

Environmental communication and science communication – conversations, connections and collaborations

Lloyd Davis, Centre for Science Communication, University of Otago, Otago, New Zealand;
lloyd.davis@otago.ac.nz

Birte Fährnich, Center for Political Communication, Zeppelin University, Friedrichshafen,
Germany; birte.faehnrich@zu.de

Ana Claudia Nepote, Centro de Investigaciones en Ecosistemas, Universidad Nacional
Autonoma de Mexico, Morelia, Mexico; nepote@enesmorelia.unam.mx

Michelle Riedlinger, Department of Communication, University of the Fraser Valley,
Abbotsford, Canada; michelle.riedlinger@ufv.ca

Brian Trench (Corresponding Author), School of Communications, Dublin City University,
Dublin 9, Ireland; brian.trench@dcu.ie

Abstract

This commentary considers the separate but interconnected evolution of science communication and environmental communication as fields of research and practice, and argues for better mutual understanding between the fields, including an understanding of necessary differences. It notes that the repertoires of science communication and environmental communication overlap but have different emphases. Environmental communication emphasises public allegiances with a view to persuasion; science communication has focussed on public understanding and appreciation of science. The potential and the need for closer cooperation are growing as the authority of science is challenged in political arenas. Both fields recognise the important contributions of science to public sense-making and informed decision-making on major issues. Increasing engagement with the science that underpins environmental issues could benefit environmental communicators. In political contexts, science communication could learn from environmental communication's greater attention to advocacy and symbolic representations.

Introduction

Environmental issues, and the application of science and technology to those issues, are receiving unprecedented levels of attention in public and policy discourses. As this has been happening, differences over responses to climate change have broadened to much wider philosophical and cultural divergences over the authority accorded to science and the assessment and interpretation of scientific evidence.

Many different views may be taken on the proposition that these developments mean we are moving into or already are in a post-truth world. Yet, it is evident that in authoritarian societies or once-liberal societies trending in that direction, it has become more difficult to advocate for evidence-based positions and policies on a wide range of topics, notably those related to environment and climate. In these conditions, environmental communication (EC) and science communication (SC) need to intensify their critical examination of their respective responsibilities and potentials; relations between EC and SC are an important aspect of that critical self-examination.

This Commentary offers a view of EC and SC and their relations that draws on the experiences of the authors, all with a foot in both camps. The Commentary is based on a ‘practice reflection’ paper and panel the authors – all members of the scientific committee of the PCST, the global network for science communication – presented at the International Environmental Communication Association conference, COCE 2017. Guided by the maxim that “good fences make good neighbours”, the panel sought to clarify differences as well as similarities between EC and SC.

We note the considerable interest in both EC and SC in looking across the fences between them. Of 108 research articles published in the journal, *Science Communication* and 237 published in the journal *Public Understanding of Science* in 2014-17, 30% and 27%, respectively, were on environmental topics; in both journals just over 60% of these papers on environment were on climate change. With little modification, this material could have been published in an environmental communication journal, though the foci may have been somewhat different.

A search in *Public Understanding of Science*, 2014-17, on ‘environmental communication’ produces mainly passing mentions or bibliographical or biographical references (journal title, publication title or author’s declared research interest). Just one use of the phrase is found in a substantive treatment of environmental communication (Sakellari, 2014), referring to Brulle (2010) on ‘environmental melodrama’. A search in *Environmental Communication*, 2014-17, on ‘science communication’ produces many passing references, but also several (e.g. Suldovsky et al, 2017; Lee et al, 2017; Burke et al, 2016) that deal with science communication in terms of formal study and theoretical reflection.

