers could be conceptualised as a formative process of (re)orienting research towards societal impact in real time. In this paper we ask how formative evaluation enables a process for researchers to be responsible for societal challenges. To respond to this question, we studied the case of the French Priority Research Program 'Growing and Protecting Crops Differently' (PPR-CPA), with the ambitious mission of eradicating pesticides by 2040. The researchers of the ten funded projects are encouraged to think about their contributions to the constitution of a 0-pesticides society as they study alternative solutions to pesticides. The PPR-CPA has integrated ASIRPA Real Time (RT), a formative evaluation approach, to support researchers in this process. As part of the ASIRPA RT team, we compared researchers' visions of eradicating pesticides before their participation in ASIRPA TR ( $T_0$ ) and one year after ( $T_1$ ). To understand how ASIRPA RT guided the PPR-CPA researchers in the process to take on responsibility, we developed the concept of 'responsible translation'. It explores the process of translating visions of alternative solutions into those of a society that has used these solutions to eradicate pesticides. Through this concept, we problematise what it means in terms of responsibility of researchers, to establish, realise and mobilise science-society associations in a mission-oriented context. We demonstrate that the researchers assume responsibility when they associate visions of actors' responsibilities in heterogenous networks, and hence, these visions become part of the translation process in mission-oriented contexts.

## **Framing evaluations of transformation oriented R&I policies: incorporating a Multi-Level-Perspective approach in the evaluation design.**

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Thursday, 15th June - 16:40: (JUB-G22) - Full paper presentation

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*Michael Dinges (AIT Austrian Institute of Technology), Christiane Kerlen (Kerlen Evaluation), Surya Knöbel (AIT Austrian Institute of Technology), Maximilian Gasser (AIT Austrian Institute of Technology), Kathleen Toepel (Kerlen Evaluation), Harald Wieser (Austrian Institute for SME Research), Jakob Kofler (Austrian Institute for SME Research)*

Due to the high complexity of grand societal challenges and related transformative R&I policy responses, evaluations need to go beyond traditional evaluation approaches that focus on checking whether the desired objectives have been achieved and implementation has been efficient. While assuring accountability remains a main rationale for evaluations, communication between partners – regarding goals and research design - mutual learning for increasing effectiveness becomes ever more important. Against this background, this paper analyses the experiences and learnings of the ongoing, formative accompanying evaluation approach of the ‘7th Energy Research Programme – Innovations for the Energy Transition’ (EFP) of the German Federal Ministry for Economic Affairs and Climate Action. The paper shows an evaluation approach embedded in a Multi-Level-Perspective and provides lessons learned from applying this approach. The article elaborates on how a theoretical embedding in the Multi-Level Perspective (Geels, 2006) can be integrated into an evaluation approach and thereby enhance the usefulness of the evaluation process. The paper shows that the formative evaluation serves its learning function by combining the multi-level perspective with an instrument-specific theory of change. This contributes to a better understanding of possible transition mechanisms induced by an R&I programme and provides the basis for reflexive learning on an ongoing basis. Furthermore, predominantly linear thinking of the theory of change could be reduced by contextualizing it in a larger innovation system framework provided by the multi-level perspective. As a result, gaps in the intervention mechanisms conducive to spur transformation processes can be identified, and pathways to impact can be linked to specific system transformation processes.

## **ViennaUP: Experiences with in-process evaluation of a new startup-festival**

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Thursday, 15th June - 16:40: (JUB-G22) - Full paper presentation

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*Tobias Dudenbostel (Technopolis Austria), Alfried Braumann (Vienna Business Agency)*

We present the in-process evaluation (carried out in German language as “Begleitende Evaluierung”) of ViennaUP, a start-up festival that was celebrated in Vienna in 2022. In the period from May 27, 2022, to June 03, 2022, 34 events took place as part of the ViennaUP organised by different organisations. We describe the festival and the motivation of the organizer, Vienna Business Agency (VBA), to commission an in-process evaluation that was carried out by Technopolis Group. We, as project managers in charge of the evaluation at VBA and Technopolis Group, present and discuss our respective views and reflections on the development of the endeavour, highlight ex-ante expectations regarding the instrument of “in-process evaluation” and reflect on the degree to which they were able to be fulfilled. We furthermore try to connect it with scholarly discussion and present policy recommendations.

## **17.5 National evaluation cultures**

## Learning from meta-evaluation to transform STI Policy evaluation cultures: evidence from a comparative study on Colombia and the United Kingdom

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Friday, 16th June - 09:00: (JUB-G22) - Full paper presentation

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*Juan Pablo Centeno (Technopolis Ltd), Gonzalo Ordóñez-Matamoros (Universidad Externado de Colombia)*

The evolution of STI policy frameworks entails a transformation in evaluation approaches and practices. Accordingly, literature depicts multiple evaluation frames, from *peer review*-inspired approaches, to *systemic* frameworks and approaches interested in *formative evaluation* of transformative change. Despite the key and changing role of evaluation in the STI policy process, little is known about how the former shapes and feeds into the latter, specially in emerging economies where evaluation cultures remain weak. Furthermore, there is little systematic evidence on policy interventions that allows to translate *policy learning* into effective *policy change*. With that in mind, this paper inquires on the conditions needed to transform evaluation cultures to better grasp the particular features of policies designed under new STI frames, and to facilitate the use of the evidence produced by evaluations to enhance the STI policy process. To that aim, we apply a meta-evaluation approach to take a comprehensive look at the STI policy evaluation culture in the cases of Colombia and the United Kingdom, in order to draw comparative lessons from an emerging and developed economy. We examine selected evaluations from repositories of 36 evaluations performed from 1997 to 2021 in Colombia, and 66 evaluations conducted in the UK between 2008 and 2023. A systematic review is conducted based on categories such as the type of evaluation, type of STI policy evaluated, publication date, observation period, authors (institutional), purpose of the analysis, evaluation methods, results and conclusions, among others. Expected results include a complete data base of systematized and processed information on STI policy evaluations that will eventually allow us to build an Evidence Gap Map (EGM) that graphically shows what we currently know (or ignore) about the practice and performance of STI policy in Colombia. Policy implications of this research include the production of lessons that facilitate the contributions of meta-evaluation in re-thinking evaluation cultures in emerging economies. Also, it will provide useful evidence for policymakers, program managers and evaluators on STI governance in both countries.

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## Rethinking evaluation to help steer a national science system

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Friday, 16th June - 09:00: (JUB-G22) - Full paper presentation

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*André Brasil (Centre for Science and Technology Studies, Leiden University)*

The Brazilian science system emerged in the 1950s through public policy initiatives aimed at developing scientific research and nurturing highly qualified human resources. The establishment of the Brazilian Agency for Support and Evaluation of Graduate Education (CAPES) played a crucial role in funding and regulating the national science system. Evaluating research and graduate education in Brazil serves two main purposes: ensuring quality and distributing funding effectively. CAPES has been responsible for evaluating and accrediting graduate programs since the 1970s, with programs being assessed every four years. Building upon previous research, this study consists of two phases. The first provides an overview of the current state of the Brazilian science system in the international context using Scopus data. The study examines aspects such as research growth, impact, and collaboration. While Brazil ranked 13th in publication volume in the previous evaluation cycle, it dropped to 14th in the subsequent cycle. The country's performance in highly cited publications was below the world average. However, international collaboration significantly improved outcomes. The study aims to provide evidence that informs policymakers about investment decisions and future priorities. The study's second phase focuses on analyzing the current status of the Brazilian science system and proposing evaluation strategies for advancement. The Brazilian evaluation system is characterized as high-stakes, top-down, centralized, compulsory, and comparative. It has a strong influence on researcher behaviour and can drive change. However, it is suggested that evaluation practices could be adjusted to promote positive change more effectively. The study explores shifting the evaluation focus to value individual strengths and providing more flexibility for faculty members in graduate programs. In conclusion, this study aims to bring about change in the Brazilian evaluation system by providing evidence on the state of research and proposing adjustments to the evaluation process. By adopting a more formative role, the evaluation system can steer developments in a way that aligns with societal needs and facilitates the advancement of the Brazilian science system. The study's findings will be accessible through a website, offering interactive dashboards for dynamic exploration and improved understanding of Brazilian research.

## A realistic evaluation of science policy - generating learning for Spanish public administration institutions

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Friday, 16th June - 09:00: (JUB-G22) - Speed Talk

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*Armela Dino (University College London & Spanish Ministry of Science and Innovation)*

For decades now **science policy scholars have identified issues related to the approaches of evaluating science policy**. (Cozzens 1997; Georghiou 1998, Salter and Martin, 2001; Shapira and Kuhlmann 2003, Martin 2011, 2016, 2019, Feller 2017): The need to broadly understand impact - accountability, the ever-evolving complex context – epistemology, adaptability of methods to the demands – social enquiry, and increasing learning from evaluation – use of evaluation for policy. Yet, a **general way of evaluation persists**, focusing on performance, systemic changes and economic impact, and more specifically on publications, the broad changes in the scientific system, and in the economic activity. These studies fall under the **positivistic perspective at large**. For the first time ever in science policy, my research pursues a **programme theory realistic evaluation** (Pawson and Tilley, 1997, 2003) **approach** of the highly reputed Spanish Government “Severo Ochoa” Centres of Excellence Programme by an insider, being a science officer at the time and working for the programme. The research design used qualitative methods and the techniques of documentary analysis, semi-structured interviews, and participant observation in a realist setting (Maxwell, 2012). The conceptual model of impact of the policy was drawn first and then tested in the awarded centres, through visits, interviews, observations, and doc review. Text analysis was carried out with NVivo. By using a realist lens, the results aimed to understand **what works best and under what conditions** highlighting a wider range of outcomes. Aspects such as scientific quality, impact, partnerships, sponsorships, changes in strategy, governance, administration and management, relations with funders were analysed in depth. As a conclusion, the **critical realist perspective enabled a rethinking of science policy evaluation** responding to the main identified challenges of the discipline. The programme theory seen as a “unit of analysis” (Pawson et al. 2005) allows a broader epistemology, and a generative causality (Greenhalgh, 2014) for better understanding of context, followed by the cumulative theory testing component for a more adaptable social inquiry; a pattern of outcomes for a greater accountability, and finally, emancipation for change for more and better use of policy evaluation.

**18.1b Governing Research  
Careers: addressing  
persistent and emerging  
challenges in the context  
of the ‘impact agenda’.  
Track 18 is sponsored by  
RISIS.**

## **The effects of a national scientific qualification system (ASN) in Italy on scientific production and publication practices of academics.**

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Wednesday, 14th June - 14:15: (FUL-202) - Full paper presentation

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*Lucio Morettini (CNR IRCRES), Serena Fabrizio (CNR IRCRES), Emanuela Reale (CNR IRCRES), Ugo Finardi (CNR IRCRES)*

The introduction of National Scientific Qualification (Abilitazione Scientifica Nazionale, ASN) in Italy in 2012 changed the framework of the academic career, introducing a centralized procedure for obtaining the qualification necessary for role progression. The procedure is based on bibliometric mechanisms, as the number of citations to be compared with threshold values. One of the criticisms concerns the possibility that ASN encourages researchers to change their research activity, choosing topics that can increase their bibliometric indices and satisfy new criteria, restricting independence of research. The paper aims to investigate possible effects of the introduction of ASN on the scientific production of researchers, in particular we want to verify if there have been deviations in the choice of research topics considering new assessment criteria. We also want to verify whether there is a difference among the researchers analyzed between their perception in terms of external conditioning on the choice of topics and the actual choices of the same.

