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PERSPECTIVE

Responsible innovation across borders: tensions, paradoxes and possibilities

P. Macnaghten[a,b]*, R. Owen[c], J. Stilgoe[d], B. Wynne[e], A. Azevedo[f], A. de Campos[b], J. Chilvers[g], R. Dagnino[b], G. di Giulio[h], E. Frow[i], B. Garvey[j], C. Groves[k], S. Hartley[l], M. Knobel[b], E. Kobayashi[m], M. Lehtonen[n], J. Lezaun[o], L. Mello[p], M. Monteiro[b], J. Pamplona da Costa[b], C. Rigolin[q], B. Rondani[r], M. Staykova[s], R. Taddei[t], C. Till[u], D. Tyfield[v], S. Wilford[w] and L. Velho[b]

[a]*Department of Geography, Science Laboratories, Durham University, South Road, Durham DH1 3LE, UK;* [b]*Department of Science and Technology Policy, Institute of Geosciences, P.O. Box 6152, University of Campinas – UNICAMP, 13083-970, Campinas, SP, Brazil;* [c]*Management Department, University of Exeter Business School, Streatham Court, Rennes Drive, Exeter EX4 4PU, UK;* [d]*Department of Science and Technology Studies, University College London, Gower Street, London WC1E 6BT, UK;* [e]*Department of Sociology, Lancaster University, FASS Building, County South, Bailrigg, Lancaster LA1 4YD, UK;* [f]*Center of Engineering and Applied Social Sciences, Alameda Gaspar Nogueira 162-Edifício Club House, Apto 84, Bloco B, Bairro Jardim, Santo André, SP CEP 09090-010, Brazil;* [g]*Science, Society and Sustainability (3S) Research Group, School of Environmental Sciences, University of East Anglia, Norwich Research Park, Norwich NR4 7TJ, UK;* [h]*Environmental Health Department, School of Public Health, University of São Paulo (USP), Av. Dr. Arnaldo, 715, São Paulo, SP 01246-904, Brazil;* [i]*Science, Technology & Innovation Studies, The University of Edinburgh, Chisholm House, High School Yards, Edinburgh EH1 1LZ, UK;* [j]*Business School, University of Strathclyde, Graham Hills, 50 Richmond Street, Glasgow, Glasgow City G1 1QE, UK;* [k]*School of Social Sciences, Cardiff University, 51a Park Place, Cardiff CF10 3AT, UK;* [l]*School of Biosciences, University of Nottingham, Sutton Bonington, Leicester LE12 5RD, UK;* [m]*Federal University of São Carlos (UFSCar), Rua Riachuelo, 65, Jardim Paulista, São José dos Campos, São Paulo 12216-040, Brazil;* [n]*SPRU – Science and Technology Policy Research, Jubilee Building, University of Sussex, Falmer, Brighton BN1 9SL, UK;* [o]*Institute for Science, Innovation and Society, University of Oxford, 64 Banbury Road, Oxford OX2 6PG, UK;* [p]*Centro de Engenharia, Modelagem e Ciências Sociais Aplicadas, Universidade Federal do ABC, Rua Arcturus, 3 – Bloco Delta – Sala 387, Jardim Antares – 09606-070, São Bernardo do Campo, SP, Brazil;* [q]*Center of Education and Social Sciences, Department of Information Federal University of Sao Carlos (UFSCar), Av. Dr. Carlos Botelho, 2220, ap.82, Sao Carlos, Sao Paulo 13560-250, Brazil;* [r]*Private Equity and Venture Capital Research Group, Business School of São Paulo, Fundação Getúlio Vargas, Av. Washington Luis 1576 apto 202G, 04662-002, Brazil;* [s]*Departments of Physics and Chemistry, Durham University, South Rd, Durham, UK;* [t]*Instituto do Mar, Federal University of São Paulo, Av. Alm. Saldanha da Gama 89, Santos, SP CEP 11030-400, Brazil;* [u]*School of Social, Psychological & Communication Sciences, Leeds Metropolitan University, Room 914, Calverley Building, Portland Way, Leeds, UK;* [v]*Lancaster Environment Centre, Lancaster University, Lancaster LA1 4YQ, UK;* [w]*Centre for Computing and Social Responsibility, De Montfort University, GH5.77 Gateway House, Leicester LE1 9BH, UK*

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In March 2014 a group of early career researchers and academics from São Paulo state and from the UK met at the University of Campinas to participate in a workshop on 'Responsible

*Corresponding author. Email: p.m.macnaghten@durham.ac.uk

Innovation and the Governance of Socially Controversial Technologies'. In this Perspective we describe key reflections and observations from the workshop discussions, paying particular attention to the discourse of responsible innovation from a cross-cultural perspective. We describe a number of important tensions, paradoxes and opportunities that emerged over the three days of the workshop.

