

We regret any misperception that we sought to proclaim a 'new' or 'innovative' approach. In hindsight, it would have been appropriate to cite relevant TRM literature in our Letter, and we are thankful to do so here. However, given the region's non-uniform social and physical landscapes and the relatively limited application of TRM to date, the results of our study cannot provide direct support for TRM as a comprehensive management strategy. This should not discount continued development of the practice or exploration of its potential benefits. □

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L. W. Auerbach¹, S. L. Goodbred Jr^{1*},
D. R. Mondal², C. A. Wilson¹, K. R. Ahmed³,

K. Roy³, M. S. Steckler⁴, C. Small⁴, J. M. Gilligan¹
and B. A. Ackerly⁵

¹Department of Earth and Environmental Sciences, Vanderbilt University, Nashville, Tennessee 37240, USA. ²School of Earth and Environmental Sciences, Queens College–City University of New York, Queens, New York 11367, USA. ³Environmental Science Discipline, Khulna University, Khulna 9208, Bangladesh. ⁴Lamont-Doherty Earth Observatory, Columbia University, Palisades, New York 10964, USA. ⁵Department of Political Science, Vanderbilt University, Nashville, Tennessee 37203, USA. *e-mail: steven.goodbred@vanderbilt.edu

CORRESPONDENCE:

Opening up the black box of adaptation decision-making

To the Editor — Although the recent Perspective by Eisenack *et al.*¹ attempts to move the discussion on barriers to climate change adaptation forwards, in our view it still does not address a key challenge that has hampered this line of research since its beginnings. In 2007, the Fourth Assessment Report of the IPCC stated that adaptation efforts will encounter — and hence need to overcome — different types of limits, constraints or barriers². Since then, the scientific community has busily identified and catalogued all manner of different barriers, and discussed various means of overcoming them. While offering an important first step in exploring adaptation, the tendency to abide by top-down and functionalist views of decision-making and barriers is both problematic conceptually and unsupportable empirically if the ambition is to explain adaptation decision-making.

Much of the scholarly debate has implicitly followed the logic that since there is a 'gap' between the actual and expected output of adaptation decision-making, something must be preventing policymaking from attaining its true equilibrium. Hence the often *ex ante* identified barriers to adaptation required to explain this gap¹. The key problem with this line of thinking is that it originates with the normative assumption that collective decision-making at national, regional, and local levels should be producing climate-adaptive decisions and actions. This highly linear and functionalist understanding of decision-making assumes

that socio-political systems would be automatically adjusting to changes in the absence of barriers³. As a consequence of such a view, the complexities of collective decision-making on adaptation are reduced to simple input–output models in which important internal dynamics and processes are absent. This is what has often been referred to as a black box view on decision-making⁴.

Categorizing any factor or process as a barrier reduces complex and highly dynamic decision-making processes into simplified, static and metaphorical statements about why current outcomes are 'incorrect'. Examples are omnipresent in the adaptation literature, in which blame for the failure of decision-making to address climate change risks is placed on such factors as lack of resources, lack of knowledge, or lack of will⁵. But explaining decision-making requires first and foremost identification of the suite of (plausible) causal processes that are responsible for producing a certain outcome or effect⁶. Barrier thinking, with its overly reductionist comprehension of the decision-making process, prevents such explanations.

Contemporary public policy and governance studies have long abandoned barrier thinking and instead treat decision-making processes as dynamically complex, contributing to an erratic pattern of decision-making that does not necessarily result in appropriate responses to policy drivers^{7,8}. Of central concern are the

iterative processes of social construction, problem framing and the intentional development of policy alternatives. Processes such as power struggles, misfortune, organized irresponsibility and social learning — as well as policy innovation and diffusion — are critical to policy outcomes^{4,5,9}, and thus also to our research frameworks, if they are to be realistic and robust.

Although we sympathize with the proposal by Eisenack *et al.*¹ to include feedback, causal interdependencies and agency — in other words to increase complexity — in climate change adaptation policy analysis, these proposals are of limited value if they remain rooted in barrier thinking. If the ambition is to explain rather than to describe how public policy can successfully address the challenges of climate change adaptation, the functionalist framework — and the associated concept of barriers — should be discarded altogether.

Alternatives are plentiful. In political sciences, for example, implementation research has moved away from notions of barriers to implementation as it became clear that the actions prescribed based on the identified barriers fail to solve the problems in practice. Contemporary third generation implementation studies now focus on a variety of top-down and bottom-up causes and processes for explaining the way decision-makers deal with given rules and norms in understanding how implementation processes work,

and succeed or fail¹⁰. In this respect, Michael Lipsky's seminal study is worth mentioning, as he shows how street level bureaucrats reinterpret policy guidelines to deliver actions that fit their beliefs and sense of justice¹¹.