## **Making Sense of Impact: how researchers' sense-making informs an institutional impact strategy. The case of Rotterdam School of Management**

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Wednesday, 14th June - 14:15: (FUL-202) - Full paper presentation

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*Nevien Kerk (Erasmus University Rotterdam), latiffah salima baldeh (Erasmus University Rotterdam), Tung Tung Chan (Erasmus University Rotterdam), Stefan de Jong (Erasmus University Rotterdam)*

This paper presents the results of a study conducted at Rotterdam School of Management (RSM) to understand researchers' sense-making processes regarding impact definitions and perceptions. The aim was to inform an institutional impact strategy that addresses the diverse needs and attitudes of academics at RSM. Through interviews, document review, a workshop, and observations, a bottom-up approach was employed to understand the schools' impact using sense-making processes as a framework. The study revealed that academics perceived impact as an additional workload, affecting their focus on impact-related activities. The capacity for impact work was influenced by factors such as career trajectory, job security, and recognition structures. Early-career researchers faced particular challenges due to the emphasis on publishing and research. Additionally, there were varied understandings of impact and a lack of clear impact-related policies within the school, leading to uncertainty among academics. External stakeholder relationships were seen as vital, but these lacked structure and departmental collaboration. The findings highlighted the cumulative nature of sense-making processes, shaping shared notions of impact within the faculty. The study recommended an impact strategy that considers these perceptions and addresses structural barriers. Key suggestions included clear expectations for impact at different career stages, a strong definition of societal impact, structural incentives, and comprehensive implementation and dissemination strategies. In conclusion, the study emphasized the importance of ongoing sense-making processes to guide the development of an impact strategy that meets the needs of researchers at RSM. By understanding individual perceptions, the study aimed to minimize barriers and power imbalances. The findings contribute to the continuous reflection on the impact agenda, facilitating the institutional response to foster impact realization in academic work.

**18.3b Governing Research  
Careers: addressing  
persistent and emerging  
challenges in the context  
of the ‘impact agenda’.  
Track 18 is sponsored by  
RISIS.**

## Doctoral Training and Career Paths of Early Career Researchers

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Thursday, 15th June - 15:30: (FUL-202) - Full paper presentation

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*Mabel Sanchez Barrioluengo (Manchester Institute of Innovation Research), Cornelia Lawson (Manchester Institute of Innovation Research), Carolina Canibano (INGENIO (CSIC-UPV))*

This study examines the self-perception of transferable skills among PhD holders for different career paths, with a focus on identifying doctoral skill profiles depending on the sector of employment. Making use of the European science and innovation policy and navigating a changing landscape of career paths and competence frameworks, our findings suggest that there are specific skill profiles for each sector, such as cognitive and managerial skills for non-academic careers, and research, impact, and communication skills for academia. These findings have important implications for designing doctoral education policies and programs, as well as policies targeting inter-sectoral mobility and employment of researchers.

## Beyond the PhD: Rethinking doctoral careers in the modern knowledge economy

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Thursday, 15th June - 15:30: (FUL-202) - Full paper presentation

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*Billy Bryan (RAND Europe), Kay Guccione (University of Glasgow)*

This study seeks to understand the interaction between the component domains of doctoral value to identify those which have a greater influence on overall perceptions of the value of a doctorate. It also investigates what may lead an individual to say it was not worth doing. Using Bryan and Guccione's (2018) conceptual model of 'doctoral value', this study employed a qualitative survey, to examine 261 perceptions of the value of the doctorate in a range of employment contexts. There were three main findings:

1. **Value domains confirmed** - The four value domains identified in our earlier conceptual model of doctoral value hold true in this larger dataset. The overall picture is positive; the vast majority (83%) said it was worth it, particularly in their careers, skills and personal lives.
2. **Overall value of the doctorate is judged on career and personal value** - Respondents' overall value judgements often hinged on whether their doctorates had allowed them to achieve what they had expected to. Positive value gained in one domain was able to outweigh significant negatives in others.
3. **Being valued increases perceptions of value** - The circumstances of respondents' current employment were the most common predictor of overall value. Those who reported that their doctorates were not worth it (11%), attributed this to their doctorate not resulting in a positive career outcome

A recurring concept was that respondents considered that their doctorate had been 'worth doing' for the value it conveyed to them personally, but not 'worth having' due to its low value to employers. This new understanding illustrates the complexity of decision-making and the individual career timelines that influence value. Our research positions the 'career' and 'personal' value domains as determinant in informing individual value judgements. Our findings lend weight to calls for doctoral education and governance to focus on non-academic careers, and also inspire further investigation into how non-academic employers recruit, motivate, and value doctoral graduates. We propose that research funders, university research leaders and employers must rethink their approach to doctoral careers by using a supply-chain-style mechanism, adding value to the student experience before and after graduation.

**18.4 Governing Research  
Careers: addressing  
persistent and emerging  
challenges in the context  
of the ‘impact agenda’.  
Track 18 is sponsored by  
RISIS.**

## **Impact of habilitation procedures on academic career: some insights from the Italian experience**

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Thursday, 15th June - 16:40: (FUL-202) - Full paper presentation

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*Antonio Zinilli (CNR IRCRES), Emanuela Reale (CNR IRCRES), Dario Germani (CNR IRCRES)*

The study examines the effects produced by the Italian National Scientific Habilitation (ASN -Abilitazione Scientifica Nazionale) on the academic career, with a special attention to the effects on early career researchers. ASN is a national evaluation process for the academic recruitment that was implemented in 2011 (Law dec. 30, n. 240, 2011; Martini et al., 2022). ASN is like other habilitation procedures already in place in other countries (Enders, 2001; Musselin, 2004), and it is a precondition to apply for permanent positions of full and associate professor in Italian universities. This study investigates two research questions: i) what changes ASN produces on the quality of research according to the perceptions of the academics? ii) which factors describe the differences between those who assume ASN has had an impact on research quality and those who believe it has not? The hypothesis we want to test is that the effects of the scientific habilitation are mainly driven by the disciplinary field to which the scholars belong; thus, the changes reported by the scholars investigated are associated to different epistemic regimes and personal characteristics (e.g., gender). The importance of the effects produced by scientific habilitation is controlled against the importance of other factors: internationalization of the individuals, their capability to succeed in competitions for research funding, the strategic steering of the university they belong, and their networking. The results show that the effect of ASN is independent of the scientific field to which the scholar belongs. Furthermore, there is no evidence to conclude that gender has a significant effect on the response variable. Having at least one child is positively associated with the perceived effect of ASN on the research quality.

## International Postdoctoral Mobility and Career Effect: The Case of Italian Academia

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Thursday, 15th June - 16:40: (FUL-202) - Full paper presentation

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*Massimiliano Coda Zabetta (University of Barcelona), Aldo Geuna (University of Turin)*

This paper investigates the effect of international postdoctoral mobility on academic career. International postdoctoral appointments might either help to expand researchers' scientific and technical human capital while at the same time ensuring career stability or disconnect the researcher from the national academic network making her return and career in the home country's academic system more difficult. We use duration models on individual data to predict time to first appointment and time to promotion (from assistant to associate or full professor positions). Using a panel dataset of 18 thousand Italian academics in all disciplines over 30 years, we find that international postdoctoral appointments, while being weakly related to a slower entry in the academic system, have a positive effect on career outcomes and reduce the waiting time for tenure. This provides evidence that early-stage international mobility is beneficial for academics' career in the long-term. We use institution-based bibliometric indicators to measure different dimensions of social capital/network which affect researchers' career, namely: localism, home country linkages and expanding the scientific network finding weakly significant effects for the first two. Usual control variables are significant and robust.

## On the breadth of academic engagement activities: The effects of institutional experiences and individual opportunities

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Thursday, 15th June - 16:40: (FUL-202) - Full paper presentation

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*Paula Schipper (Copernicus Institute of Sustainable Development, Utrecht University), Jarno Hoekman (Copernicus Institute of Sustainable Development, Utrecht University), Maryse Chappin (Copernicus Institute of Sustainable Development, Utrecht University), Koen Frenken (Copernicus Institute of Sustainable Development, Utrecht University)*

The Societal Impact of research is becoming more and more important for universities, in particular, as a way to contribute to solving complex societal problems. Individual academics play a crucial role in realizing Societal Impact. The interactions between academics and non-academic organizations with the aim of Societal Impact creation is known as Academic Engagement. In this study, we ask the question of to what extent institutional experiences and individual opportunities affect the breadth of Academic Engagement. We look at a single and unique organizational context: Utrecht University's faculty of Geosciences. The faculty of Geosciences hosts natural and social scientists, and has recently integrated Academic Engagement in its reward and recognition policy to foster Academic Engagement by all its academic staff members. Based on a representative sample, distinguishing between 26 Academic Engagement activities, we find no differences between natural and social sciences, or for international mobile academics, in the breadth of Academic Engagement activities that employees undertake. However, we find that male colleagues, and academics with more research time show more breadth in their performed Academic Engagement activities, pointing to structural differences in individual opportunities. Finally, we also observe that those with work experience outside academia are more prone to show increased breadth in Academic Engagement. Ultimately, this research can be used to create more fitting support systems and evaluation models for the societal impact of academics within the university.

# **19.1 Reimagining research and funding cultures in the Anthropocene**

## Using a capabilities approach to explore the design space for responsible innovation policies

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Thursday, 15th June - 10:50: (FUL-213) - Full paper presentation

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*Robert Smith (University of Edinburgh), Michael Bernstein (AIT Austrian Institute of Technology), Cian O'Donovan (University College London), Filippo Cuttica (Independent Consultant)*

Emerging biotechnologies from fields such as synthetic biology and industrial biotechnology raise challenges for governance. In response, public funders have developed new approaches to govern these technologies before decisions are locked in and products emerge onto the market. Over a decade of experience with these nascent forms of governance, such as Responsible Research and Innovation (RRI), shows their value but also the limitations, particularly when implemented without consideration of day-to-day working conditions, sector specific distinctions and institutional structures shaping research in the biological sciences. Drawing on three workshops with members of the ERA CoBioTech funding programme, we show how a new approach, grounded in the idea of human capabilities, can help to integrate the skills, knowledge and institutional conditions needed to enact upstream governance in the design of future funding programmes. We identify the goals researchers associated with RRI in the life sciences, outline five sets of capabilities that enable researchers, managers and administrators to practise responsible research and innovation, and unearth a corresponding set of resources that these capabilities depend upon. Funders that learn to design programmes to maximise and expand the five capability sets are likely to enable more substantive forms of upstream governance than before.