There is an apparent asymmetry in the respective interest in each other’s topic-fields, with SC showing more interest in EC’s than vice versa, but also asymmetry in the respective referencing of each other’s work, with EC doing more in that regard than SC. Lindenfeld et al (2012) gave significant attention to relations between the two in developing a strategy for communication on sustainability science. The authors note the “fractured nature of university disciplines” (p.30) but also EC’s particular sensitivity to “issues that threaten to undermine interdisciplinary collaboration” (p.31). In advocating for collaboration with SC, however, the authors significantly understate SC’s effort to develop alternatives to traditional information-transmission models, attributing to SC the “rearticulation” (p.33) of such models despite “recent” (p.33) critique of the deficit model – in fact, a live, even central, concern within science communication for two decades (see Lee et al, 2017). The historical view is corrected, at least implicitly, in a more recent paper (Suldovsky et al, 2017), arising from the same project with two of the same co-authors, where the literature on various models of science communication is discussed.

The asymmetries noted here contrast with the striking symmetries and overlaps in the recent histories of EC and SC. Key developments and events in both opened the paths for academic education and research through jointly labelled sections of international communication associations. It is less than 30 years ago that the label of ‘science communication’ was widely accepted but in the intervening period official campaigns, professional conferences and networks, university programmes and specialist journals have emerged to establish science communication as a field of practice, education and research

(Trench, 2012). EC acquired similar attributes of a distinct field of intellectual and academic effort from the early 1990s (Cox, 2013; Cox & Depoe, 2015), reproducing the defining organisational and institutional features seen in SC.

A key founding difference, however, is that EC emerged in part as a critique of science or, at least, of the science-technology-industry nexus contributing to infrastructure and investments perceived to be harmful to the environment, whereas early SC was focussed on surveys of public scientific literacy and strategies of popularisation intended to raise literacy levels. This historical difference between the fields continues to characterise some of those between SC's and EC's relationships to dominant power structures. However, the recent prominent attention to environmental themes in SC research relates to a longer-standing interest in contested science and public controversies that represented an antidote to the promotion of science and of science awareness that defined much SC effort in the early years.

A related difference between the two fields relates to EC's increasing attention to advocacy and allegiance and SC's continuing attention to knowledge discovered by scientific means. As Hansen (2011) observed of EC:

it appears that the battles over these [controversial environmental] issues are now as much to do with communication aimed at 'winning hearts and minds' as they are to do with communicating science-based or expert evidence" (p. 8)

Milstein (2009) considers that:

much environmental communication scholarship is critically engaged not only with understanding human-nature relations but also in aiding somehow social-environmental change" (p.347).

On this and other bases, the two fields have grown separately, though often concerned with the same or similar parts of science and its application.

We believe that both fields would be well-served by a better understanding of each other. In the following sections, we consider the differences and similarities between EC and SC in five areas in which they have a common interest but patterns of convergence and divergence show between the fields. We conclude with proposals for interaction and collaboration.

Public dialogue

Public dialogue has become a key concern of SC, frequently represented as a necessary abandonment of one-way (or "deficit") models of communication. The concerns of SC with dialogue are closely connected with those of EC. The first, however, tends to be focused more on institutions and the latter more on civil society organisations and on their role in influencing policy.

Within EC, as in SC (e.g. Wynne, 2006), the difficulty of realising true dialogue and giving it material form has been recognised (Phillips, 2011; Carvalho et al, 2017). This has occasioned self-critique in EC: Brulle (2010, p. 89) applies a standard of "public dialogue" in an analysis of EC messaging strategies that he sees as "designed to influence public opinion [on environmental matters] in a particular manner", and are little more than "one-way

communication in which individual citizens are treated as objects of manipulation and control.”

Phillips et al. (2011) linked SC and EC through their shared interest in purposive, mainly policy-oriented, forms of public dialogue. Contemporary SC, however, represents “dialogue” in many other forms, too (e.g. science centres, art-science collaborations, science cafés, science comedy, etc.). The primary motivations of such dialogue may be to provide pleasurable opportunities to engage with science or support informed decision-making, but it can be difficult to disentangle these motivations from those associated with maintaining public legitimacy.

Public engagement and participation

EC and SC might be expected to converge around public engagement and participation over shared concerns such as climate change, but here too there are differing approaches. EC has been described as a “crisis” discipline because environmental issues and associated public engagement activities are perceived as crises (see e.g. Cox, 2007; Milstein, 2009). In contrast, public engagement and participation activities of science communicators centre on citizens’ engagement with scientific information.