Keywords: responsible innovation; Brazil; cross-cultural comparison; political economy; invisibilities; affect and care

Responsible (research and) innovation (RI) is emerging as a powerful science policy discourse, particularly in Europe. Although interpretively flexible, RI framings have largely developed to date in Europe and North America, promising a framework in which RI processes become responsive to societal challenges, in the face of the inevitable uncertainties, ambiguities and questions that innovation creates (Owen, Macnaghten, and Stilgoe 2012; von Schomberg 2013). Notwithstanding globalization, these framings have thus far spoken mainly to particular science – innovation – society relationships of the global North, seeking to move science and technology assessment beyond simply anticipated risks and market benefits. The 'anticipation, inclusion, reflection, responsiveness' framework, for example, developed by the authors, suggests that RI can be implemented through developing institutional capacities that help researchers to *anticipate* possible future impacts and implications, that open up such questions to broader and *inclusive* dialogue, that encourage *reflection* on the motivations for and potential implications of the research, and that use these processes to influence the RI process itself in a *responsive* manner (Owen, Bessant, and Heintz 2013; Stilgoe, Owen, and Macnaghten 2013). But how could RI be framed in other parts of the world, notably the global South? Furthermore, do such Northern framings of RI travel and translate beyond borders, and should they do so?

In March 2014, 10 early career researchers (social and natural scientists) from São Paulo state, Brazil, and 11 from the UK met at the University of Campinas to participate in a workshop on 'Responsible Innovation and the Governance of Socially Controversial Technologies'. Joined by a further three senior academics from both countries, the workshop aimed to foster interaction, learning and collaboration. This paper summarizes some reflections and observations of the participants as they together considered RI from a cross-cultural perspective.

If RI is to make a positive difference in a rapidly globalizing world, it will need to ensure there is a place for the global South at the heart of the development of its discourse, rather than as an after-thought, or just as another comparative case study. North–South relationships can easily become top-down, including those of knowledge production, where the South has tended to be represented as passively consuming knowledge produced in the North. By engaging with the global South and its sometimes different and often differentiated needs, it becomes clear that RI may have to be 'responsible' in ways that are not an immediate priority for those more developed nations in the North (and in particular the EU and USA), where the RI discourse has so far largely developed. RI will for example have to be located in a different set of debates on urban and economic development, institutional reform, capacity building, transitions and social responsibility. How RI intersects with, challenges or indeed is challenged by parallel concepts – such as 'social inclusion' (Dagnino 2012), or initiatives such as *Buen Vivir* that aim to build development in line with a country's indigenous past (Gudynas 2011), or narratives associated with opening up markets in the so-called 'Bottom of the Pyramid' (Prahalad 2006), or those which have argued variously for 'inclusive', 'grassroots' or 'empathetic' innovation – remain outstanding questions.

In considering RI from a Southern perspective perhaps the greatest risk is what one of the Brazilian participants described as 'ideological coercion': i.e. foisting a concept that has to date had a rather Northern (and in policy terms European) atmosphere on the global South with little regard

for its context and for the assumptions that RI as a Northern political artifact brings (e.g. in terms of culture, politics, economy, demographics, governance and power structures, institutional arrangements, science and society relationships). RI is interpretively flexible, culturally framed and politically entangled. If RI in its Northern framing broadly attempts to build public and political processes and institutions that are routinely and systematically attentive and responsive to the political and social aspects of RI, such political and social dimensions cannot be taken for granted in the global South. RI in its Northern constitution has a normative basis that advocates for a 'different socio-technical order to be', one that 'hints at a more inclusive, democratic and equitable science–society relationship' (van Oudheusden 2014, 72). But from a Southern perspective (notwithstanding the large heterogeneity that characterizes its countries, regions, municipalities and institutions) Northern assumptions of what that socio-technical order and those science–society relationships are (or should be) are at best naïve. At worst they could position RI as yet another instrument of what one Brazilian participant described as intellectual 'neo-colonialization' – that it could unwittingly reproduce or reinforce relations of dependence that are far from emancipatory for the global South. We therefore considered RI as a site of constitutive, discursive struggle, and in exploring this describe some tensions, paradoxes and opportunities that emerged over the three days of the workshop.