## **Promoting societal engagement through social labs in key enabling technologies: Problems and possibilities for transforming innovation ecosystems**

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Thursday, 15th June - 10:50: (FUL-213) - Full paper presentation

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*Raúl Tabarés (TECNALIA, Basque Research & Technology Alliance), Izaskun Jimenez Iturriza (TECNALIA, Basque Research & Technology Alliance), Anna Aris (Vrije Universitat Amsterdam), Willemine Willems (Vrije Universitat Amsterdam)*

Innovation policies are increasingly facing a significant pressure for their reorientation towards addressing societal challenges such as climate change with the embedding of values like sustainability and responsibility. Public backlashes around the implications of innovation in contributing to greater inequality as well as the growing critiques to technosolutionism approaches are also contributing to this reorientation. But embracing sustainability, responsibility or others in innovation policy agendas, as well as displacing the importance of economic growth on them, demands of significant efforts that go beyond current incentives, tools and mechanisms operationalized by classical understandings of innovation. In this paper we aim to explore and assess the potentialities and possibilities of social labs for transforming innovation ecosystems while gaining knowledge and insights into how such ecosystems can be made more responsible. In particular, we explore what is needed for social labs to enable and encourage structurally embedding societal engagement processes into innovation ecosystems and as such facilitate a reorientation of innovation policies towards societal challenges. The paper is built up on a dataset that gathered empirical evidence from the setting up of six social labs set up into six EU countries (Bulgaria, Denmark, Estonia, Italy, Serbia and Spain) engaging more than 200 participants (academia, industry, public administration and citizens) from the fall of 2021 until the summer of 2022. Our findings point to the potential of social labs as a transformative learning ecosystem that can be of help for inducing transformations into innovation ecosystems for meeting societal challenges. We argue that the reorientation of innovation policies should also include dedicated efforts to transform classical understandings of innovation associated to economic growth for embracing new values such as sustainability, social justice or responsibility through meaningful societal engagement.

## **20.1 Understanding inter- and transdisciplinary research practices**

## The involvement of non-academic partners in societally targeted funded research

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Thursday, 15th June - 09:00: (FUL-202) - Full paper presentation

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*Irene Ramos-Vielba (Danish Centre for Studies in Research and Research Policy, Department of Political Science, Aarhus University), Rikke E. Povlsen (Danish Centre for Studies in Research and Research Policy, Department of Political Science, Aarhus University), Duncan A. Thomas (Danish Centre for Studies in Research and Research Policy, Department of Political Science, Aarhus University), Carter Bloch (Danish Centre for Studies in Research and Research Policy, Department of Political Science, Aarhus University), Andreas K. Stage (Danish Centre for Studies in Research and Research Policy, Department of Political Science, Aarhus University), Mette L. Falkenberg (Danish Centre for Studies in Research and Research Policy, Department of Political Science, Aarhus University)*

The focus of research funding has progressively expanded into broader variegated societal goals through, among other things, the promotion of transdisciplinary research, which is considered critical for problem-solving and value creation in society. In consonance, collective knowledge production and translation processes based on collaborative networks in the science and society interface are expected to generate further societal contributions by incorporating organisations from outside research institutions into the scientific process. Against this background, this paper examines the involvement of non-academic partners in societally targeted funded research through the exploration of three main assumptions supporting the rationale for such participation. (1) It is believed that more societally inclusive research would allow blending cultural values and expertise from different practitioners as non-scientific domains are expected to facilitate more socially robust knowledge. (2) A second assumption considers that the integration of external insights, tacit knowledge and practical skills may also contribute to the generation of more effective responses to actual societal problems and needs. (3) A third intertwined argument in favour of non-academic involvement in research is linked to the expectation of generating wider knowledge dissemination and further utilisation of research outputs. We qualitatively explore these three assumptions through semi-structured interviews with 16 non-academic partners in funded research projects. The analysis is based on societally oriented funding programmes in renewable energy and food science from main national public funding agencies in Denmark, Netherlands and Norway. This work provides new insights on the types of participating non-academics in societally targeted funded research, the role they play for research development and knowledge co-creation, and to what extent they facilitate broader uses and benefits for society.

## **20.2 Exploring the governance of inter- and transdisciplinary research**

# Exploring the potential of bibliometric indicators and qualitative criteria to improve the assessment process of interdisciplinary research proposals: a retrospective approach

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Thursday, 15th June - 10:50: (FUL-202) - Full paper presentation

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*Anne-Floor Scholvinck (Rathenau Instituut), Laurens Hessels (Rathenau Instituut)*

The potential of interdisciplinary research is increasingly recognized, but in competition for funding, interdisciplinary research proposals tend to be underappreciated in relation to disciplinary proposals. In this study we investigate the possibility to support the evaluation of interdisciplinary research proposals with additional indicators of interdisciplinary research quality. Based on the literature we have developed a set of qualitative and bibliometric indicators. We also empirically explore the relation between the interdisciplinarity of research proposals, the interdisciplinary research process that follows once a proposal is funded, and the interdisciplinary nature of the outputs of the funded studies. Using a small dataset, we found a bibliometric correlation between the interdisciplinarity of a proposal and its scientific outputs. Finally, we have studied the applicability and validity of the indicators proposed, based on interviews with interdisciplinary researchers and a re-assessment session. In the re-assessment session members of an original evaluation panel have assessed four original research proposals again, but now supported with our indicators. This work session confirmed the potential of some of the indicators, but also raised critical reflections about their limitations and unintended side-effects.

## Embracing heterogeneity to improve support for inter- and transdisciplinary research: the SHAPE-ID project

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Thursday, 15th June - 10:50: (FUL-202) - Full paper presentation

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*Isabel Fletcher (University of Edinburgh), Catherine Lyall (University of Edinburgh), Bianca Vienni-Baptista (ETH Zurich)*

Inter- and transdisciplinary research are seen as key means of addressing complex social problems (formerly ‘grand challenges’ and now ‘missions’) and so have become significant topics in discussions about knowledge production and research funding processes. However, the full potential of inter- and transdisciplinary research (IDR and TDR) to address real complex problems remains unfulfilled and integration remains largely rhetorical (Weingart, 2000; Pregering 2006). A tension between this a widespread rhetoric about the necessity of IDR and TDR and the persistence of policies based on disciplinary perspectives means that inter- and transdisciplinarity (ID and TD) are poorly understood and badly supported by governments and funding agencies. In the first half of this presentation we describe the existence of multiple heterogeneous understandings of inter- and transdisciplinary research and a lack of recognition within research policy of these different ways of conducting research. We argue that this lack of recognition hinders the development by funding agencies (and others) of new ways supporting inter- and transdisciplinary research, especially specialised funding instruments and evaluation processes. In the second half we describe two key outputs from the SHAPE-ID project - a reader gathering together key texts on ID and TD with commentaries from those working in this area, and an online toolkit of curated resources for conducting and supporting IDR and TDR (<https://www.shapeidtoolkit.eu/>). Our hope is that by making best practice in collaborative research more widely accessible, these outputs can contribute to the development of improved funding and evaluation processes by funding agencies and other stakeholders.

**21.1 Translational  
Research: how far have  
we come to bridge the gap  
between science and  
practice**

## Exploring translational research lines and the institutional mechanisms that support them

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Wednesday, 14th June - 09:00: (JUB-G36) - Full paper presentation

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*Fabien Ibanez (SPRU, University of Sussex), Joshua Moon (SPRU, University of Sussex), Kate Jones (SPRU - Sussex), Duncan Moore (SPRU, University of Sussex), Michael Hopkins (University of Sussex)*

Prior work on translational research in biomedicine is not simply the transplantation of academic research from ‘bench to bedside’ but involves a series of iterative and relational steps in which academics, industry, clinicians, and policymakers interact with one another to solve problems and shape outcomes. Existing studies of translational research often focus on the project as the unit of analysis, utilizing the clear boundaries placed on project timeframe and scope to help bound case studies. However, the process of moving academic findings into the policy or clinical context can take long periods of time and occur over multiple interdependent projects, limiting the perspectives that a project as the unit of analysis can provide. In this paper we expand upon the existing concept of the ‘research line’ to encapsulate a research team’s efforts across multiple interdependent projects to advance an idea. For translational research this idea has the potential for application in biomedicine. We study eight early stage translational research lines at an academic research organization in the UK, using the Diversity Approach to Research Evaluation (DARE). In doing so we provide a series of insights. First, we demonstrate four different pathways along which translational research lines may progress, with only one of these being directly ‘from bench to bedside’ in a linear manner. Second, describe the team dynamics of a series of cases, noting the importance of linking in internal collaborators (from neighboring labs, specialist facilities) and external collaborators (in industry, hospitals). Thirdly, we describe a range of support mechanisms that enable early-stage translational research lines to become established and to progress effectively.

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## Translating Research into Innovation: Policy and practice from the experience of three European transnational partnerships in health

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Wednesday, 14th June - 09:00: (JUB-G36) - Full paper presentation

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Dimitri Gagliardi (Manchester Institute of Innovation Research), Effie Amanatidou (Manchester Institute of Innovation Research)

Translational Research refers to the “*effective translation of the new knowledge, mechanisms, and techniques generated by advances in basic science research into new approaches for prevention, diagnosis, and treatment of disease [...] essential for improving health.*” (Fontanarosa & De Angelis, 2002, p. 1728). Approaches to translating research into innovation show that types of networking and network structures are linked to innovation outcomes and the mechanisms at the basis of successful translation rely on the production of knowledge, experimentation and applications by multiple parties working collaboratively (Zerhouni, 2007; Molas-Gallart et al, 2016; Gohar et al. 2019). In this work we focus on three health-related European Partnerships (era-learn.eu) trying to understand how such partnerships link research with innovation following the translational continuum, a stage-gate representation of the innovation process (Balconi et al, 2010). Our findings are based on 34 interviews undertaken in 2021/2022 with about 40 representatives of partnerships and their projects (partnership management and governing boards, project PIs, research and clinical partners, large companies and SMEs). The interviews were recorded and the anonymised transcriptions were thematically analysed applying the Gioia method of analysis (Gioia et al, 2013). This allowed us to articulate how partnerships undertake translational research and why certain steps, strategies or practices are undertaken. From a policy perspective, partnerships provide important policy learning experience and an extended network of relations amongst a variety of the stakeholders across the EU Member States. They enact such policy strategies at the most granular level spanning from responding to high level health policy objectives and through fostering translation of basic and clinical research into new therapies and approaches. From a research and innovation perspective, partnerships can boast excellent research capabilities and are increasingly focusing their translational activities in developing functional channels to market and to patients, while building capacities and investing heavily in the next generation of researchers, clinicians and health entrepreneurs. Their translational effort can also be seen in experimenting new ways to cross-sectoral knowledge exchanges and collaborations providing spaces for developing new experimental methodologies.

**21.2 Translational  
Research: how far have  
we come to bridge the gap  
between science and  
practice**

## Approaches to International Collaborations in Translational Research: a study on Italian Research Hospitals

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Wednesday, 14th June - 13:45: (JUB-G36) - Full paper presentation

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*Federica Rossi (Birkbeck, University of London), Ugo Finardi (CNR IRCRES)*

This work tries to understand how the organisation of clinical research in the context of research hospitals favours greater engagement in international collaboration. The question is relevant due to the importance that translational medical research has taken on in recent years. In order to respond to this question, the study exploits publicly available information about Italian research hospitals. The dataset collects data from several sources – the Italian Ministry of Health, Web of Science, the research hospitals' own websites. The main dependent variables are the shares of international affiliations of the publications of each hospital, and a measure of diversification of publications' international affiliations, obtained through the Herfindahl-Hirschman index. Results show that two different organisational models for research are present. The first one, which we term 'group-based research organisation', is characterised by the presence of formal groups with diverse leadership, and results in higher share of collaboration, but with a narrow set of countries, particularly high income countries. The second one, which we term 'individual-based research organisation', is characterised by less diverse leadership, and results in more geographically diversified collaborations and a higher share of collaborations with middle and low income countries.

