NOTF #6

RRI in Africa

By Carla Montesano and Vittorio Colizzi



RRI IMPLEMENTATION IN BIOSCIENCE ORGANISATIONS





Andrea Declich with the STARBIOS2 partners





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The integration of university and research systems, and of these with civil society, is one of the open issues concerning the bioscience sector in the context of increasing globalization. This type of integration is not new in Europe (being among the aims of the European research framework programmes, which are also aimed at developing the so-called ERA - European Research Area) and has a long tradition within highly industrialized countries (for example between European countries and the USA). It constitutes a field of innovation in the case of cooperation with emerging and developing countries and, in particular, with the African continent. In the last two centuries this continent has often been the subject of passive transfer of European technologies and "values". However, in the last decades, African governments and research actors have been developing and implementing their own policies and action strategies in this field. For European and African people, developing together the responsibility for research, especially in the field of biosciences, is an opportunity that must go hand in hand with technological transfer and innovation, to which Africa is now making impressive qualitative and quantitative progress.

In this framework, the promotion of a shared orientation between European and African partners on the subject of research and responsible innovation can be a way to proceed. This theme was one of the objects of the Action Plan of the University of Tor Vergata.

On this matter, a workshop titled "RRI in Africa: challenges and perspectives" was held in October 2018. It was focused on RRI implementation in biosciences in Africa. The experiences of

STARBIOS2 members in the cooperation between African and European research organisations were discussed. Among the approximately 80 participants were professors and PhD students in Europe and Africa, STARBIOS2 members, rectors of the Somali National University and Evangelic University of Cameroon, representatives of Italian universities (Camerino, Modena, Rome La Sapienza, Rome Tor Vergata, Padua, Parma, Pavia and others) and research institutions (CNR), and UNESCO, Focusing on RRI implementation in biosciences, some topics of discussion were the RRI approach, problems specific to RRI in Africa, experiences from higher education in Cameroon and Italy, student mobility, and scientific projects of Africa PhD students enrolled in Italian universities. The discussions resulted in some ideas on how to best develop a plan for RRI implementation in African research institutions, and the conclusion that there may be a need to re-think the European strategy for RRI in the African context. In this framework, a promising approach for improving the exchanges between African and Italian universities was singled out in the promotion and further development of the "dual degrees" experience.

REFERENCES

- Ahuja, S.K., Aiuti, F., Berkhout, B., Biberfeld, P., Burton, D.R., Colizzi, V., Deeks, S.G., Desrosiers, R.C., Dierich, M.P., Doms, R.W., Emerman, M., Gallo, R.C., Girard, M., Greene, W.C., Hoxie, J.A., Hunter, E., Klein, G., Korber, B., Kuritzkes, D.R., Lederman, M.M., Malim, M.H., Marx, P.A., McCune, J.M., McMichael, A., Miller, C., Miller, V., Montagnier, L., Montefiori, D.C., Moore, J.P., Nixon, D.F., Overbaugh, J., Pauza, C.D., Richman, D.D., Saag, M.S., Sattentau, Q., Schooley, R.T., Shattock, R., Shaw, G.M., Stevenson, M., Trkola, A., Wainberg, M.A., Weiss, R.A., Wolinsky, S., Zack, J.A. (2006). A plea for justice for jailed medical workers. Science, 314(5801).
- Alberts, B., Kirschner, M.W., Tilghman, S., & Varmus, H. (2014). Rescuing US biomedical research from its sistemi flaws. Proceedings of the National Academy of Sciences. 111(16).
- Alsop, R., Bertelsen, M., Holland, J. (2006). Empowerment in practice: from analysis to implementation, The International Bank for Reconstruction and Development/The World Bank.
- Ambrosio, A.M., Mariani, M.A., Maiza, A.S., Gamboa, G.S., Fossa, S.E., Bottale, A.J. (2018). Protocol for the production of a vaccine against Argentine Hemorrhagic Fever in Maria S. Salvato (ed.) Hemorrhagic Fever Viruses: Methods and Protocols. Methods in Molecular Biology, vol. 1604. Springer. Doi 10.1007/978-1-4939-6981-4-24.
- Andoh, C.T. (2011). Bioethics and the challenges to its growth in Africa. Open journal of philosophy. 1(02), 67-75. 10.4236/ojpp.2011.12012.
- Bamgbose, A. (2011). African languages today: The challenge of and prospects for empowerment under globalization. In Selected proceedings of the 40th Annual Conference on African Linguistics. ed. Eyamba G. Bokamba, et al., 1-14. Cascadilla Proceedings Project Somerville. www.lingref.com, document #2561.
- Barugahare, J. (2018). African bioethics: methodological doubts and insights. BMC medical ethics, 19(1), 98, 10.1186/s12910-018-0338-6.
- Battilana, J., Leca B., and Boxenbaum E. (2009). "How actors change institutions: towards a theory of institutional entrepreneurship." Academy of Management annals 3.1 (2009).
- BBSRC Biotechnology and Biological Sciences Research Council (2018). "Forward look for UK Bioscience" released on 29 September 2018. https://bbsrc.ukri.org/documents/forward-look-for-uk-bioscience-pdf/ (accessed on: 05/09/2019).
- Beckert, J. (1999). Agency, entrepreneurs, and institutional change. The role of strategic choice and institutionalized practices in organisations. Organisation studies, 20(5).
- Bendels, M.H., Dietz, M.C., Brüggmann, D., Oremek, G.M., Schöffel, N., Groneberg, D.A. (2018). Gender disparities in high-quality dermatology research: a descriptive bibliometric study on scientific authorships. *BMJ Open* 2018;8:1–11. doi:10.1136/bmjopen-2017-020089