The multiple productions and circulations of responsible innovation

The workshop sensitized participants to the ways in which meanings, definitions, enactments and possibilities of RI vary across political cultures and nation states. We need to be sensitive to the particular socio-political context in which RI has emerged as a science policy discourse in Europe and North America and how, under what conditions, and with what effects, these travel to non-Western contexts.

Various participants perceived current framings of RI as speaking to a specifically European set of institutionally defined priorities, values and concerns. These include a focus on emerging and potentially disruptive advanced technologies such as biotechnology, nanotechnology, synthetic biology, robotics and geoengineering; the ambition to shape science and innovation trajectories on the basis of European values; its use as a vehicle for a policy shift from 'risk governance' to 'innovation governance'; and its ambitions to re-configure and enlarge the responsibilities and capacities of scientists and innovators to enable them to better care for the future, for example, through systematic training in universities and encouraging collaboration and information sharing between academic and industrial sectors (see, amongst many, Felt et al. 2007; Owen, Bessant, and Heintz 2013; Stilgoe, Owen, and Macnaghten 2013).

From a Brazilian (and global South) perspective, these assumptions appear less robust. Privileging emerging technologies may be less relevant and, indeed, such framing may occlude precisely the kind of problematic issues associated with RI that an effective RI policy should illuminate and address. A focus on emerging technologies might suggest for example that a priority case for RI in Brazil would be second generation biofuels. Whilst important, this is likely to have little direct bearing on the day-to-day life of most Brazilians, for whom there are more pressing challenges of socio-economic and urban development than science-based innovation (unless RI can seek to develop ways to bring these together). Such an approach would conceal the disconnect between an emphasis on hi-tech science and innovation (and policy) in the North and the relevance of such science and innovation (and policy) for the majority of the population in the global South. Therefore, further consideration needs to be given to determining what kind of issues RI should address to ensure that the approach is both contextual to local needs and yet also concerned with the global and unequally distributed impact of innovation practices (Gupta 2012).

With this view we should therefore locate and engage RI in *local contexts, cultures and practices*. This demands attention for example to local and traditional, non-Western forms of knowledge, social and religious contexts (including gender-related issues such as patrilineal systems of behavior and power), property rights and patterns of ownership more generally. How, for example, do feminist concepts of care that frame Northern conceptions of RI translate into these very different contexts? It was also recognized that although RI has developed in the context of, and as a policy response to, controversial or questionable forms of *technological* innovation, an enormous variety of *social innovation* occurs in the global South, directed specifically at social and/or environmental goals and sometimes as a means of adjustment-response to inadequately designed or badly chosen technological innovations. RI needs to consider its role, if any, in accommodating and encouraging such innovation too, generating recommendations for a more socially focused, and less high-tech focused, innovation policy.

Participants discussed the idea that current, Northern formulations have tended to represent RI as something that is *done* to science, technology and innovation: as both an experiment and as an innovation in governance processes and relationships. This in turn demands that attention is given to the context and meanings of governance in different parts of the world, including (local, national and regional) questions of effectiveness and efficiency, representative democracy, accountability, strategic focus, environmental sustainability, equity and fairness, respect for the rule of law, the limits of capitalism, the need to consume less, as well as to ethical and public desirability and acceptability. Institutions and their organizational capacities, their political and regulatory culture, their social climate and risk culture are important locations for observing the opening up or closing down of innovation governance, and we cannot assume these are the same across the globe. RI must therefore include questions of *political economy* and *power relations* among networks and actors in different geographical contexts, whose publics and institutions form part of the system of innovation that contribute to new forms of social, political and technical order.

(In)visibilities and emergence

The workshop called into question *the object of RI* – what is it that we are being responsible about? The key issue here is to ensure that RI does not confine problem definition, or make the simultaneous rendering of alternative possible problem-framings incommensurable or invisible. Alternative ontologies, alternative definitions of problems, priorities and questions, and alternative possible knowledge and innovation trajectories are still-born without forms of reflexivity that challenge existing ways of defining 'given' objects of analysis.