## Research and Innovation Policy in Emerging Economies: Rationales and Instruments of International Actors' Support

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Wednesday, 14th June - 13:45: (JUB-G36) - Full paper presentation

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*Hamdy Abdelaty (Freie Universität Berlin), Amila Pilav-Velic (University of Sarajevo), Hatidza Jahic (University of Sarajevo),  
Djerdj Horvat (Fraunhofer Institute for Systems and Innovation Research ISI), Martina Kovac (Freie Universität Berlin),  
Carsten Dreher (Freie Universität Berlin)*

The field of Research and Innovation (R&I) policy has been the subject of extensive research and debate among scholars and policymakers in developed economies. However, in emerging economies, it is a nascent field that is only recently gaining the attention of policy stakeholders. This paper aims to investigate the challenges that hinder the establishment of a functional innovation policy cycle in emerging economies, taking into account the crucial role of international actors in such contexts. The paper adopts a case study approach using desk research and interviews to analyze Innovation Policy Programs in Bosnia and Herzegovina. The results demonstrate that international actors fund seven of eight nationwide innovation-supporting programs, individually or multilaterally. The current mix of instruments targets different actors in a balanced manner, focusing on business recovery and digitalization in various sectors- particularly agriculture and tourism. Policymakers' interviews reveal that the policy innovation cycle faces numerous obstacles, including the lack of evidence-based policy formulation, fragmentation and misalignment between actors, infrequent evaluation, institutional deficiencies, and insufficient financial capabilities. The support of international actors is essential to fill the domestic capability gap, but it lacks contextual awareness and does not adequately reflect local realities. We draw a set of recommendations based on the analysis.

**21.3 Translational  
Research: how far have  
we come to bridge the gap  
between science and  
practice**

## **Embedding Artificial Intelligence in Healthcare - The Case of AI-enabled Diagnostics**

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Wednesday, 14th June - 15:45: (JUB-G36) - Full paper presentation

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*Sandra Gillner (University of Bern)*

Despite high expectations, predictions about the spread of artificial intelligence (AI) in healthcare exceed reality to date, with reports of non-adoption, abandonment, or failure to implement AI. Our current models providing roadmaps to technology spread in healthcare seem to be inadequate to fully grasp the complexities of AI spread. In this study, we present a complexity science approach to direct our inquiry at the dynamic, nonlinear, and context-dependent process of AI spread in healthcare which challenges prevailing mechanistic and unilinear models. We conduct a qualitative study of AI-enabled diagnostics to theorise about how AI is embedded in healthcare. The notion of embedding allows us to connect local implementation with systemic diffusion. We identify a sociocultural, governing, and technological subsystem in healthcare whose features result in tensions during the spread of AI. These tensions are internalised by the healthcare system through emergent practices of stealth science, agility, and ambidexterity. Our study contributes to the emerging body of literature on the spread of AI in healthcare by providing a new perspective through the lens of complexity science. Rather than shrinking away from the messy and ever-changing reality of technology adoption, our theoretical contribution embraces complex system processes while retaining generalisability.

# Achieving Epistemic Justice in Hospitals by Professionalizing Patient Knowledge

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Wednesday, 14th June - 15:45: (JUB-G36) - Full paper presentation

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*Senda Fattoum (Montpellier Business School), Janna Rose (Grenoble Ecole de Management), Gazi Islam (Grenoble Ecole de Management)*

The concept of boundary work has been used to describe how different groups of people might work together in collaborations or partnerships of various kinds, but little research has examined how dissimilar groups create openings or gaps in boundaries to improve relations between groups. Langley et al (2019) contribute to the literature on boundary work by discussing how collectives maintain their identities, their borders, while working with other groups, across fields or disciplines, during interdisciplinary projects. However, boundary work not only involves separate collective identities, but also separate epistemic forms of knowledge and education or transmission of that knowledge. The role of knowledge separation and combination in boundary work has been under-emphasized. This is particularly problematic in fields or industries that involve highly educated or professional groups. Boundary work is often discussed in the context of highly knowledge-intensive sectors, like science, engineering, or medicine. Discussing boundary work in these sectors not only emphasizes groups' distinct identities but also their norms for authoritative knowledge formation and maintenance. Therefore, understanding boundary work in these sectors requires a deeper understanding of how epistemic norms are constructed and maintained within and between groups. Boundary work offers a highly valuable tool to examine multidisciplinary teams and collaborations, but it often reinforces ideas about solidifying or entrenching group boundaries when one group faces another. It is important to understand how dissimilar groups can make sense of each other, to reach their goals and finalize projects. However, group borders are constructed internally and externally via processes of professionalization or legitimation, including knowledge valuation and transmission. Thus, it is vital to examine the variations in epistemic knowledge construction and valuation in boundary formation and maintenance to more fully understand the boundary work concept. To better understand the links between epistemic knowledge valuation and boundary work, we examine patients in a French hospital who undergo training, professionalization, and hiring processes to form a patient partnership between themselves—the professional patients—and the hospital administrators, staff, physicians, and non-professionalized patients.

## **Deal or no deal: unravelling patent license negotiations in academic technology transfer in the Life Sciences and Health Sector**

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Wednesday, 14th June - 15:45: (JUB-G36) - Speed Talk

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*Ivo de Nooijer (Centre for Science and Technology Studies, Leiden University)*

Based on case studies license agreements in academic technology transfer in the life sciences and health sector are investigated to determine the specific dynamics of each of the studied negotiation. The case studies are based on the perspectives of stakeholders from both licensor and licensee in that particular negotiation. In addition, the project looked at reaching an agreement as such and the wider negotiation process. The study confirms a number of observations made previously in studies investigating academic technology transfer in the U.S.A., in addition, the cases identify key role of trust between parties. This plays a role in contractual aspects, for example 'commercially reasonable effort' and in the perception of the academic researcher of the negotiation process and its outcome. This trust, or lack thereof, can have substantial impact on the process, in particular if the researcher is involved in the licensee as well, i.e. plays a role in the company. This effect appears to be strongest in the case of startup companies set-up by teams with limited experience. The case studies highlight that in those cases the need for expertise is frequently met by investors, giving them an important albeit somewhat ambiguous role in the license negotiation process. They are formally not a party to the license agreement but play an important role in the outcome of the negotiations. The role of trust and expertise found in the project suggest an interesting parallel to research findings about alliance management. The study concludes that license negotiations can benefit from stakeholder centered approach that emphasizes the perspective of the four or five stakeholder groups involved; instead of the traditional legal approach that emphasizes two legal entities.

**22.1 Performance  
evaluation of government  
S&T budgeting:  
theoretical, empirical,  
and methodological  
contributions**

## Does grant funding foster research impact? Evidence from France

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Wednesday, 14th June - 09:00: (FUL-213) - Full paper presentation

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*Alberto Corsini (CSIC Institute of Public Goods and Policies (IPP)), Michele Pezzoni (Côte d'Azur University)*

Policymakers are interested in assessing the effectiveness of the competitive grant funding model in producing impactful research. In the French context, we compare the impact of scientific articles supported by competitive grants with the impact of articles not supported by grants using a probabilistic matching procedure. We rely on publication acknowledgments to retrieve funding information and on citation data to assess the articles' impact. We find that articles supported by competitive grants receive more citations than articles not supported by grants in the long run, while the difference is not significant in the short run. We find heterogeneity across fields.

## **Evaluation Synthesis of Innovation Policies in Latin America: Outputs, outcomes, and Impacts of direct support to Firms (2012-2022)**

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Wednesday, 14th June - 09:00: (FUL-213) - Full paper presentation

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*Alan Santos (University of Campinas - Unicamp), Adriana Bin (University of Campinas - Unicamp), Luciane Ferrero (University of Campinas - Unicamp)*

Although the STI field has an essential tradition in evaluation practices, few studies seek to systematize several evaluations of the same policy in this field and compare the results found in different situations. This work contributes to this gap and it is justified by the need for systematization and an integrated view of STI policies' outputs, outcomes, and impacts. This research aimed to systematize and discuss the results and impacts of STI Policies in selected Latin American countries (Argentina, Brazil, Chile, Colombia, Mexico, and Uruguay), focusing on Direct Support measures and to indicate possible bottlenecks and opportunities present in the results of the evaluations of these policies. The work sought to answer the following research question: What are the outputs, outcomes, and impacts of direct support policies to R&D and innovation in firms in selected Latin American countries? We used the Science and Innovation Policy Evaluations Repository (SIPER) as database and updated it to performed a systematic qualitative review through the results and impact percentage mean present in the selected 24 evaluations of direct support to STI between 2012 and 2022 in the region. In general, we observed that the results and impacts of direct support for STI policies in this analysis were positive on all analyzed fronts. In this way, we contribute for methodological and empirical perspectives. The methodological contribution were through the application of a systematic qualitative analysis in STI Policies evaluations in LATAM. The empirical contribution were trough the observation of the positive effect for Direct Support in STI policies and the discussion regarding data information and standarization in evaluations practice in the region.

## Institutional Reform and the Allocation of the Central Government S&T Funding in China

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Wednesday, 14th June - 09:00: (FUL-213) - Speed Talk

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*Yutao Sun (Dalian University of Technology), Bo Zhang (Dalian University of Technology), Cong Cao (University of Nottingham Ningbo)*

Prior research has argued that the allocation of S&T funding in performing sectors—universities, research institutes and enterprises, but the attention to the allocation of S&T funding in central government is insufficient. Related research found that national S&T programs is seriously fragmented and overlapped, different government agencies may set the same goals. China's government tries to improve the effectiveness in S&T funding system by the two vital institutional reforms. Therefore, this study examines the impact of institutional reforms on the allocation of central government S&T funding. Panel data of publicly financial budgets of 67 central government agencies over the 11-year period from 2011 to 2021, and descriptive statistical analysis, industrial structure similarity index and difference-in-differences method are used. Results show that institutional reforms have concentrated allocation of central S&T funding and made division of government agencies clearer to avoid resource overlap and redundancy, which is consistent with the reform objectives.

**Keywords:** institutional reforms, S&T funding, central government agencies, difference-in-differences, China

## **R&D subsidies in China: A methodological map using clean energy technologies as an example.**

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Wednesday, 14th June - 09:00: (FUL-213) - Speed Talk

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*Philipp Brugner (ZSI Centre for Social Innovation), Robin Schindowski (Bruegel)*

Since a decade already, China has pushed for innovation as the main driver of sustainable economic growth. Both the party and the government have been heavily involved in the direction and the implementation of this goal. However, the various channels through which the government participates in R&D activities are complex and challenging to map. We study direct monetary involvement of the Chinese government using clean energy technologies as an example. China has made enormous progress and dominates now manufacturing in almost all the clean energy technologies, most prominently in solar panel production. The processes that led to this dominance are relevant to study as the availability of clean energy technologies and their commercialisation are crucial towards achieving an affordable green transition. Our paper may also be situated in the European Union's current debate about de-risking from China while decarbonising the European industry to meet the goals stipulated by the Green Deal.