- Berger, P., & Luckmann, T. (1969). La costruzione sociale della realtà. Il Mulino, Bologna.
- Besley, J.C., & Nisbet, M.C. (2013). How scientists view the public, the media and the political process. Public Understanding of Science, 22(6), 644– 659. https://doi.org/10.1177/0963662511418743
- Bijker, W.E. & d'Andrea, L. (eds.) (2009). Handbook on the Socialisation of Scientific and Technological Research, Social Sciences and European Research Capacities, Rome: River Press Group.
- Boylan, J., Dacre, J., Gordon, H. (2019). Addressing women's under-representation in medical leadership. *The Lancet*. 2019; 393(10171): e14.
- Bromme, R. (2000). Beyond one's own perspective. The psychology of cognitive interdisciplinarity. In P. Weingart & N. Stehr (Eds.), Practising interdisciplinarity (pp. 115-133). Toronto: Toronto University Press.
- Bubela, T. (2006). Science communication in transition: Genomics hype, public engagement, education and commercialization pressures. Clinical Genetics, 70(5), 445–450. https://doi.org/10.1111/j.1399-0004.2006.00693.x
- Bubela, T., Hagen, G., & Einsiedel, E. (2012). Synthetic biology confronts publics and policy makers: Challenges for communication, regulation and commercialization. Trends in Biotechnology, 30(3), 132– 137. https://doi.org/10.1016/j.tibtech.2011.10.003
- Burchell, K. (2015). Factors affecting public engagement by researchers: literature review, Policy Studies Institute, London, https://wellcome.ac.uk/sites/default/files/wtp060036.pdf (accessed on: 24/07/2019).
- Burns, D., Squires, H., (2011). Embedding public engagement in higher education: Final report of the national action research programme, NCCPE. https://www.publicengagement.ac.uk/sites/default/files/publication/action_research_report_0.pdf (accessed on: 26/07/2019)
- Burns, T.W., O'Connor, D.J., & Stocklmayer, S.M. (2003). Science communication: A contemporary definition. Public Understanding of Science, 12(2), 183–202
- https://doi.org/10.1177/09636625030122004
- Capps, D.K., & Crawford, B.A. (2013). Inquiry-Based Instruction and Teaching About Nature of Science: Are They Happening? Journal of Science Teacher Education, 24.
- Cartwright, N., & Hardie, J. (2012). Evidence-based policy: A practical guide to doing
 it better. Oxford: Oxford University Press.
- Caulfield, T. (2005). Popular Media, Biotechnology, and the "Cycle of Hype". Houston Journal of Health Law & Policy, 337(2004).
- Chen, H.T. (2012). Evaluation von Programmen und Projekten für eine demokratische Kultur. In R. Strobl, O. Lobermeier, W. Heitmeyer (eds.). Evaluation von Programmen und Projekten für eine demokratische Kultur. Fachmedien Wiesbaden: Springer.
- Clark, B.R. (1998). Creating Entrepreneurial Universities: Organisational Pathways of Transformation. Pergamon, http://blog.ub.ac.id/yogidwiatmoko/files/2012/12/gibb_hannon.pdf
- (accessed on: 17/09/2019).