Recent research on adaptation starts to offer possible alternative routes to policy analysis that explore deeper causal processes at work. For example, Dowd *et al.*¹² used social network theory and showed that earlier and more transitional adapters were less likely to have close ties with family and community, and more likely to have external network ties, than their counterparts. Similarly, Cashore and Wejs¹³, adopting a legitimacy perspective on policy-making, explored the regulative, normative and cultural institutional dimensions of constructing legitimacy through the climate secretariat in Aarhus, Denmark, and the effect that different forms of legitimacy had on resulting adaptation planning. Their analysis provides detailed insights that allow for concrete interventions in practice, for example, when regulatory elements are needed to build legitimacy. These studies are informed by current work in the social sciences and are conceptually nuanced and empirically grounded.

Our Correspondence is not merely an expression of academic or methodological concern: A mismatch between academic models and the practical realities in which practitioners operate translates into poorly informed future policy prescriptions. Almost

ten years of barrier thinking and analysis have yielded very limited advice about how to intervene in practice to secure better outcomes^{14,15}. The examples mentioned above provide detailed explanations of the decision dynamics and causal processes that go into climate change policy-making and practice, and therefore are far more useful to practitioners and academics than functionalist approaches to adaptation. By opening up the black box of decision-making a whole range of more tailored interventions become available to address the challenges of adaptation in practice. Hence we argue that the biggest 'barrier' to adaptation might very well be the concept of barriers itself and how it is currently being used in studying adaptation decision-making. □

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Robbert Biesbroek^{1*}, Johann Dupuis², Andrew Jordan³, Adam Wellstead⁴, Michael Howlett^{5,6}, Paul Cairney⁷, Jeremy Rayner⁸ and Debra Davidson⁹
¹Public Administration and Policy Group, Wageningen University, Hollandseweg 1, 6700 EW Wageningen, the Netherlands. ²IDHEAP, Swiss Graduate School of Public Administration, University of Lausanne, Quartier Mouline, Lausanne CH-1015, Switzerland. ³Tyndall Centre for Climate Change Research, University of East Anglia, Norwich, Norfolk NR4 7TJ, UK. ⁴Department of Social Sciences, Michigan Technological University, 1400 Townsend Drive, Houghton, Michigan 49931, USA. ⁵Department of Political Science, Simon Fraser University, 8888 University Drive, Burnaby, British Columbia V5A 1S6, Canada. ⁶Lee Kuan Yew School of Public Policy, National University of Singapore, 469C Bukit Timah Road, 259772, Singapore. ⁷Department of History and Politics, University of Stirling, Stirling FK9 4LA, UK. ⁸Johnson-Shoyama Graduate School of Public Policy, University of Saskatchewan, 101 Diefenbaker Place, Saskatoon, Saskatchewan S7N 5B8, Canada. ⁹Department of Resource Economics and Environmental Sociology, University of Alberta, 515 General Services Building, Edmonton, Alberta T6G-2H1, Canada
 *e-mail: robbert.biesbroek@wur.nl

Reply to 'Opening up the black box of adaptation decision-making'

Eisenack *et al.* reply — We are encouraged by the fact that our recent Perspective on the new frontiers of adaptation barriers research¹ is generating academic debate. We hope that others will engage and thus help to advance a scientifically rigorous and practically relevant research agenda. Here we would like to respond to the Correspondence from Biesbroek and colleagues². We see as their main points that research on adaptation barriers unavoidably implies a 'functionalist', simplistic view of adaptation processes, and that 'barrier thinking' (and presumably all research on barriers) should be discarded altogether.

Although we join Biesbroek *et al.* in criticizing previous research on adaptation for often being naive about individual and collective decision-making, we see scope and reason for research on barriers that goes beyond what they call a functionalist framing². First, we

would argue that it is crucial in a world of climate change to analyse whether the pace of changing institutions and practices in place to fulfil particular societal purposes is commensurate with that of external change, and if not, to explain that disconnect. Such a line of inquiry is not just interesting scientifically, but also important for practical decision-making. It is inherent in actors' justifications for pursuing adaptation to climate change. Second, we would argue that researching barriers to adaptation is not necessarily tied to a naive conceptualization of decision-making. Although we appreciate that Biesbroek *et al.* propose implementation research as a further approach to investigate how adaptation occurs, we do not perceive this approach as an exclusive alternative. Researching the implementation of adaptation is merely the flip side, and in many ways the logical

twin, of researching barriers (which aims to explain 'implementation deficits', as coined by Hupe³).

The research focuses outlined in our Perspective are concrete proposals for 'opening up the black box of adaptation decision-making', so as to identify and explain the reasons why adaptation is delayed, less effective, or does not take place. Asking for greater attention to "power struggles, misfortune, organized irresponsibility and social learning — as well as policy innovation and diffusion" repeats this very request for more explanatory and actor-centred adaptation research. Such research is one possible way to analyse the many facets and dynamics of individual and collective adaptation decision-making. We explicitly emphasize that explanatory adaptation research needs to consider the dynamics of barriers, to avoid an inappropriate static picture