Taking the example of genetically modified (GM) insects (an emerging technology in the UK and Brazil), how can we ensure RI allows room for discussion of the *policy alternatives* to GM insects in agriculture? GM insects may or may not play a role in addressing challenges such as food security and environmental protection, but they need to be considered alongside alternatives that go beyond mere short-term economic considerations. In shifting from 'responsible innovation' to 'responsible governance', participants were alert to any assumption that innovation is the only or primary path to solving societal challenges and policy problems. Keeping visible other possible framings of issues, and their relations with wider socio-technical systems and political economies is essential for any RI formulation to remain responsive and accountable, especially since political–economic factors can obstruct, divert or hijack alternative options and different innovation trajectories.

In some cases it may be preferable *not* to innovate or at least to innovate in ways that challenge dominant Western framings of development and modernization. Some noted that even in strictly economic terms innovation is not necessarily the best stimulant to the economy. Others noted that

innovation is not one thing, and that models of innovation that include those based on 'borrow, copy, steal', or grassroots, indigenous (and sometimes alternatives to growth as the means to development) innovation, as a means of creating value and meeting social needs, remain powerful in Brazil and other developing countries. The framing and emergent nature of innovation processes in the global South poses a real challenge for RI in terms of remaining responsive and rendering this 'in-the-making' quality visible.

Although reflection (and reflexivity) has been a significant feature of RI discourse, a specific need identified was at its intersection with labor, capital and work, including the extent to which the potential consequences of innovation for labor markets (including labor conditions) can be built into RI conceptualizations (e.g. in the Brazilian bio-economy). What, for example, constitutes the *work* of being responsible? This focuses our attention on questions of emotional/affective labor, the distribution of responsibilities and the institutional constraints on and pressures associated with 'being responsible'. Discussions of work need also to consider the impact of changes to working practices on the current workforce. In particular, how can those implementing RI approaches in industry engage (as potential stakeholders) the significant numbers of Brazilians who do not work in the formal economy and who remain as a consequence economically invisible?

Questions of political economy

Participants observed that there is a need to move beyond the consideration of responsibilities at the level of individual actors or sites, to consider responsibilities in a more systemic way that locates RI in its broader political economy. Discussions of some of these broader systemic dimensions – including corporate power, unquestioned political and institutional support for science and technology, policies of neoliberalism, capitalist structures and modes of production and extraction of capital – quickly highlight or reveal systemic irresponsibilities associated with powerful driving forces for innovation. Whether or not there are ways of 'regulating' such systemic qualities of 'irresponsibility', these have to be researched and understood, as a step towards their possible 'responsibility-transformation'.

For example, biofuels in Brazil are sometimes presented as a good example of responsible, sustainable innovation. Brazil is represented not only as having produced the most developed and integrated biofuels program in the world but as having produced a system of sugar cane bioethanol production that is low carbon, that mitigates greenhouse gas emissions efficiently (compared to other biofuel crops), that does not do serious damage to natural ecosystems and that represents one of the most promising ways to achieve sustainable development (see Goldemberg 2007; Sorda, Banse, and Kemfert 2010; Walter et al. 2011). However, closer attention reveals various systemic issues, ranging from concerns over the labor conditions of sugar cane workers to the ways in which governmental support for biofuels in transport has produced selective 'lock-in' to particular technological-economic trajectories, which of course also lock-out potentially different, more sustainable, and more just, forms of innovation – in this case making it harder to encourage alternative non-automobile forms of urban mobility, and thus failing to impact on the appalling levels of congestion, environmental pollution, lack of infrastructure and poor public transport that is commonplace across many of Brazil's major cities (da Matta 2010). In São Paulo alone – as an illustration of Brazil's apparently relentless car obsession – it is estimated that more than 1000 cars enter the road network every day (Michener 2014).