- Clark, H. (1996). Using Language. Cambridge: Cambridge University Press.
- Clarke, L.J., & Kitney, R.I. (2016). Syntheticbiology in the UK-an outline of plans and progress. Synthetic and systems biotechnology, 1(4), (https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5625736/ (accessed on: 18/07/2019).
- Colizzi V., de Oliveira T., Roberts R.J. (2007). Libya should stop denying scientific evidence on HIV. Nature: 448 (7157):992.
- Colizzi, V., et al. (2019). Structural Transformation to Attain Responsible BIOSciences (STARBIOS2): Protocol for a Horizon 2020 Funded European Multicenter Project to Promote Responsible Research and Innovation. JMIR Res Protocl 8(3):e11745, https://www.researchprotocols.org/2019/3/e11745/ (accessed on: 30/09/2019).
- Condit, C. (2001). What is "public opinion" about genetics? Nature, 2(10). https://doi.org/10.1038/35093580
- d'Andrea, L., Marta, F.L., Kahma, N. and Vase, S., (2017). FIT4RRI, Project Report on the Literature Review, Deliverable 1.1 (public), December 31st, 2017, https://zenodo.org/record/1434349#.W8iFg3szbcs (accessed on: 30/09/2019).
- d'Andrea, L., & Declich, A. (2005). The sociological nature of science communication. JCOM, 4(2).
- d'Andrea, L., Quaranta, G., & Quinti, G. (2005). Manuale sui processi di socializzazione della ricerca scientifica e tecnologica. CERFE. Rome.
- Dahler-Larsen, P. (2006). Evaluation after Disenchantment? Five Issues Shaping the Role of Evaluation in Society. In Shaw, I.F., Greene, J.C., Mark, M.M. (eds.), The Sage Handbook of Evaluation. London: Sage Publications.
- Dahler-Larsen, P. (2012). The evaluation society. Stanford: Stanford University Press.
- D'Armiento, J., Witte, S.S., Dutt, K. Wall, M., McAllister, G. (2019). Achieving women's equity in academic medicine: challenging the standards. *The Lancet*. 2019: 393(10171).
- Declich G., d'Andrea, L. (2018), "Triggering Institutional Change Towards Gender Equality In Science. Final Guidelines of the TRIGGER Project", project funded by the European Commission under the FP7 for Research.
- de Oliveira, T., Pybus, O.G., Rambaut, A., Salemi, M., Cassol, S., Ciccozzi, M., Rezza, G., Gattinara, G.C., D'Arrigo, R., Amicosante, M., Perrin, L., Colizzi, V., Perno, C.F. (2006). Benghazi Study Group. Molecular epidemiology: HIV-1 and HCV sequences from Libyan outbreak. Nature. 2006; 444.
- Döring, N., & Bortz, J. (2016). Forschungsmethoden und Evaluation in den Sozial- und Humanwissenschaften. Berlin: Springer.
- Eden, G., Jirotka, M., & Stahl, B. (2013). Responsible research and innovation: Critical reflection into the potential social consequences of ICT. In Research Challenges in Information Science (RCIS), 2013 IEEE Seventh International Conference on. IEEE.
- Elster, D. (2016). Deliverable 5.1 First Interim Report, University of Bremen, Bremen.
- Elster, D., Barendziak, T., Birkholz, J. (2016). Science Education as a Trigger to Attain Responsible Research and Innovation. In Pixel: New Perspectives in