# **23.1 Biosocial technical systems: integrating analysis on sociotechnical systems, biosocial systems, and policy evaluation**

## Makers, Activists, and Biosocial Politics: Challenging Disease Transmission and Reframing COVID Debates

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Wednesday, 14th June - 15:45: (FUL-201) - Full paper presentation

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*Eric Kennedy (York University)*

During the early days of the COVID-19 pandemic, a common theme in public conversations was the notion of adapting to a “new normal.” COVID-19 seemed to represent an inflection point, at which – for better or for worse – it would be impossible to return to old norms. The concept of a “new normal” reflected a sort of breaking with previous social practices, policy approaches, and lifeways. Yet, only a few years later, the idea of “learning to live with the virus” became the broader, more contemporary approach. This rapid shift from the inevitability of a new normal to the gravity of the old one is rife with interpretive flexibility. In this paper, I explore a counter-cultural movement of citizen scientists and hackers who view themselves as holding fundamentally different views about impact – and the underlying goals by which impact is measured – when contrasted with traditional players in public health. I begin by introducing these citizen scientists and hackers under the broad category of ‘clean air advocates.’ I offer a brief sketch of two clusters within this diffuse community: an original cluster that developed and advocated the “Corsi-Rosenthal Box,” followed by an overlapping series of advocates seeking to ‘optimize’ these devices, prove their impact, and translate that direct impact into policy impact. I then turn to a reflection on alignments and contrasts with traditional citizen scientist and hacker movements, before exploring – in the spirit of Eu-SPRI – a series of further questions as I begin into more formal empirical work within this project.

## Social acceptance to health technologies: media and COVID19 in Brazil

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Wednesday, 14th June - 15:45: (FUL-201) - Full paper presentation

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*André Luiz Sica de Campos (Unicamp State), Rebeca Feltrin (State University of Campinas), Paula Xavier (Fiocruz), Gustavo Carvalho (Fiocruz), Janaina Pamplona da Costa (State University of Campinas), Pamela Lang (Fundação Oswaldo Cruz)*

Differently from recent episodes of epidemic diseases such as HIV and Zika viruses, where biological factors were prominent, COVID-19 posed challenge in areas such as health policies, efforts to create novel drugs and vaccine development but also, a new and critical arena emerged in the realm of communication and the circulation of knowledge and information. With new forms of communication and social interaction, recent Public Health Emergencies of International Concern became more challenging. The COVID-19 pandemic not only caused havoc in health systems, but it was also articulated with a disinfodemic (Posetti and Bontcheva 2020), that is the context where there is an epidemic of disinformation, false information is circulated and causes negative impacts at the social and health levels. Consequently, treatment and prevention for COVID-19 involves both medical approaches and efforts in communication. During disinfodemics, false information covered the characteristics of COVID-19 and targeted institutional and individual sources. Efforts to mitigate the effects COVID-19 had to be implemented beyond therapeutical, medical and scientific aspects, encompassing issues such as access to reliable information. Memes, fake news, bogus websites, false data sources, disinformation campaigns posed health risks to the population exposed to COVID-19, particularly before immunization. Disinfodemics created feelings of doubt in relation to credible sources of knowledge such as scientific research and related institutions. In this realm, the response to COVID-19 relied not only in the development of vaccines, their deployment but also on their social acceptance. In this paper we interpret these events under the biosocial technical perspective. That is, the acceptance of new technology by the public is part of a broader technoscientific system, whereby networked agents, artifacts, information, knowledge and regulations interact among themselves and also with biological agents (Jasanoff and Kim, 2015; Fox, Griffy-Brown & Dabic, 2020). To analyse these issues, we take the case of Fundação Oswaldo Cruz, Brazil in the period between 2020 and 2022. Fiocruz not only had to assimilate and manufacture Oxford/AstraZeneca vaccine, but also engaged in the reorganization of its communication policies. Our analysis is based on institutional documents, the impacts generated by content covering Fiocruz and 11 interviews.

# **Exploring biosocial technical systems: Vaccine development and the response to Public Health Emergencies of International Concern by public sector research institutes in Brazil**

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Wednesday, 14th June - 15:45: (FUL-201) - Full paper presentation

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*André Luiz Sica de Campos (State University of Campinas), Janaina Pamplona da Costa (State University of Campinas), Liz Greco (State University of Campinas), Paulo Cintra (State University of Campinas)*

The objective of this paper is to analyse the nature of the response of Instituto Butantan (Butantan) and Fundação Oswaldo Cruz (Fiocruz), public research institutes responsible for human vaccines in Brazil, to Public Health Emergencies of International Concern (PHEIC). We propose to do so by exploring the concept of biosocial technical systems. As such we observe how societal systems, biological systems and vaccine technology influence one another in an interdependent way. Vaccine technology is conceptualized from the perspective of their capabilities. We consider that the vaccine industry, from the perspective of developing countries, poses challenges not only in relation to Research and Development and local vaccine production but also in terms of vaccine acceptance, which calls for integration of the biosocial and the sociotechnical systems concepts. We identify the institutional construction of the public health and research system in Brazil and the relevance of universalization in care. These elements resounded in the public health research efforts to develop a vaccine to cope with the Zika virus PHEIC in 2016, as well as in the public perception of science in the response to this crisis. We analyse the production of background scientific knowledge employing a qualitative methodology (173 interviews), complemented by secondary data and data for publications and patents. We then observe how the development of Zika virus vaccines drew upon international networks and the adaptation of accumulated knowledge on existing vaccines such as dengue and Yellow Fever. No Zika vaccine entered the production stage as the epidemics receded, but qualitative data attests the overall positive view of public research in this response. Based on this analysis we draw implications to the internalization of vaccine production to deal with the Covid-19 PHEIC as well as its acceptance. The expertise accumulated in production of existing vaccines and clinical trials proved to be useful in the internalization of the production for Covid-19 vaccines. A number of barriers and enablers in vaccine scientific research, technological development and production are identified.

## **What can be learnt from the histories of production and use of vaccines and medicines in Chile for integrated analysis of sociotechnical systems, biosocial systems and policy evaluation?**

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Wednesday, 14th June - 15:45: (FUL-201) - Full paper presentation

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*Cecilia Ibarra (Universidad de Chile)*

At the beginning of the 20th century, Chile experienced a health crisis with high mortality rates due to infectious diseases. In this context, public policies promoted the development of socio-technical systems that were aligned with the health reality, under the beliefs and values of decision-makers. Under this historical context, the development and production of medicines in the Bacteriological Institute in Chile between 1930 and 1960 shows alignment of biosocial realities with socio-technical systems, forming a biosocial technical system. This paper examines three cases -production of vaccines, neoarselán and penicillin- to answer the questions: What instruments for the promotion of science, technology and innovation and what forms of institutional work are observed? The health crisis in Chile was profound. Health was linked to social and economic concerns and the role of the state in public health was preponderant. These ideas promoted reforms to and a reorganization of the country's health services, which included the creation of the Bacteriological Institute, The Bacteriological Institute's mission was to train bacteriologists, to produce serums, vaccines and biological and biochemical products and to control the manufacture and sale of these products in Chile. The Institute was tasked with delivering these healthcare products to government at cost price. In the 1940s, the application of vaccines and medicines contributed to a decrease in Chile's mortality rate. It is hoped that the findings of this historical study will motivate reflection on the range of innovation policy possibilities in biosocial technical systems, in relation to the historical circumstances and institutional work involved.

# **24.1 Creative and Cultural Industries and Innovation: New models, new policies, new institutions**

## **Technological, Organisational and Environmental factors motivating creators to adopt digital platforms in the creative and cultural industries (CCIs)**

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Friday, 16th June - 13:30: (FUL-202) - Full paper presentation

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*Vasiliki Fytrou (University of the Aegean), Pinelopi Stavrianidi (University of the Aegean), Naoum Mylonas (Assistant Professor, Ionian University), Anastasia (Natasha) Constantelou (Associate Professor, University of the Aegean)*

Digital technologies and tools transform creative and cultural industries (CCIs) and foster the emergence of new entrepreneurial and business models (Lerro et al., 2022). Digital platforms (DPs) provide creators with intermediaries that offer them more than just new sales opportunities. This work in progress seeks to empirically explore the extent of DPs' adoption by CCIs entrepreneurs. In particular, this work in progress examines, by employing the TOE theoretical framework, the factors that impact the adoption of DPs by creators from various CCIs. TOE is a theoretical framework that describes the process through which an individual enterprise adopts and implements a technological innovation and understands it as being influenced by three independent contexts, the technological, the organizational, and the environmental. In this work in progress, empirical research carried out in a sample of 180 creators who are self-employed or exert entrepreneurial activity in CCIs in Greece. Structural Equation Modelling (SEM) is adopted in order to assess the research model introduced in this work, due to the fact that it can measure all paths simultaneously, not stepwise, it is considered a more comprehensive method than stepwise regression analysis.

# Technological Innovation as an Enabler of Social Value Creation in the Museum Sector: Evidences from the InnovaMusei Experience.

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Friday, 16th June - 13:30: (FUL-202) - Full paper presentation

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*Federico Bartolomucci (Politecnico di Milano), Paola Riva (Politecnico di Milano)*

Digitization and innovative technologies are increasingly acknowledged as social value enablers, having the capacity to re-shape the museum sector and empower these institutions to fulfil their mission of creating societal value and encouraging cross-cultural understanding. Literature has so far discussed the disruptive power of technology in the cultural sector, but little attention has been dedicated to impact assessment of technological innovation on museums in terms of social value creation. Recognizing this, our research addresses the following research question: *is technological innovation a catalyst for social value creation in the museum sector?* To answer, we adopt the Social Innovation theoretical lens to regard technological innovation not only as outcome (i.e., the technological artefact), but rather as the social process of interaction among various actors, that leads to the creation and adoption of the outcome. Specifically, we develop an impact measurement model which considers four types of impact - economic, social, environmental, and cultural - in relation to three actors involved in the innovation process - museums, cultural users, and the local community in which museums operate. We test the model by applying it to a technological innovation program in the museum sector, i.e., InnovaMusei, promoted by the innovation-hub Cariplo Factory, held in Northern Italy between March 2021 and June 2022 and involving more than fifty[PR1] museums and fifteen startups providing high-tech solutions to improve the museums' offerings impact on society. Measuring efficacy of technological innovation in enhancing museums' impact on their users and on local communities, our study provides explorative evidence on the contribution that technology could give to museums' social value creation and encourages academics to apply our model to different cases to further discuss its generalizability and validity. Moreover, showing that potential corrective measures may be implemented to maximize the tech-innovation process' impacts, our study encourages practitioners and policymakers to increase their support for such initiatives through new investment and grant schemes.

## **Protecting Creativity: A qualitative study on national versus European design rights**

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Friday, 16th June - 13:30: (FUL-202) - Full paper presentation

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*Doris Schartinger (AIT Austrian Institute of Technology), Michael Barber (AIT Austrian Institute of Technology)*

Connecting creativity and innovation processes in many cases relates to intellectual property rights as they are a means to protect resource-intensive creative activities. This paper addresses the design registration behaviour of firms by providing first) quantitative evidence on design registrations by Austrian firms in Austria and on the European level, and second) qualitative evidence on the motives and strategies of firms behind their design registration behaviour on the national and European level. National design rights for Austria and EU-wide design registrations by Austrian firms seem to be rarely combined. Only a small amount of firms bundle them together and make use of both rights/scopes of protection, most firms use either national design protection or EU-wide design protection. We explore this on the basis of interviews with patent attorneys, lawyers specialised on intellectual property law and experts and representatives of cultural and creative industries.