This raises serious questions about the *levels* at which we think about responsibility in the context of innovation and the political economy in which these are located. It also challenges us to understand – and intervene in – the technical, social, institutional and cultural forms of innovation that are continuously being woven-together in seamlessly indistinguishable forms. The paradox is that no one actor is in control, but *everyone* is implicated, has agency and therefore

is responsible, interconnected in complex networks, at multiple scales, and in numerous ways. RI cannot be achieved only by single actors, organizations or institutions, when such systemic outcomes depend upon interactive combinations which can swamp and redirect changes of one actor alone. However, the fact that everyone is implicated does not mean that there is horizontality, but instead that hierarchies are interconnected in complex networks, at multiple scales. Indeed, some participants questioned whether there needs to be a binding association between ideas of responsibility and democratic governance with participatory mechanisms for innovation governance. Other forms of constructing and enacting responsibility need to be part of the empirical universe we are addressing.

Affect, care and capacity

Issues of affect were also highlighted in the workshop, demonstrating the importance of the contribution of affect to the formulation of RI. This consideration of affect problematized existing formulations that have framed the normative aspects of RI (e.g. 'care for the future') around the concept of 'right impacts'. So far, these have focused largely on universalizable 'normative anchor points', such as the UN's Universal Declaration of Human Rights or the Treaty on the European Union (von Schomberg 2013). Such attempts at universalism can produce unhelpfully 'thin' normative frameworks which may mask, under the guise of universalism, culturally specific narratives regarding what the full range of stakeholders in different cultural contexts judge to be the aspects of innovation processes and outcomes that 'matter' to them. The importance of such considerations was highlighted in the workshop in discussions of what is typically excluded from quantitative and modernistic approaches to risk assessment. For instance, the emotional reaction which people have to innovation (or non-innovation) could be seen in one participant's discussion of how Brazil has historically been cast as a 'villain of deforestation'. Within RI frameworks and discourse there is an expectation on innovators to be reflexive and responsive but rarely with a consideration of the affective capacity and skills required, or of the cultural resources 'at hand' for such emotional work. For example, in non-Western settings, where non-instrumental relations may be more pronounced, RI may be expressed in everyday experiences of happiness and sadness, in rebellion and compassion, in hope and despair. There needs to be an awareness of the specific cultural and institutional context in which innovators are working in order to understand the ways in which this kind of affective engagement may be constrained or enabled.

Furthermore, some participants questioned whether innovations and technologies are or should be primarily framed as instruments for bringing about future effects or 'impacts'. Technologies mediate, through time, our conception of what our *purposes* should be just as much as they are developed with particular 'impacts' in mind (Mol 2008). Technologies should be treated, instead, as elements of *practices of care* that both serve intended ends and that mediate our changing conceptions of these ends. As well as allowing us to be sensitive to cultural (and especially affective) differences in what innovation futures may be envisaged, moving in this direction would also allow us to focus more on relevant aspects of the present – in particular, on what desirable capabilities, dispositions and virtues may be supported by specific technologies, and how these will change the ways in which we 'handle' an intrinsically uncertain future.

Conclusions

We have in this Perspective described a number of observations from the workshop discussions as participants reflected on RI in a cross-cultural context, categorized in the form of tensions, paradoxes and possibilities. We finish by considering what UK RI scholars took back to Europe after learning from Brazil. This includes, first, the need to be sensitive to the socio-political context in which RI has

developed in an especially European context; second, the need to ensure that RI engages in local contexts, cultures and practices (whether these be in the UK, Brazil or elsewhere) including with existing forms of social innovation; third, that RI sustains an on-going and critical dialogue with existing forms of capital-intensive innovation, exposing systemic irresponsibilities and opening up potentially different, more sustainable, and more just forms of innovation; and fourth, that RI does not seek to impose an a priori framework onto the global South but rather to use its leverage – as a framework that has considerable policy traction – to open up alternative forms of development, complementing and entering into dialogue with existing Southern discourses.

A repeatedly raised issue in the workshop revolved around capacity, with important questions around how to build and integrate RI into practice in real-world settings. There is a growing demand for tools and guidance to build distributed capacity in RI (e.g. from the European Commission, from scientists wanting to implement RI in grant proposals/training initiatives, etc.). To provide such training itself requires, *inter alia:* the development of new curricula and their consideration and diffusion across cultural and disciplinary contexts; differential knowledge of the role of actors (e.g. engineers and natural scientists) in the innovation process; the creation of networks as a hybrid mode of governance; and the development of indicators across different sectors and technologies to illustrate how RI frameworks might be used across different national and (inter)disciplinary contexts.