- Science Education, Conference Proceedings 2017, Florence/LibreriaUniversitariaEdizioni.
- Elster, D., Barendziak, T., Birkholz, J. (2019). Towards a sustainable and open science. Enhancing responsible research and innovation in the biosciences at the University of Bremen. Bremen: University of Bremen.
- Equality Challenge Unit (2005). Athena SWAN Charter. 7th Floor, Queen's House, 55/56 Lincoln's Inn Fields, London, WC2A 3LJ https://www.ecu.ac.uk/equality-charters/athena-swan/
- ERA CoBioTech (2018). Strategic Agenda a vision for biotechnology in Europe, November 2018,
 https://www.cobiotech.eu/lw_resource/datapool/systemfiles/elements/files/7D5 DE99D41EC4DCCE0539A695E869159/current/document/114492_ERA_CoBio_a genda_final_high-res.pdf (accessed on 18/07/19)
- ERA CoBioTech (2018). Strategic Agenda a vision for biotechnology in Europe, https://www.cobiotech.eu/lw_resource/datapool/systemfiles/elements/files/7D5 DE99D41EC4DCCE0539A695E869159/current/document/114492_ERA_CoBio_a genda_final_high-res.pdf (accessed on: 18/07/19)
- ESFRI European Strategy Forum on Research Infrastructures (2006), Roadmap for European Research Infrastructure. Report of the Biology and Medical Science. Roadmap Working Group, October 2006, https://ec.europa.eu/research/infrastructures/pdf/esfri/esfri_roadmap/roadmap_2006/bms-report-roadmap-wg-2006_en.pdf (accessed on: 05/09/2019).
- European Commission (2016). SheFigures 2015, Directorate-General for Research and Innovation, Brussels.
- Eze, M.O. (2008). What is African communitarianism? Against consensus as a regulative ideal. South African Journal of Philosophy. 27(4). 10.4314/saipem.v27i4.31526
- Faria, N.R, Quick, J, Claro I.M, Theze, J, de Jesus, J.G, Giovanetti, M. et al. (2017).
 Establishment and cryptic transmission of Zika virus in Brazil and the Americas.
 Nature 546.
- Faria, N.R. et al. (2016). Mobile real-time surveillance of Zika virus in Brazil.
 Genome Medicine, 96.
- Felt, U., Fochler, M., & Sigl, L. (2017). IMAGINE RRI: A Card-based Method for Reflecting Responsibility in Life Science Re-search
- Filardo G, da Graca B, Sass DM, Pollock BD, Smith EB, Martinez MA. Trends and comparison of female first authorship in high impact medical journals: observational study (1994-2014). BMJ 2016:352:1-8. doi:10.1136/bmi.i847
- Flipse, S.M., Van der Sanden, M.C., & Osseweijer, P. (2014). Setting up spaces for collaboration in industry between researchers from the natural and social sciences. Science and engineering ethics, 20(1).
- France, B., Gilbert, J.K. (2006). A model of communication about biotechnology. Rotterdam: Sense Publishers in cooperation with The New Zealand Biotechnology Learning Hub.
- Gade, C.B. (2012). What is ubuntu? Different interpretations among South Africans of African descent. South African Journal of Philosophy. 31(3). 10.1080/02580136.2012.10751789