## **25.1 Policy & Public Sector Social Innovation**

## **Changing universities' mobility practices in the Ruhr area. Setting up participatory workshops as input for interventions in socio-technical systems**

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Wednesday, 14th June - 09:00: (JUB-144) - Full paper presentation

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*Marlon Philipp (TU Dortmund University), Kay Cepera (TU Dortmund University), Johannes Weyer (TU Dortmund University)*

Building on the results of previous quantitative research within the InnaMoRuhr project, five scenario workshops with students, scientific staff as well as administrative employees were conducted to identify means to facilitate a sustainable mobility transition in the university context and to identify possible intervention measures. In the first three workshops, four future scenarios based on data from a previous large-scale survey in the project were developed further to achieve feasibility: Digital Universities, interconnected Universities, Bicycle Universities, and Universities as Hubs. In addition, 75 personas were developed to identify possible individual opportunities and risks. Across the board, it became apparent that childcare in particular influences mobility, as this requires a flexible chain of transport in order to be able to react spontaneously to events. In addition, the discussions showed that university employees are significantly more car-savvy than students, who can more readily imagine doing without a car. In the fourth workshop, four of the previously created personas were selected and their challenges and corresponding solutions regarding everyday mobility were discussed. Here, it became apparent that an improvement of public transport, for example with regard to the cost structure but also the combinability with the bicycle, could change individual mobility. Further suggestions mentioned include the promotion of sharing options as well as the promotion of bicycle comfort, for example through shower facilities. Based on the fourth workshop's results, three real laboratory ideas that combine a broad bandwidth of the suggestions were identified. The ideas "bicycle hub", "mobility budget" and "e-car-sharing" were then validated discursively in the fifth workshop by means of user journeys and haptically by means of prototyping. This resulted in user-oriented intervention advice. These suggestions were then implemented as experiments in three real laboratories that took place from September to December 2022.

## Applying policy mix thinking to social innovation: from experimentation to socio-technical change

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Wednesday, 14th June - 09:00: (JUB-144) - Full paper presentation

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*Karoline Rogge (Fraunhofer ISI & SPRU, University of Sussex), Maria Stadler (Fraunhofer Institute for Systems and Innovation Research ISI)*

So far, the emerging literature on policy mixes for sustainability transitions has paid little attention to social innovation. This seems at odds with recent claims that transformative policies should promote a wide range of innovation, and social innovation in particular. In this paper, we explore whether and how policy mix delineation and analytical approaches that were developed primarily with technological innovation in mind can be usefully applied to social innovation. We examine empirical case study evidence, and proceed in two steps: after an initial top-down mapping of the focal policy mix for social innovation in energy in Germany, we conduct a bottom-up mapping of the policy mix relevant for the social innovation field of 'participatory incubation and experimentation' in Germany's energy sector. Based on our insights we discuss the relevance and recognition of social innovation in sustainability transition policy mixes, and offer research and policy implications for accelerating socio-technical change.

## **Sparking From Barriers: A Cross-Disciplinary Conceptual-Empirical Approach Towards Public Sector Social Innovation Orientation**

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Wednesday, 14th June - 09:00: (JUB-144) - Speed Talk

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*Katrin Bauer (TU Dortmund University)*

Against the backdrop of grand societal challenges and the ergo much-needed comprehensive transformations, the public sector is reckoned among the central players in the social innovation ecosystem (Moulaert et al. 2007; Howaldt et al. 2016). In this vein, public sector actors must entrepreneurially create opportunities with the challenge-constrained resources at hand to so spark social innovation as remedy (Mulgan and Albury 2003; Baker and Nelson 2005). However, research to this point considers procedures in the public sector as rather static, for example, due to accountability structures (Klein et al. 2013; Audretsch et al. 2020), which hinders public sector actors from entrepreneurially orientating at and subsequently promoting social innovation. Likewise, a holistic set of dimensions including roles and organizational factors that reflect public sector actors' orientation at social innovation has not been focused on yet by recent research (Domanski et al. 2020; Mair et al. 2023). Therefore, the present research, first, via a semi-systematic meta-narrative review of the public sector literature, delivers a clustered synthesis of factors hindering public sector actors' entrepreneurial behavior. To systematize the results, the work builds upon creation theory of entrepreneurship (Alvarez and Barney 2007). Second, drawing from the literature analysis and earlier own empirical work, it develops a multi-dimensional construct of what is here framed public sector actors' social innovation orientation. Findings contribute critical input to the interface of social innovation and public sector research, generating insights into barriers and ultimately enablers of social innovation by public sector actors. By deploying a cross-disciplinary perspective and developing a novel measurement instrument, the present work diverges from a holistic view on social innovation (Kaletka and Pelka 2015) and from the large body of conceptual research (Rana et al. 2014), so contributing conceptual and empirical intermediaries and new modes of knowledge generation in social innovation research (Howaldt 2019). Practically, we deliver guidelines on roles and organizational factors for public sector actors (Windrum et al. 2016; Pel et al. 2020) and public policy to consider when aiming at the promotion of social innovation.

## **25.2 Social innovations challenging incumbent hegemonies**

## Innovation for hegemonic versus counter-hegemonic agendas: Latin American concepts and practices

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Wednesday, 14th June - 15:45: (JUB-144) - Full paper presentation

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*Les Levidow (Open University)*

Technoscientific innovation has become a hegemonic symbol of beneficent progress in various senses: a social opportunity for better livelihoods; eco-efficiency improvements benefiting environmental protection, and economic competitiveness in global markets. These putative benefits have helped legitimise profit-driven capital-intensive innovation; its design helps exploit (or expel) labour, plunder natural resources and perpetuate socio-economic inequalities. Those agendas have provoked alternatives seeking to benefit societal groups which are otherwise marginalised or harmed by innovation. In Latin America, alternative innovations and concepts have arisen from social movements resisting the hegemonic system. In particular: solidarity economy (EcoSol) initiatives have innovated production techniques developing collective skills under their own control. Likewise short food chains (circuitos cortos) for closer, fairer relationships between producers and consumers, while avoiding profit-driven intermediaries. Innovation for those counter-hegemonic agendas is often called 'technology', understood as technology-in-use.

Adjectives highlight specific roles. In particular:

- Social technology denotes production methods which can be cheaply developed, consolidated, appropriated by the producers, and then easily replicated or adapted elsewhere.
- Socio-environmental technologies facilitate practices that are environmentally sound, resource-conserving, socially just, economically viable, culturally acceptable, and easily replicable.
- Socio-territorial technologies encompasses any product or process rooted in a communitarian initiative to reproduce its socio-environmental basis in resisting territorial threats.

In particular, agroecological innovation has arisen through a convergence between movements for solidarity economy and agroecology. This EcoSol-agroecology convergence has facilitated stronger alternatives and resistance against the dominant agri-food system. Such concepts and practices have been developed through horizontal knowledge-exchange, often called *diálogo de saberes*, whereby practitioners analyse their experiences with each other and with external experts including academic researchers. Beyond specific innovations, Participatory Action Research (PAR) structures experiential learning so that a collective subject can better plan future actions and so become a more effective agent for social change. In Latin America, such methods arose from a counter-hegemonic agenda resisting dependence on neocolonial Northern models and globalised markets. The methods combine academic knowledge with popular wisdom; they learn how to adapt expert innovations and knowledge for alternative development trajectories. Through such stakeholder engagement, academic researchers have enriched their critical concepts and gained greater impact for their research insights.

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# The role of gender in explaining citizens' participation in social innovations in the energy transition - An empirical analysis for France and Germany.

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Wednesday, 14th June - 15:45: (JUB-144) - Full paper presentation

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*Hannah Janßen (Fraunhofer Institute for Systems and Innovation Research ISI), Elisabeth Dütschke (Fraunhofer Institute for Systems and Innovation Research ISI)*

Social innovations in the energy transition such as investments in energy cooperatives or engagement in political campaigns have the potential to accelerate the energy transition. However, for social innovations to reach their full potential and to generate social impact, they have to be supported by as many people as possible, including different societal groups. When it comes to the energy transition, a growing body of evidence suggests gender differences in involvement. Therefore, this paper explores the potential gender gap in participation in selected types of social innovations in the energy sector. Using large-scale representative survey data (n=3,898) from Germany and France we apply logit regression models to examine whether gender is statistically significantly related to stated intentions to engage in social innovations in the energy transition. We group the social innovations in the categories (1) civic engagement (including: participation in campaigns supporting green or sustainable energy, volunteering for a green or sustainable energy project or organization, volunteering for a proenvironmental project or organization) and (2) investment (including: investment in energy cooperatives, investments in a green or sustainable investment asset). We find that in some cases gender has an influence on the interest to participate in social innovations in the energy transition above and beyond other variables, especially in France and for social innovations related to investments. When it comes to social innovations categorized as civic engagement, women in France are less likely than men to volunteer proenvironmentally or in the energy transition. For investment, women in Germany and France are less probable to intent to invest in energy cooperatives. Additionally, in France women are less probable to intent to invest in sustainable investment assets. Even though the energy domain has been found to be dominated by men, this only partly applies for social innovations in the energy transition as pointed out by our study. Hence, to some extent social innovations enable women to bring in their perspectives into the energy transition. However, especially for investment intentions we identify gender disparities. Thus, women miss out on opportunities to gain further financial independence and shape the energy transition.

## Social Innovation and Violent Conflict: The Case of Syria

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Wednesday, 14th June - 15:45: (JUB-144) - Full paper presentation

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*Salah Moussalli (SPRU, University of Sussex)*

This paper looks at the development of social innovation under the conditions of violent conflict, using the Syrian conflict as a case study, and looking at digital social innovation in particular. Following an exhaustive literature review, a conceptual framework is developed to research this relationship, and data is collected from a group of social innovators and practitioners. The research findings suggest that conflict affects social innovation through three channels: the push-factor, entrepreneurial activities; the pull-factor, framework conditions; and the social innovation process. Over the short term, violent conflict enables social innovation. This happens through strengthening the entrepreneurial activities on the push side, and the societal climate framework on the pull side. These lead to enabling the proposals and prototyping stages of the social innovation process. On the long term, social innovation is disabled. This happens through inhibiting conditions in the resources, political, and institutional frameworks on the pull side. These lead to disabling the prototyping and sustaining stages of the social innovation process. In other words, violent conflict creates an initial surge in social innovation activity, but most of this activity remains underground and doesn't find a way to become sustainable and institutionalised. The results of this research suggest that policy makers should work on enhancing the institutional and resources frameworks, to enable the transition of social innovations into sustainable models that can contribute to the post-conflict reconstruction.

## Social exnovation

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Wednesday, 14th June - 15:45: (JUB-144) - Speed Talk

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*Rick Hölsgens (TU Dortmund University), Karina Maldonado-Mariscal (TU Dortmund University)*

The paper offers a review of social innovation and exnovation literature in search for synergies and opportunities for exnovation of unsustainable practices. The ideas behind exnovation are not particularly new. Despite this, academic attention for exnovation in relation to social innovation literature remains rare. While existing literature on ‘social exnovation’ is small and nearly non-existent, it is expected to be able to identify synergies and expose (policy) opportunities to more effectively implement and diffuse sustainable social innovations as novel practices, once the exnovation of existing practices is better understood and theorized in (sustainable) social innovation literature. Although social innovation scholars have called social innovation a paradigm shift in innovation research, it can be argued that a large part of the literature on social innovation when analysed in a historical perspective tends to align with mainstream innovation, in the sense that they “are based on the assumption that innovation is a force for creating a better world” (Schot and Steinmüller, 2018, p. 1561). Social innovation is seen as the introduction (and diffusion) of *new* sustainable behaviour and practices, contributing to positive changes. However, in line with sufficientarian thinking about ‘enough innovation’ and exnovation of unsustainable technologies and practices, social innovation research might benefit from an exnovation approach. We identify that research in social innovation needs more radical thinking, and needs to address the conflicts of innovation and degrowth. Placing a reflection in the field of innovation research, where current problems call for a need to innovate more radically within innovation itself.