Nisbet (2017) has called upon scientific institutions that engage in SC to move beyond activities focussed on the science and become more “issues-focussed”, thus moving closer to EC approaches. Communicators working at the interface of science and the environment recognise scientific information as necessary but not sufficient to engender public engagement and participation. EC researchers (e.g. Carvalho et al, 2017) even argue that the “scientisation” of issues like climate change can depoliticise them and demobilise citizen participation and engagement. Ottinger (2015) suggests that science communicators might best assist scientists by engaging publics in ways that move beyond the idea of a homogenous and value-free science. As a sign of these changing times, the concept of public engagement in science has broadened to encompass science in society activities (Bucchi & Trench, 2014), including a wide range of non-institutionalised knowledge-making and -sharing activities and conversations about emerging scientific and technological developments and their impacts (e.g. citizen science, science-art collaborations and cultural critiques).

Activism and Advocacy

With regard to activism and advocacy two overlaps appear: on the one hand, science has become relevant to environmental activism as a *content of communication*; on the other hand, *communication instruments and techniques* used in EC are increasingly adopted in SC practice.

While SC research on the use of science in EC is limited, it shows that environmental activists rely on scientific evidence to substantiate their arguments when competing for public and political attention (e.g. Yearley, 2014). Activists rely on the credibility and trustworthiness of science and regard it as highly important to be well informed about the latest scientific findings (Fährnich, 2017). In public and political discourse; consequently, they may be seen as neither lay nor scientists (Eden, 2010), though they do not generate or

independently evaluate the knowledge they use but rely on the claims of others (Turner, 2007; Jasanoff, 2012). Their use of scientific evidence is not likely to be neutral and objective: they may challenge notions of expertise, scientific certainty, and issue closure (Eden, 2010). Accordingly, such environmental communicators are not only “alternative” (Maesele, 2009) but also *strategic* science communicators who have an impact on the public visibility and perception of science and thus deserve closer attention in both EC and SC (Eden, 2010; Fähnrich, 2017).

At the level of communication strategies, instruments and techniques, scientists and science communicators have begun to adopt activist methods derived from and documented in EC (Frickel, 2004). This recent development is not (yet) a focus of SC but work in this direction of overlapping interest is impeded by arguments that participating in such advocacy contributes to the increased politicization of scholarly work and further confounds the public understanding of science (e.g. Roston, 2017).

Communicating sustainability

Communicating sustainability represents a challenge for SC and EC and raises issues of concern to both, including complexity, consumption, ambivalence, mobility, uncertainty, risk and conflict (Godemann & Michelsen, 2011). The developing field of sustainability science incorporates social dimensions, including communication, as it engages with problems at the intersection of society, ecology and the economy, with climate change being one of the most relevant (McGreavy & Hart, 2017). For Kates (2011) it is an interdisciplinary research activity that includes the natural and social sciences, engineering, medicine and the humanities.

Communicating about sustainability is often treated as a sub-field of EC, but with a particular concern for knowledge co-production (McGreavy & Hart, 2017). This requires researchers and practitioners to find ways of communicating with each other in addressing fundamental relationships between nature and society, combining different ways of knowing and learning, even in scenarios with uncertain and limited information (Kates et al. 2001).

It was specifically in relation to sustainability science that Lindenfeld et al (2012) and Suldozsky et al (2017) gave focused attention to relations between EC and SC, in the latter case discussing the literature on, and applying analytically, “the three models of science communication identified in previous work: diffusion, dialogue, and participation (i.e. knowledge co-production)” (p.588).

Representations of nature

The representation of nature and of humanity’s place in it has been central to EC (Hansen & Machin, 2013), while SC has little vested interest in nature as a symbolic entity or in efforts to preserve nature in some pristine state. Even when dealing with such emotionally-charged environmental science as that about climate change, SC’s focus is typically on the effect of the communication on the receiver rather than the environment or nature *per se* (e.g. Bourk et. al., 2015; Sol Hart & Feldman, 2016).