- Gardy, J.L., and Loman N.J. (2018). Towards a genomics-informed, real-time, global pathogen surveillance system. Nature Reviews Genetics (19) (1.
- Gerber, A. (2018). RRI: How to 'mainstream' the 'upstream' engagement. Journal
 of Science Communication, 17(3), C06,
- https://jcom.sissa.it/sites/default/files/documents/JCOM_1703_2018_C06.pdf (accessed on: 21/07/2019)
- Gibb, A. and Hannon, P. (2006). "Towards the entrepreneurial University?, in International Journal of Entrepreneurship Education, v. 4, http://blog.ub.ac.id/yogidwiatmoko/files/2012/12/gibb_hannon.pdf (accessed on: 30/10/2018)
- Gittelman, M., (2016). The revolution re-visited: Clinical and genetics research
 paradigms and the productivity paradox in drug discovery. Res. Policy,
 http://dx.doi.org/10.1016/j.respol.2016.01.007
- GREAT (2013). Annual report on the main trends of SiS, in particular the trends related to RRI, http://www.great-project.eu/deliverables_files/deliverables05.
- Griffiths, R. (2004). Knowledge production and the research- teaching nexus: The
 case of the built environment disciplines. Studies in Higher Education 29, no. 6.
- Healey, M. (2005). Linking research and teaching: Exploring disciplinary spaces
 and the role of inquiry- based learning. In Reshaping the University: New
 Relationships Between Research, Scholarship and Teaching, edited by R. Barnett.
 Maiden head, UK: McGraw-Hill/Open University Press.
- Herschberg, C., Benschop, Y., & van denBrink, M. (2018). Precarious postdocs: A
 comparative study on recruitment and selection of early-career
 researchers. Scandinavian Journal of Management, 34(4).
- Herzog, C. (2016). Successful comeback of the single-dose live oral cholera vaccine CVD 103-HgR. Travel medicine and infectious disease, 14(4). doi: 10.1016/i.tmaid.2016.07.003.
- Hill, S.C. et al. (2019). Emergence of the Zika virus Asian lineage in Angola. bioRxiv 520437; doi: https://doi.org/10.1101/520437.
- Jagsi, R., Guancial, E., Worobey, C., Henault, L., Chang, Y., Starr, R., Tarbell, N., Hylek, E. (2006). The 'Gender Gap' in Authorship of Academic Medical Literature

 A 35-Year Perspective. N Engl J Med 2006;355.
- Jenkins, A. (2004). A Guide to the Research Evidence on Teaching- Research Relations. York, UK: The Higher Education Academy. Available online: https://www.heacademy.ac.uk/system/files/id383_guide_to_research_evidence_on_teaching_research_relations.pdf (accessed on: 20/06/2019).
- Kalpazidou Schmidt, E., Ovseik, P.V., Henderson, L.R., & Kiparoglou, V. (2019).
 Understanding the Athena SWAN award scheme for gender equality as a complex social intervention in a complex system: analysis of Silver award Action Plans in a comparative European perspective. bioRxiv. doi:10.1101/555482.
- Kalpazidou Schmidt, E. & Cacace, M. (2017). Addressing gender inequality in science: the multifaceted challenge of assessing impact. Research Evaluation, vol. 26. no 2.
- Kalpazidou Schmidt, E. & Cacace, M. (2018). Setting up a Dynamic Framework to Activate Gender Equality Structural Transformation in Research Organisations. Science and Public Policy, vol. 59.

- Kalpazidou Schmidt, E. (2009). Evaluation, in Bijker W. E. &d'Andrea (eds.),
 Handbook on the Socialisation of Scientific and Technological Research, Social Sciences and European Research Capacities, pp. 169-189, Rome: River Press Group.
- Kalpazidou Schmidt, E. (2016). Development of monitoring and assessment tools
 of structural transformation actions to attain responsible biosciences. STARBIOS2
 report.
- Kalpazidou Schmidt, E.K., & Cacace, M. (2018). Setting up a Dynamic Framework to Activate Gender Equality Structural Transformation in Research Organisations. Science and Public Policy.
- Kuhlmann, S., Lindner, R., & Randles, S. (2016). Conclusion: making responsibility
 an institutionalised ambition. In Navigating Towards Shared Responsibility in
 Research and Innovation: Approach, Process and Results of the Res-AGorA
 Project (pp. 161-166). Fraunhofer ISI.
- Kwiek, M. (2015). "Academic Entrepreneurialism and the Changing Governance in Universities. Evidence from Empirical Studies", in Reihlen, W.M., Frost, J., Hattke, F. (eds.) Multi-level Governance of Universities: The Role of Strategies, Structures, and Controls
- Lawrence, T., Suddaby, R., & Leca, B. (2011). Institutional work: Refocusing institutional studies of organisation. *Journal of Management Inquiry*, 20(1).
- Lederman, N. G., Antink, A., & Bartos, S. (2014). Nature of science, scientific inquiry, and socio-scientific issues arising from genetics: A pathway to developing a scientifically literate citizenry. Science & Education, 23(2).
- Lindlof, T.R. (1995). Qualitative Communication Research Methods. London: Sage.
- Lutz, D.W. (2009). African Ubuntu Philosophy and Global Management. *Journal of Business Ethics*. 84(3), 313-328. 10.1007/s10551-009-0204-z
- Mann, A., & Di Prete, T.A., (2013). Trends in gender segregation in the choice of science and engineering majors. Social science research, 42(6), https://www.ncbi.nlm.nih.gov/pubmed/24090849 (accessed on: 26/07/2019)
- March, J.G., Gherardi, S., & Cimmino, S. (1993). Decisioni e organizzazioni. Il Mulino, Bologna.
- Mezzana, D. (2018). Some Societal Factors Impacting on the Potentialities of Electronic Evidence, in M.A. Biasiotti et al. (eds.), Handling and Exchanging Electronic Evidence Across Europe, Law, Governance and Technology Series 39, Springer, https://doi.org/10.1007/978-3-319-74872-6_14.
- Mezzana, D. (ed.) (2011), Technological responsibility. Guidelines for a shared governance of the processes of socialisation of scientific research and innovation, within an interconnected world, Roma, CNR: www.scienzecittadinanza.org/public/SetDevGuidelines.pdf (accessed on: 08/11/2018)
- Msoroka, M.S. & Amundsen, D. (2018). One size fits not quite all: Universal research ethics with diversity. *Research Ethics*. 14(3), 1-17. 10.1177/1747016117739939.
- Musselin, C. (2007). The Transformation of Academic Work: Facts and Analysis. Research & Occasional Paper Series: CSHE. 4.07. Center for studies in higher education;