## **25.3 Practices for sustainable social innovations**

## **The key role of contextualizing local social practices in project ownership and sustainability. A case study in post-conflict communities in Northern Uganda**

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Thursday, 15th June - 09:00: (JUB-144) - Full paper presentation

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*Bertha Vallejo (TwINS Afrika), Mia Stockmans (Tilburg University), Primrose Nakazibwe (Ndejje University)*

In practice, very few capacity development interventions remain self-sustainable after the project has ended and the resources have been exhausted. This is of great concern for donors and taxpayers. This article explores the role that considering contextual factors and including social processes and practices in project design and implementation play in output sustainability after the project conclusion. By using a case study of a social innovation addressing collective mental trauma in post-conflict communities in Northern Uganda and which results indicated that the participants were perceived as more active and capable socially after the training, suggesting a decrease in their negative reliance on their community groups and positive and significant effects on the participants' social-economic resilience. After five years of the initial intervention, the team returned to the sites and explored the role of contextualization and inclusion of local social practices in the pre-design in after-project sustainability. The results indicate the significant relevance of carefully combining the co-creation approach with carefully selecting stakeholders and their interactions with the community. The project also found the critical relevance of translating the intervention into the different local languages and, most importantly, contextualizing the words adopted in the translations to those used by the community. We argue that by including critical stakeholders in the co-design of the implementation, tailoring the interventions to the cultural and linguistic context of the recipients, and engaging in the local social practices, these interventions are sustained and psychologically owned by the communities after the intervention has ended. Engagement and co-creation play a key role in adapting new alternatives, such as the tool, and generate a sense of ownership in the community. By focusing on the social processes accompanying any intervention, this research looks at cultural and political appropriation at different levels of analysis (the communities, district, and national authorities). The paper contributes to empirical studies of capacity development and after-project sustainability and implementation science by adding more understanding of the adaptation phase connecting capacity development interventions with after-project sustainability within the growing stream of empirical studies on non-medical interventions in [mental] health in low-resource contexts.

## Reducing Environmental Impact through Shared Ownership: A Model of Consumer Behaviour

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Thursday, 15th June - 09:00: (JUB-144) - Full paper presentation

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*Francesco Pasimeni (Eindhoven University of Technology - Technology, Innovation, and Society group), Tommaso Ciarli (UNU-MERIT, United Nations University)*

We propose a simple model to study the conditions under which consumers prefer to purchase a good in coalition rather than individually. To identify those conditions, we study the full parameter space that defines the characteristics and preferences of heterogeneous consumers, the characteristics of the good, and the characteristics of a public service that offers the same services as the good. We find that shared ownership emerges only under niche conditions, for relatively lower income consumers with relatively higher demand. Furthermore, shared ownership is more likely to emerge if the shared good is relatively small and can be purchased in small coalition with lower coordination costs. Results are relevant to design sustainable consumption policies as they show that the diffusion of shared goods reduce the net number of goods in an economy, and therefore their environmental impact. However, we do not find any impact of shared ownership in reducing inequality in accessing goods. We show that policies that reduce the relative price of the shared purchase can accelerate the transition to a more sustainable shared consumption.

## Social Innovation Research and Practice Theories – Using Practice Theories’ Lenses to Analyse the Diffusion of Social Innovation

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Thursday, 15th June - 09:00: (JUB-144) - Full paper presentation

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Marthe Zirngiebl (TU Dortmund University)

The paper presentation contributes to the conceptual development of social innovation research based in social theory by developing the contours of a heuristic for studying the diffusion of social innovation drawing on social practice theories. The paper argues that while the aspect of changing social practices can be found in many social innovation definition, it is especially Howaldt & Schwarz's (2010) conceptualisation, which needs further theoretical sharpening by operationalising social practice theory. Thereby, adopting a social practice theory perspective shifts attention from scaling – often referred to in social innovation research – to diffusion, which is inherently linked to processes of social change. Building upon these presumptions, the heuristic following Shove et al. (2012) starts from the proposition to distinguish between *practice-as-entity* and *practice-as-performance*. Mainly using Shove et al.' (2012) elements approach complemented by Jaeggi's focus on norms driving the change of social practices composes the inner layer of the heuristic defining a single practice (which from a social innovator's perspective needs to change). However, this perceived need to change does not equal the agency allowing for it. This inner set up of a *social practice-as-entity* is followed by an outer layer in which the performance of a practice takes place in a context determined by material arrangements, time and rules (following Schatzki, 2019 and Blue & Spurling, 2017). Yet, these three context defining variables at the same time are common connectors to other practices with which the social practice at hand forms bundles and complexes. The diffusion and establishment of the innovative social practice, representing at first sight a practice variety, ultimately rests on its ability to form bundles and complexes thereby eventually affecting multiple other practices and complexes of them to bring about social change. The paper then closes by outlining some implications for innovation policy and considerations for empirically testing the heuristic.

## **25.4 Regional Dimensions in Social Innovation**

## Rethinking innovation beyond economic growth for sustainability transitions

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Thursday, 15th June - 10:50: (JUB-144) - Speed Talk

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*Andrea Perez (SPRU - Sussex)*

Confronted with ecological, social and economic crises, the main policy response has been to advocate technological innovation within a 'green growth' paradigm. However, evidence suggests that current conventional models for innovation in sustainability are inadequate to fully resolve linked crises of unsustainability. Current environmental issues cannot be solved merely by incremental improvements and technological fixes. Here, a new space of opportunity is opening for social movements that are exploring alternative development pathways and a radically different approach to economic development. This research aims to contribute to understandings of how innovation is conceived and enacted by social movements concerned with issues around green growth. Most of the literature on sustainability transitions and innovation still focuses on more conventional economic assumptions and understandings of innovation, as well as conventional practices in business and government. There is less research on how movements might prefigure new models, criteria and settings for innovation that require a rethinking of innovation in a postgrowth society, which is the gap in the literature that this research intends to address. This research integrates a thematic analysis and critical discourse analysis from data collected through in-depth semi structured interviews, participant observation and document analysis of two counterpointed case studies: one addressing together in a nuanced way several radical social movements characterised by broadly overlapping views around "degrowth" ideas, and the other focusing specifically on broadly comparable "scholar activist" communities associated with contrasting ideas of "green growth". This research will provide timely analysis that is both constructive and critical towards rethinking innovation in society, which will benefit policymakers, businesses and civil society organisations.

## Experiments as a form of social pharmaceutical innovation

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Thursday, 15th June - 10:50: (JUB-144) - Full paper presentation

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*Wouter Boon (Utrecht University), Tineke Kleinhout-Vliek (Utrecht University)*

Rare diseases are associated with various market and systemic failures. Experiments are emerging all over the rare disease space seeking to overcome or address these failures. Often these experiments involve new ways of organising and novel social arrangements. We study these social pharmaceutical innovation experiments and ask the question: how and under which conditions do these social pharmaceutical innovation experiments, flourish and contribute to transformative change? We pay attention to the way these experiments are organized and protected from strong institutions that are prevalent in the healthcare field, and to the way they actively attempt to scale. To answer the research question, we have studied six social pharmaceutical innovation initiatives in the Netherlands, varying from clinician-led disease registries and magistral production of medicines in hospital pharmacies to patient organisations organising clinical trials. Our analysis shows that the SPIN initiatives are actively acquiring subsidies to sustain their activities (shielding), devoting resources and attention to the organisation of their experiment, e.g. by creating networks and visions (nurturing), and articulating narratives to argue for special treatment vis-à-vis the prevailing regime (empowerment). We found three distinct modes of experimentation scaling. First, we see that the practical elaboration of SPINs gets de-contextualised and re-contextualised. The second mode of experimentation roll-out concerns aligning of the niche with narratives and movements already ongoing at the 'global niche level'. The third mode is about the non-scaling of the pilots.

# The growing role of globally connected, locally acting maker communities for social and societal change: insights from grassroots movements in the Global South

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Thursday, 15th June - 10:50: (JUB-144) - Full paper presentation

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*Hanna Saari (VTT Technical Research Centre of Finland), Maria Åkerman (VTT Technical Research Centre of Finland), Barbara Kieslinger (ZSI Centre for Social Innovation)*

In many communities globally, especially in the Global South, environmental degradation and climate change threaten the very conditions of life. The residents in the frontlines of the ecological changes react in many ways. Grassroots innovations and innovation communities that aim at combating local environmental changes and contributing to global solutions hold significant potential for change. We argue that a critical aspect in realizing this potential is community empowerment. In EU-funded Critical Making project, we explore the potential of the global maker movement to address the societal needs of communities and to challenge the existing economic structures in a responsible and inclusive way. This article is primarily based on interviews that we have conducted with participants of the Critical Making Mentoring programme launched by the Critical Making project. The participants had an on-going maker project aiming at creating social impacts. The mentoring programme aimed at helping them enhance the sustainability of their practices as well as build for economic continuity. Building an online community and receiving peer support were important parts of the mentoring programme. A small financial support was also offered as part of the programme. The interviews are conducted twice with the same participants, first right before the start of the mentoring programme (“entry interviews”, 14 participants interviewed) and second time after the last workshop (“exit interviews”, 11 participants interviewed). All interviews were group interviews held online. Here we are presenting the very initial first results of the interviews, cross-fertilized with earlier community empowerment literature. We were able to identify five aspects that are especially important for empowering maker communities of the global south, namely creative resource mobilization under scarcity, increasing situational awareness, learning to manage relations with wider society, new skills and knowledge, and sharing and openness. The analysis we will present is initial, and the work of conceptualizing community empowerment of maker communities and the potential impacts it has will continue. Based on our research, the consideration of community aspects is crucial in creating impactful maker communities with potential of bringing about positive societal changes.

# **Poster Exhibition**

# Wage and Employment Effects of Artificial Intelligence in UK Labour Markets

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Wednesday, 14th June - 12:30: (Jubilee Foyer) - Poster

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*Lorraine Mackenzie (University of Sussex)*

Artificial Intelligence is growing at unprecedented rates, and has the potential to significantly change the task-structure of occupations. The growth of AI is being met with widespread fear of technological unemployment and rising inequality, however it is not clear if these effects will be realised. This paper first constructs a task-based measure of AI exposure in UK occupations, finding that at an occupational level there is variation not only across occupational groups but also within them. This is largely driven by differences in types of occupations, with non-routine cognitive occupations facing high exposure across all groups. Whether or not AI will lead to unemployment and increasing inequality depends on the strengths of the displacement and productivity effects, this paper will measure local effects within Travel-To-Work Area's using local equilibrium framework in order to capture potential productivity spillovers.