By definition, EC is both persuasive – it educates and seeks to solve environmental problems – and constructive: through its language and visual representations of nature it

becomes a symbolic call for action (Cox, 2013). Depictions of nature on covers of *Time* magazine have been categorised as showing nature as a resource or as an object of exploitation, or showing humanity's place in nature (Meisner & Takahashi, 2013). In EC wilderness and pristineness are often defined in terms of the absence of humans (e.g. Takach, 2013). This use of environmental rhetoric and visuals, leading to a social-symbolic construction of nature, is perhaps one of the strongest distinctions between EC and SC. When the noted environmental writer George Monbiot (2017) advocates a more immediately affective language for talking about nature, e.g. "living planet" rather than "environment", he is imagining the fields moving further apart.

Hand-in-hand with this social-symbolic construction of nature, EC often employs branding and marketing techniques as necessary partners for advocacy, which contrasts with their near-absence in SC (Finkler, 2014). An analysis of 826 online videos on science-related topics revealed that those about an environmental topic (e.g. climate change) were nearly four times more likely than those about a science topic (e.g. nanotechnology) to try to persuade the viewer of a particular standpoint (Davis & León, in press). Tools derived from marketing, especially when applied to video and film, are seen as a particularly potent approach to communication when the intention is to alter people's attitudes and behaviour (Finkler, 2014; Arendt & Matthes, 2016).

Conclusion

Our exploration of connections and conversations in EC and SC points to their overlapping repertoires and their different emphases. EC's recognition that communication is always "interested" and embedded in values is nowadays echoed in SC's science-in-society focus. SC's support of public sense-making and informed decision-making is echoed by EC scholars who have questioned whether EC need always come from a place of adversarial activism. Cox (2007), for example, suggests that a mandate for EC could be to "enhance the ability of society of respond appropriately to environmental signals relevant to the well-being of both human communities and natural biological systems" (p.5).

Well-established scholars in both fields have noted the need for more nuanced understandings of the processes of political decision-making associated with SC (Scheufele, 2014) and EC (Hansen, 2015). Collaborations around common case studies could connect important learnings from each field, bridging investigations of civic activism and discussions of scientific citizenship and epistemic justice, and connecting to findings drawn from political communication and public opinion research.

Points of divergence also provide fruitful areas of connection and future collaboration for these fields. For example, dominant practices in EC around climate change focus less on the science than on raising awareness about issues, promoting values, engaging society in actions, changing the behaviours of individuals and influencing policy. In contrast, SC is generally reticent to recognise public engagement activities motivated by activism as communication worthy of attention. Future collaborations between SC and EC investigating the power relations associated with activities such as sustainability science initiatives, non-institutionalised and distributed knowledge-making (e.g. citizen science and public risk

assessment), environmental science-art projects with conservation groups, and cultural critiques of science and technology could generate useful knowledge for both fields.

We have noted that, as the authority of science is increasingly challenged, science communicators are turning to awareness-raising and behaviour-change strategies already recognised as important within EC. Meanwhile, individual environmental activists and civil society organisations are taking on roles as alternative and strategic science communicators and science critics. Increasing engagement with the science that underpins environmental issues may potentially improve outcomes from the environmental communicator's perspective, whereas a greater emphasis on evidence-informed advocacy and persuasion, particularly the use of video and film, could enhance the relevance of the work of science communicators. The implications of these moves for the symbolic representation of science in society, and the public legitimacy of science are worthy foci for both fields.