The theory and practice of RI have an unfortunate tendency to become separated, when it is clear that they can and should be informing one and other. In the workshop conversations we identified a real need to maintain dialogue between analytical insights from studies of RI, and the development of concrete frameworks and tools for 'doing' RI. Equally, in terms of achieving practical impact, it was recognized that theoretically and empirically well-grounded ideas are not alone sufficient for gaining progressive impacts. Those ideas and associated evidence need to be developed, but impact may be achieved only when disruption has taken place to established institutional, scientific and governance habits and routines. This is important in terms of maintaining and enhancing a reflexive and critical disposition, both in science and technology studies of RI and more broadly as RI begins to move across borders.

One of the formal objectives of the workshop was to develop ideas for future collaborative research. A number of proposals are in various stages of development aimed at understanding the efficacy of RI as an emergent policy discourse in non-European arenas. The ideas presented in this paper will be further developed in the form of a future Special Issue of this journal.

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Notes on contributors

Phil Macnaghten is Professor of Geography at Durham University and Visiting Professor at the Department of Science and Technology Policy at the University of Campinas (UNICAMP) where he is researching responsible innovation from a cross-cultural perspective.

Richard Owen is Professor of Strategic Innovation Management at the University of Exeter Business School where he holds the Chair in Responsible Innovation.

Jack Stilgoe is Lecturer in the Department of Science and Technology Studies at University College London, where he teaches science policy and sociology of science.

Brian Wynne is Professor of Science Studies at the Centre for the Study of Environmental Change (CSEC), Sociology, Lancaster University, and Visiting Professor at the Centre for Technology Innovation and Culture, University of Oslo.

Adalberto Azevedo is Adjunct Professor in the Center of Engineering and Applied Social Sciences at the Federal University of ABC in the State of São Paulo, where he teaches science and technology public policy.

André de Campos is Assistant Professor in the School of Applied Sciences at the University of Campinas.

Jason Chilvers is Senior Lecturer in Environment, Science and Society at the School of Environmental Sciences at the University of East Anglia.

Renato Dagnino is full Professor in the Department of Science and Technology Policy at the University of Campinas (UNICAMP).

Gabriela di Giulio is Assistant Professor in the Environmental Health Department, Public Health Faculty at University of São Paulo (USP).

Emma Frow is Lecturer in Science, Technology & Innovation Studies at the University of Edinburgh.

Brian Garvey is Research Associate at the University of Strathclyde's Business School.

Chris Groves is Research Associate in the School of Social Sciences at Cardiff University.

Sarah Hartley is Research Fellow in the School of Biosciences at the University of Nottingham.

Marcelo Knobel is full Professor at the Institute of Physics at the University of Campinas (UNICAMP) and Associate Coordinator of Research Collaboration at the Foundation for Research Support of the State of São Paulo (FAPESP).

Elizabete Kobayashi is Research Associate at the Federal University of São Carlos (UFSCar) in the State of São Paulo.

Markku Lehtonen is Research Fellow at the Science and Technology Policy Research (SPRU) at the University of Sussex.

Javier Lezaun is James Martin Lecturer in Science and Technology Governance at the University of Oxford.

Leo Mello is Assistant Professor in the Center of Engineering and Applied Social Sciences at the Federal University of ABC in the State of São Paulo.

Marko Monteiro is Assistant Professor in the Department of Science and Technology Policy at the University of Campinas (UNICAMP).

Janaina Pamplona da Costa is a Research Associate in the Department of Science and Technology Policy at the University of Campinas (UNICAMP).

Camila Rigolin is Associate Professor in the Centre of Education and Social Sciences at Federal University of São Carlos (UFSCar) in the State of São Paulo.

Bruno Rondani is Program Coordinator of the Private Equity and Venture Capital Research Group at Fundação Getúlio Vargas in São Paulo.

Margarita Staykova is Lecturer in Departments of Physics and Chemistry at Durham University.

Renzo Taddei is Assistant Professor in the Instituto do Mar at the Federal University of São Paulo.

Chris Till is Senior Lecturer in Social Science at Leeds Metropolitan University.

David Tyfield is Reader in the Lancaster Environment Centre at Lancaster University.

Leo Velho is full Professor in the Department of Science and Technology Policy at the University of Campinas (UNICAMP).

Sara Wilford is Senior Lecturer and Research Fellow at De Montfort University.

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