- Naveca, F.G. et al. (2019). Genomic, epidemiological and digital surveillance of Chikungunya virus in the Brazilian Amazon. PLoS Negl Trop Dis. 13, 3-0007065.
- Nowotny, H. (2007). Knowledge Production and its Constraints: epistemic and societal considerations, paper presented at the Gulbenkian Foundation, Lisbon, 2007, http://helga-nowotny.eu/downloads/helga_nowotny_b58.pdf (accessed on: 18/07/2019)
- Nowotny, H., Scott, P., Gibbons, M., & Scott, P.B. (2001). **Re-thinking science: Knowledge and the public in an age of uncertainty**. Cambridge: Polity.
- Owen, R., Forsberg, E-M., Shelley-Egan, C. (2019). RRI-Practice Policy Recommendations and Roadmaps, RRI-Practice project report. Deliverable 16.2, https://www.rri-practice.eu/knowledge-repository/recommendations/ (accessed on: 21/07/2019)
- Pan-African Bioethics Initiative (PABIN), (2003). PABIN Third Conference: Good Health Research Practices in Africa. Addis Ababa, Ethiopia.
- Pawson, R. & Tilley, N. (1997). Realistic Evaluation. London: Sage.
- Pierini, M. (2008). Le prix de la liberté: Libye, les coulisses d'une négociation, Actes Sud
- Pinheiro, R., & Stensaker, B. (2014). Designing the entrepreneurial university: The interpretation of a global idea. Public Organisation Review, 14(4).
- Quaranta, G. (1985). L'era dello sviluppo, Franco Angeli, Milano.
- Quick, J., et al. (2017) Multiplex PCR method for MinION and Illumina sequencing of Zika and other virus genomes directly from clinical samples. Nat Protoc, 2017. 12(6).
- Reale, E., Nedeva, M., Thomas, D., & Primeri, E. (2014). Evaluation through impact: A different viewpoint. Fteval Journal, 39.
- Reydon, T.A., Kampourakis, K., & Patrinos, G.P. (2012). Genetics, genomics and society: the responsibilities of scientists for science communication and education. Personalized Medicine, 9(6). https://doi.org/10.2217/pme.12.69
- Rog, D.J. (2012). When background becomes foreground: Toward Context-Sensitive Evaluation Practice. New Directions for Evaluation, 135.
- Rome Declaration on Responsible Research and Innovation in Europe https://ec.europa.eu/research/swafs/pdf/rome_declaration_RRI_final_21_Nove mber.pdf (accessed on: 26/07/2019)
- Royal Society (2006). Survey of factors affecting science communication by scientists and engineers. the Royal Society.
- https://royalsociety.org/~/media/Royal_Society_Content/policy/publications/20 06/111111395.pdf (accessed on: 24/07/2019).
- Ruggiu, D. (2015). Anchoring European governance: Two versions of responsible research and innovation and EU fundamental rights as 'Normative anchor points'. NanoEthics, 9(3).
- Sadler, T.D. (2011). Socio-scientific issues in the classroom. Heidelberg, Springer.
- Sambala, E.Z., Cooper, S. and Manderson, L. (2019). Ubuntu as a Framework for Ethical Decision Making in Africa: Responding to Epidemics. *Ethics & Behavior*. 10.1080/10508422.2019.1583565
- Shendure, J., Ji, H., (2008). Next-generation DNA sequencing. In *Nature Biotechnology*, 26.