## Factors to setting innovation policies for sustainable mobility: a comparative study of 22 European countries.

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Wednesday, 14th June - 12:30: (Jubilee Foyer) - Poster

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*Monika Wozniak (Jagiellonian Univeristy)*

The literature analysing innovation policies in less developed countries noticed that their innovation policies tend to ignore the ideas of directing innovation towards solving general problems such as the quality of life or climate change, which is characteristic of mission-oriented innovation policies (MOIP). This may be related to their overemphasis on generating economic growth through innovation policy as the first step in the evolutionary development of innovation policies' framework (Pires et al., 2019; Schot and Steinmueller, 2018). The aim of the study is to identify the macro factors that contribute to establishing MOIP for sustainable mobility among European countries compering less and more developed countries. It uses the Qualitative Comparative Analysis (QCA) research approach based on cases (which are treated as a unique configuration of conditions) to set logical relationships between factors and outcomes in a transparent and reliable way. To analyze casual complexity by QCA, four main factors were constructed: high level of country's development; having a clear political vision for sustainable transport; automotive as an important part of the economy; high share of renewable energy sources in transport. The QCA model for the presence of MOIP for sustainable mobility (con=1, cov=0,66) shows that having a political vision with a strong automotive structure in place but without a high share of renewable energy sources in transport are triggers to set up the desired type of programs. Seems that innovation policies for sustainable mobility on a national level are around transport technology innovations leading to the reduction of gas emissions of vehicles (including electromobility). Transformation purposes are embedded in maintaining of transport sectors' competitiveness in core automotive countries and value chains countries in CEE. The framework of "innovation for economic growth" overlaps with the framework of "transformative change" in studied cases (Schot and Steinmueller, 2018). The study shows regional variation in the design of innovation policies. Less developed countries are behind in terms of transformation investments. A lack of political vision for sustainable investment in existing economic structures could widen development gaps and contribute to weakening value chains with insufficient investment in sustainable technologies.

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## Monitoring the regulation of AI/ML-based medical devices: Evolution and current issues

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Wednesday, 14th June - 12:30: (Jubilee Foyer) - Poster

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*Maria Oyola (The University of Queensland, Australia), Anna Jenkins (The University of Queensland, Australia), Lisette Pregelj (The University of Queensland, Australia), Haitham Tuffaha (The University of Queensland, Australia)*

Artificial intelligence and machine learning (AI/ML) applications in healthcare have the potential to revolutionize diagnosis, provider workflow, and healthcare costs. The past decade has seen significant growth in AI/ML-enabled medical devices. These devices are increasingly used in medical fields such as radiology and pathology, with performance sometimes surpassing that of medical experts. However, the novelty and complexity of AI/ML-enabled devices pose challenges for traditional medical device regulation. Regulatory frameworks have struggled to keep pace with the rapid advancements in AI/ML technology. The lack of tailored standards for ensuring the safety, efficacy, and quality of these products without stifling innovation has been a major obstacle for the deployment of breakthrough technologies. Additionally, the iterative nature of AI/ML models, which continuously evolve and self-update based on real-world data and user feedback, does not align well with current regulatory paradigms for medical devices. To explore how global regulatory frameworks are evolving to address these challenges, a semi-automated software-based approach was used. Regulatory documents, particularly industry guidance documents, from four leading regions (US, UK, European Union, and Australia) were collected and analysed. The analysis revealed significant variations in the provisions for AI/ML-based medical devices across jurisdictions, particularly regarding “black box” algorithms and adaptive algorithms. Industry guidance documents are playing a crucial role in informing stakeholders about regulatory agencies’ early-stage thinking and interpretation of current issues. The regulatory frameworks in the US, UK and Australia have recently incorporated provisions to address issues such as cybersecurity, risk classification, and software changes in medical device applications. These developments indicate a shift towards more flexible and responsive approaches to regulation. The study highlights the need for global harmonisation to streamline the regulation of AI/ML-enabled medical devices and facilitate broader access to these innovative technologies. By addressing critical regulatory gaps, such harmonization can ensure the safety, performance and transparency of highly complex devices throughout their life cycle.

## Heterogeneous effects of automation: Evidence from Germany

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Wednesday, 14th June - 12:30: (Jubilee Foyer) - Poster

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*Pelin Ozgul (Maastricht University)*

This paper presents empirical evidence on the impact of automation technologies on wage and employment growth in Germany over the period 2012-2019. By combining a novel measure for technology exposure that captures workers' exposure to AI, robotics and software with administrative data, we estimate the heterogeneous impact of these technologies on workers' labour market outcomes. Our analysis reveals substantial heterogeneities in workers' exposure and the distinct potential of AI targeting different types of workers compared to robotics and software. We find that high-skilled, high-educated workers and workers in occupations that require complex and highly complex tasks are most exposed to AI, while their exposure is lower to robotics and software technology. At the industry-occupation level, we find that exposure to AI is positively related to wage growth, but that the wage effect is negative for robots and software. We do not observe similar effects for employment growth, as the estimates are close to zero and statistically insignificant for all three technologies. Our findings also indicate that higher union coverage within an industry puts upward pressure on wage and employment growth as AI exposure increases, potentially signalling the cushioning effect of labour market institutions.

## Decentralised Renewable Energy Technologies for the Energy Transition: Drivers and Barriers.

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Wednesday, 14th June - 12:30: (Jubilee Foyer) - Poster

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*Isabel Aparisi Cerdá (INGENIO (CSIC-UPV)), David Ribó-Pérez (TU Delft), Mónica García-Melón (INGENIO (CSIC-UPV)), Pablo D'Este (INGENIO (CSIC-UPV)), Rocío Poveda Bautista (INGENIO (CSIC-UPV))*

Adopting renewable energy sources presents both opportunities and obstacles. The transition to an economy led by renewable energy technologies poses environmental, technical, economic, social, and regulatory challenges. This study highlights the critical drivers and barriers to adopting decentralised Renewable Energy Technologies. We conducted a systematic literature review of scientific publications and reviewed relevant grey literature to identify the drivers and barriers. The Analytic Network Process method was applied to evaluate the importance of the drivers and barriers, which were obtained from a literature review. The results suggest a strong correspondence between barriers and drivers and that the main barriers can be addressed with the main drivers. Clear regulations and policies are critical to overcoming several of the identified barriers. Market participation mechanisms and access to sufficient finances are key drivers for adopting renewable energy technologies.

## How to collaborate in a crisis: developing ‘swift trust’ in transdisciplinary research projects

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Wednesday, 14th June - 12:30: (Jubilee Foyer) - Poster

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*Isabel Fletcher (University of Edinburgh), Catherine Lyall (University of Edinburgh)*

This presentation discusses how to design transdisciplinary research that responds to a crisis. We also reflect on the limitations of transdisciplinarity in practice, particularly when trying to persuade policy actors of its relevance and usability. Many authors (e.g. Cannon, 2020) have described the time- and resource-intensiveness of transdisciplinary research as well as its reliance on trust-based relationships. Similarly, reviews of the literature on the co-ordination of teams (e.g., Mayo, 2020) confirm that teamwork is best in stable conditions, where people have learned over time to work together (Hackman, 2011). So, what happens in situations where time is limited and individuals have to develop new collaborations in the face of urgent and compelling deadlines? In the autumn of 2020, we were commissioned to analyse the development of the Scottish programme for testing wastewater for Covid-19. This was a new transdisciplinary collaboration between biomedical researchers, the Scottish government (including the Scottish Environment Protection Agency) and Scottish Water. Our research aimed to identify and document the working methods, structures and interactions that contributed to this partnership in Scotland, analysing aspects of the programme that had been successful and where improvements could be made for future rapidly convened collaborations. We used insights from the sociology of disasters (Drabek and McEntire, 2003) on the cohesiveness of teams during situations of collective stress and the concept of “swift trust” (Meyerson et al., 1996) when there is time pressure to achieve project goals (Mishra, 1996) to analyse our data. From our research interviews, we found that the Scottish Covid-19 wastewater testing programme was an impressive achievement: a nationwide surveillance programme for a novel organism was developed collaboratively from a “standing start” in less than six months. A key success factor was the existing network of contacts and relationship built up by CREW (a research brokerage organisation) and other professional bodies. However, after this impressive start, the programme encountered organisational issues that made the transition from innovative research to a routine testing programme challenging. Existing contacts and ‘pandemic good will’ were not sufficient to overcome policy siloes between health and environment and gaps in policy leadership.

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## Integrating RRI into Smart Specialization Strategy: Taking Stock of Regional Initiatives

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Wednesday, 14th June - 12:30: (Jubilee Foyer) - Poster

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*Lukasz Nazarko (Bialystok University of Technology), Rafael Popper (Manchester Institute of Innovation Research)*

Responsible Research and Innovation (RRI) and Smart Specialization Strategies (RIS3) are two innovation-related, “made in Europe” concepts that have received increasing attention in recent years. RRI refers to a participatory and ethics-based approach to research and innovation that takes into account the intended and unintended social, economic, and environmental impact of scientific and technological developments. Smart Specialization Strategy (RIS3), is a policy framework aimed at boosting the competitiveness of regions based on their endogenous innovation capacity. It focuses on identifying and developing the unique strengths and potentials of each region, based on a bottom-up approach that involves multiple stakeholders, including the enterprises, academia, and civil society. The departure point for this study is the assumption of the possibility (and the need) to integrate RRI and RIS3 in the European innovation policy. There are both tensions and complementarities of the two policy paradigms. There are two main aspects that make the RRI-RIS3 integration promising. The first one is the territorial aspect. RRI essentially omits geography, while RIS3 has a very clear place-based focus. The second aspect is the acceptance of the multitude of visions for a region’s future. While RRI embodies the reflexive governance model, plurality of visions and aspirations, RIS3 is rather straightforward in the search for the one right economic development path. The research is based on the analysis of the characteristics and deliverables of the following EU-funded (Horizon 2020 and Interreg) projects thematically related to the topic of the study: MARIE, CHERRIES, DigiTeRRI, RIPEET, RRI-LEADERS, RRI2SCALE, SeeRRI, TeRRIFICA, TeRRitoria, TetRRIS, TRANSFORM, and REINFORCING. In conclusion, the relationship between RRI and RIS3 is the one of complementarity. The integration of RRI principles into RIS3 can help to ensure that regional innovation strategies are aligned with the values and needs of local communities, and that the benefits of innovation are distributed more equitably. It is too ambitious to say that the combination of RIS3 and RRI provides a complete conceptual and methodological package that effectively promotes responsible and sustainable regional innovation. However, these two concepts compensate for a number of each other’s weaknesses and offer a novel perspective on regional development policy.

## Early Career Researcher: A consistent policy mix towards a circular European plastic industry

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Wednesday, 14th June - 12:30: (Jubilee Foyer) - Poster

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*David Pfeffer (ETH Zurich)*

To mitigate the adverse environmental effects of plastic production, the EU has introduced a set of policies that aim at transitioning towards a more circular and resource efficient plastic economy. While recent research has highlighted that existing legislation colliding with the spirit of new policies often emerged as a key barrier to a circular transition, in-depth analysis of the legal landscape in specific sectors, its characteristics, as well as the complementarities and trade-offs between the single policy instruments are lacking. This article proposes looking at the EU policy landscape on plastics used in electric and electronic equipment (EEE) through the lens of a policy mix framework to address this gap. We assess current the level of consistency and comprehensiveness in the policy mix and demonstrate that value chain actors are affected in different ways by the EU policy and legal landscape. The EEE sector provides a particularly relevant setting. Recent years have seen rapid growth of waste from electrical and electronic products. Yet, the uptake of recycled plastics in EEE is still very low compared to other sectors. Our analysis is structured the following way: we first give an overview of the legal landscape and types of policies governing the uptake of recycled content for EEE products at the EU level. In a second step, we classify them along their coverage and stringency. Finally, we group them along the value chain actor they primarily address, and the end application they target. Using a combination of desk research and semi-structured interviews of different value chain actors and policy makers we provide a comprehensive overview of the current regulatory landscape governing the use of plastics in the EEE sector. We hereby evaluate the consistency and comprehensiveness of the policy mix and discuss how each instrument affects different actors in the value chain. Based on our findings we provide recommendations on how to remove existing regulatory hurdles to transitioning to a more circular EEE sector.

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