References

- Ahrendt, F. & Matthes, J. (2016). Nature documentaries, connectedness to nature and pro-environmental behavior. *Environmental Communication*, 10(4), 453-472.
DOI <https://doi.org/10.1080/17524032.2014.993415>
- Bourk M., Rock J., & Davis L.S. (2015). Mediating the science: Symbolic and structural influences on communicating climate change through New Zealand's television news. *Environmental Communication*, published online, 1 October, 1-19. DOI: 10.1080/17524032.2015.1058289
- Brulle, R. (2010). From environmental campaigns to advancing the public dialog: Environmental communication for civic engagement. *Environmental Communication*, 4(1), 82-98. DOI: 10.1080/17524030903522397
- Bucchi, M. & Trench, B. (2014). Science communication research: Themes and challenges. In M. Bucchi & B. Trench (Eds.) *Routledge Handbook of Public Communication of Science and Technology*, 2nd ed., (pp 1-13) Abingdon & New York: Routledge.
- Burke, B.J., Welch-Devine, M., Gustafson, S., Heynen, N., Rice, J.L., Gragson, T.L., Evans, S.R. & Nelson, D. R. (2016). Can science writing collectives overcome barriers to ,more democratic communication and collaboration? Lessons from environmental communication praxis in Southern Appalachia, *Environmental Communication*, 10(2), 169-186
- Carvalho, A., van Wessel, M., & Maesele, P. (2017). Communication practices and political engagement with climate change: a research agenda. *Environmental Communication*, 11(1), 122-135.
- Cox, R. (2007). Nature's crisis disciplines: Does environmental communication have an ethical duty? *Environmental Communication*, 1, 5-20. DOI: 10.1080/17524030701333984
- Cox R. (2013). *Environmental communication and the public sphere*, 3rd ed. Newbury Park, CA: Sage.
- Cox, R. & S. Depoe (2015). Emergence and growth of the "field" of environmental communication. In A. Hansen & R. Cox (Eds.) *Routledge Handbook of Environment and Communication*, Abingdon: Routledge.

- Davis, L.S. & León B. (in press). New and old narratives: changing narratives of science documentary in the digital environment. In B. Leon & M. Bourk (Eds.) *Online Video as a Tool for Science Communication*. Abingdon: Routledge.
- Eden, S. (2010). NGOs, the science-lay dichotomy, and hybrid spaces of environmental knowledge In: P. Meusburger, D. Livingstone, H. Jöns (Eds.) *Geographies of Science* (pp. 217–230). Dordrecht: Springer.
- Fährnich, B. (2017). Digging deeper? Muddling through? Informationsgenerierung & Bedeutungskonstitution von wissenschaftlichen Informationen durch kanadische Umweltaktivisten [Information selection and sense making of scientific information by Canadian environmental activists]; Presentation at the annual conference of the Science Communication Section of the German Communication Association, April 2017, University of Koblenz-Landau.
- Finkler, W. (2014). Save the whales Part II: A new science advocacy communication framework, in J. E. S. Higham, L. Bejder & R. Williams (Eds.) *Whale-watching: Sustainable Tourism and Ecological Management* (pp 352-364). Cambridge: Cambridge University Press.
- Frickel, S. (2004). Just science? Organizing scientist activism in the US environmental justice movement. *Science as Culture*, 13(4), 449-469. doi:10.1080/0950543042000311814
- Godeman, J. & Michelsen, G. (2011). Sustainability Communication - An Introduction. In J. Godeman & G. Michelsen (Eds.). *Sustainability Communication. Interdisciplinary Perspectives and Theoretical Foundation* (pp. 3-11). Dordrecht: Springer.
- Hansen, A. (2015). Promising directions for environmental communication research. *Environmental Communication*, 9(3), 384-391. DOI: 10.1080/17524032.2015.1044047
- Hansen, A. (2011). Communication, media and environment: Towards reconnecting research on the production, content and social implications of environmental communication. *International Communication Gazette*, 73(1-2), 7-25. DOI: 10.1177/1748048510386739
- Hansen A., & Machin D. (2013). Researching visual environmental communication. *Environmental Communication*, 7(2), 151-168. DOI: 10.1080/17524032.2013.785441
- Jasanoff, S. (2012). Reason in practice. In S. Jasanoff (Ed.) *Science and Public Reason* (pp 1-23), Abingdon & New York: Routledge.
- Kates, R., Clark, W., Corell, R., Hall, J. M., Jaeger, C. C., Lowe, L., McCarthy, J. J., Schellnhuber, H. J., Bolin, B. & Dickson, N. M. (2001). Sustainability Science, *Science* 292: 641-642.
- Kates, R.W. 2011. What kind of a science is sustainability science? *Proceedings of the National Academy of Sciences*, 108(49), 19449-19450.
- Lee, N., VanDyke, M.S. & Glenn Cummins, R. (2017). A missed opportunity? NOAA's use of social media to communicate climate science, *Environmental Communication*, published online 10 January 2017.
- Lindenfeld, L. A., Hall, D. M., McGreavy, B., Silka, L. & Hart, D. (2012) Creating a place for environmental communication research in Sustainability Science, *Environmental Communication*, 6(1), 23-43.
- McGreavy, B. & Hart, D. (2017). Sustainability science and climate change communication. In *Oxford Research Encyclopaedia of Climate Science*. Published online, May 2017. DOI: 10.1093/acrefore/9780190228620.013.563
- Maesele, P. (2009). NGOs and GMOs. A case study in alternative science communication. Conference Papers – International Communication Association, 2009 Annual Meeting.

