AUTHORS:
Kevern L. Cochrane[1]
Warwick H.H. Sauer[1]
Shankar Aswani[1,2]

AFFILIATIONS:
[1]Department of Ichthyology and Fisheries Science, Rhodes University, Makhanda, South Africa
[2]Department of Anthropology, Rhodes University, Makhanda, South Africa

CORRESPONDENCE TO:
Kevern Cochrane

EMAIL:
k.cochrane@ru.ac.za

HOW TO CITE:
Cochrane KL, Sauer WHH, Aswani S. Reply to 'Society's needs cannot be met by applied science alone: A response to Cochrane et al. (2019)'. S Afr J Sci. 2019;115(7/8), Art. #6415, 2 pages. https://doi.org/10.17159/sajs.2019/6415

ARTICLE INCLUDES:
☐ Peer review
☐ Supplementary material

KEYWORDS:
marine and coastal science

PUBLISHED:
30 July 2019

Reply to 'Society's needs cannot be met by applied science alone: A response to Cochrane et al. (2019)'

We welcome discussion on our paper on science in the service of society[1] but find the response by Glassom et al.[2] to be weak and frequently flawed. We can only cover some of the more important disagreements we have in the words available to us.

Glassom et al.[2] misinterpret our paper in their title: 'Society's needs cannot be met by applied science alone': a statement of the obvious and unrelated to any of our arguments. Another misinterpretation occurs in their comment: 'It makes no sense to sacrifice strong disciplinary research because of a perceived imperative for interdisciplinary work'. We actually wrote that 'Disciplinary science should therefore not be discouraged but much greater emphasis must be placed on….interdisciplinary science' and other statements recognising the role of disciplinary science. They wrote 'they assume an unrealistic linearity in the way that science translates to policy and management'. We make no such assumption and the stakeholder model, our recommended scientific approach, encourages an interactive, evolutionary and non-linear approach in addressing problems and searching for understanding and solutions.

They argue that there is no real difference between pure and applied science and that pure cannot be considered superior but elsewhere indicate that they, erroneously, indeed consider actionable science to be inferior, claiming that curtailing basic science would trap science in a 'quagmire of low innovation' and that a focus on actionable science would 'result in the loss of much foundational knowledge and important skills, and risk degrading scientific capacity'. Statements such as these are incorrect and demonstrate their limited knowledge of the scope and nature of actionable science.

Glassom et al.'s statement 'Constraining research and teaching to conform to a narrow, short-term political or social agenda …' is also misleading. Actionable science presents opportunities to engage in a vast and complex realm, requiring not only standard skills of basic science but new, evolving skills and practices (see for example Moore et al.[3] and Palmer[4]). The only fundamental difference between actionable science and basic science is intention: the former is designed to be directly relevant to pressing societal needs. In the South African small pelagic fishery, for example, actionable science ranges from genetics and parasitology to socio-economic conditions of seasonal workers.

We do not dispute that basic science can sometimes lead to societal benefits but the cherry-picking of examples by Glassom et al. is unconvincing, as is their emphatic statement that 'innovation is far more likely to come from basic research than from applied or actionable research', referring to a 1942 biography of J.J. Thompson. They report that basic research may provide an annual 20–60% return on investment, referring to a paper by Press.[5] Those estimates originate from a paper by Salter and Martin[6] in which these authors criticised such quantitative estimates, reporting that estimating the true benefits is very difficult. The authors concluded that basic research, which they define broadly, can lead to significant benefits but the manner in which this occurs, and the extent and conditions for benefits to be achieved, are far from straightforward. Salter and Martin[6] raise many issues relevant to an assessment of the optimal use of public funds for research.

Glassom et al. also argue that actionable science will frequently not have the desired impacts because of vested interests, and that interdisciplinary science will be difficult. We do not disagree, but these arguments simply reinforce the need for actionable science, with ongoing innovation to strengthen its impacts. High-quality actionable science is not sufficient to achieve society's goals, but is an essential requirement. It is precisely because of vested interests that scientific rigour and objectivity remain paramount, which engagement with stakeholders should never compromise. Research capacity is known to be stagnating or declining in several key South African government departments because of budget constraints – the potential implications of which are alarming. Surely, all public implementers and sponsors of science need to consider how they are currently contributing to sustaining national capacity for actionable science, and where they can improve to avoid those likely dire consequences?

Finally, Glassom et al. refer to the National Research Foundation (NRF) scoring system for funding applications. We criticised NRF's criteria used to rate scientists, not necessarily those for other funding opportunities; however, a 10% allocation to 'impact on society' is nevertheless woefully inadequate given the enormous challenges to be addressed in South Africa.

Conclusions

There are other areas where we disagree. We conclude that nothing in Glassom et al.'s response justifies significant changes to the conclusions and recommendations in our paper. Prospect theory tells us that humans tend to prefer the status quo rather than risks of change, but our recommendation to scientists who are not already there, and to public funders of science in South Africa, is to step into the world of actionable and integrated science. The science is exciting and innovative, and more likely to make a difference in a world urgently requiring scientific intervention and advice for our marine environments.

References

1. Cochrane KL, Sauer WHH, Aswani S. Science in the service of society: Is marine and coastal science addressing South Africa's needs? S Afr J Sci. 2019; 115(1/2), Art. #4418, 7 pages. https://doi.org/10.17159/sajs.2019/4418
2. Glassom D, Scharler UM, Macdonald AHH. Society's needs cannot be met by applied science alone: A response to Cochrane et al. (2019). S Afr J Sci. 2019;115(7/8), Art. #6294, 3 pages. http://doi.org/10.17159/sajs.2019/6294

3. Moore JW, Nowlan L, Olszynski M, Jacob AL, Favaro B, Collins L, et al. Towards linking environmental law and science. FACETS. 2018;3:375–391. https://doi.org/10.1139/facets-2017-0106

4. Palmer MA. Socioenvironmental sustainability and actionable science. Bioscience. 2012;62:5–6.

5. Press WH. What's so special about science (and how much should we spend on it?). Science. 2013;342:817–822. https://doi.org/10.1126/science.342.6160.817

6. Salter AJ, Martin BR. The economic benefits of publicly funded basic research: A critical review. Res Policy. 2001;30:509–532. https://doi.org/10.1016/s0048-7333(00)00091-3