- Smith, R.D.J., Scott, D., Kamwendo, Z.T., Calvert, J. (2019). An Agenda for Responsible Research and Innovation in ERA CoBioTech. Swindon, UK: Biotechnology and Biological Sciences Research Council and ERA CoFund on Biotechnology
- https://www.cobiotech.eu/lw_resource/datapool/systemfiles/elements/files/858 86BE9C7161C71E0539A695E865A64/live/document/ERA_CoBioTech_RRI_Fram ework.pdf (accessed on: 18/07/19)
- Spruit, S.L., Hoople, G.D., & Rolfe, D.A. (2016). Just a cog in the machine? The
 individual responsibility of researchers in nanotechnology is a duty to
 collectivize. Science and engineering ethics, 22(3).
- Stephan, P. (2013). How to exploit postdocs. *BioScience*, 63(4).
- Stilgoe, J., Owen, R., & Macnaghten, P. (2013). Developing a framework for responsible innovation. Research Policy, 42(9).
- Sutcliffe, H. (2011). A report on Responsible Research and Innovation for the European Commission. Retrieved from http://ec.europa.eu/research/sciencesociety/document_library/pdf_06/rri-report-hilary-sutcliffe_en.pdf (accessed on: 30/9/2019).
- Temoshok, L.R., & Wald, R.L. (2008). Integrating multidimensional HIV prevention programs into healthcare settings. Psychosomatic medicine, 70(5). doi: 10.1097/PSY.0b013e31817739b4.
- Thézé, J. et al. (2018). Genomic Epidemiology Reconstructs the Introduction and Spread of ZikaVirus in Central America and Mexico. *Cell Host Microbe*. 23.
- Van Belle, S.B., Marchal, B., Dubourg D. and & Kegels, G. (2010). How to develop a theory-driven evaluation design? Lessons learned from an adolescent sexual and reproductive health programme in West Africa. BMC Public Health, 10, 741.
- Van Schomberg, V. & van Schomberg, R. (2013). A Vision of Responsible Research and Innovation. In Owen, R., Heintz, M. & Bessant J. (Eds.), Responsible Innovation (pp. 51-74). London: John Wiley & Sons, Ltd.
- Von Schomberg, R. (2019). Why Responsible Innovation. In The International Handbook on Responsible Innovation. A Global Resource. Von Schomberg, R. and Hankins, J. (Eds.). Cheltenham: Edward Elgar Publishing. Forthcoming.
- Watermeyer, R. (2015). Lost in the 'third space': the impact of public engagement in higher education on academic identity, research practice and career progression, European Journal of Higher Education, 5:3, http://www.tandfonline.com/doi/pdf/10.1080/21568235.2015.1044546 (accessed on: 24/07/2019).

ABOUT THE STARBIOS2 GUIDELINES

This guideline aims to help readers formalize and trigger structural change aimed at introducing appropriate RRI-related practices to their own organisations. This is not a series of prescriptions, but an itinerary of reflection and self-interpretation addressed to different actors within the biosciences. To support this itinerary of reflection and self-interpretation, the document provides...

- a description of a general RRI Model for research organisations within the biosciences, that is a set of ideas, premises and "principles of action" that define the practice of RRI in bioscience research organisations,
- some practical guidance for designing interventions to promote RRI in research organisations in the Biosciences, putting into practice the RRI Model,
- · a set of useful practices in implementing the structural change process,
- and information on particular STARBIOS2 cases and experiences, as well as materials, tools and sources, are also provided in the Appendix and in the Annex.



