- Meisner, M.S. & Takahashi, B. (2013). The nature of Time: How the covers of the world's most widely read weekly news magazine visualize environmental affairs. *Environmental Communication*, 7(2), 255-276. DOI: 10.1080/17524032.2013.772908
- Milstein, T. (2009). Environmental communication theories. In S. W. Littlejohn, & K. A. Foss (Eds.). *Encyclopaedia of Communication Theory* (pp 345-349). Newbury Park, CA: Sage. DOI: 10.4135/9781412959384
- Monbiot, G. (2017) We should say what we mean about nature, *Village – Ireland's political and cultural magazine*, Issue 61, December
- Nisbet, M. (2017). Ending the crisis of complacency in science. *American Scientist*, 105 (1), 18.
- Ottinger, G. (2015). Is it good science? Activism, values, and communicating politically relevant science. *Journal of Science Communication*, 14 (02), C02. Retrieved from https://jcom.sissa.it/sites/default/files/documents/JCOM_1402_2015_C02.pdf
- Phillips, L. (2011). *The promise of dialogue: The dialogic turn in the production and communication of knowledge*. Amsterdam: John Benjamins.
- Phillips, L., Carvalho, A. & Doyle, J., eds (2011). *Citizen Voices – performing public participation in science and environmental communication*. Bristol: Intellect.
- Roston, M. (2017). The March for Science: Why some are going, and some will sit out. New York Times, April 17, 2017. <https://www.nytimes.com/2017/04/17/science/march-for-science-voices.html>
- Sakellari, M. (2014). Cinematic climate change, a promising perspective on climate change communication, *Public Understanding of Science*, 24(7), 824-841.
- Scheufele, D. A. (2014). Science communication as political communication, *Proceedings of the National Academy of Sciences*, 111(4), 13585-13592. doi: 10.1073/pnas.1317516111
- Sol Hart, P. & Feldman, L. (2016). The impact of climate change-related imagery and text on public opinion and behavior change, *Science Communication*, 38 (4), 415-441.
- Suldovsky, B., McGreavy, B. & Lindenfeld, L. (2017) Science communication and stakeholder expertise: Insights from Sustainability Science, *Environmental Communication*, 11(5), 587-592.
- Takach, G. (2013). Selling nature in a resource-based economy: Romantic/extractive gazes and Alberta's bituminous sands, *Environmental Communication*, 7(2), 211-230. DOI: 10.1080/17524032.2013.778208.
- Trench, B. (2012). Vital and vulnerable: Science communication as a university subject. In B. Schiele, M. Claessens, S. Shi (Eds.) *Science Communication in the World: Practices, Theories and Trends* (pp 241-257). Dordrecht: Springer.
- Turner, S. (2007). Political epistemology, experts and the aggregation of knowledge, *Spontaneous Generations*, 1(1), 36-47.
- Wynne, B. (2006) Public engagement as means of restoring trust in science? Hitting the notes, but missing the music, *Community Genetics*, 9(3), 211-220.
- Yearley, S. (2014). Environmentalists as communicators of science: advocates and critics. In M. Bucchi & B. Trench (Eds.) *Routledge Handbook of Public Communication of Science and Technology*, 2nd ed (pp 113-124). Abingdon: Routledge.