



THE IMPACT FACTOR OF ENGAGED RESEARCH: HOW UNIVERSITIES SHOULD SUPPORT NEW METRICS FOR CONSERVATION OUTCOMES

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CONSERVATION SCIENTISTS' IMPACT

- Conservation scientists usually want to make an **impact on real-world conservation outcomes**
- Conservation has always been a **mission-oriented discipline**
- But what does it really mean to make an **impact**?
- Does publishing as many papers as possible in **high-impact journals** make the impact needed?
- Universities continue to reward researchers based on **publishing metrics** such as the number of articles they publish, the citations of their papers or their H-index, resulting in 'publish or perish' pressures, leading scientists to prioritize publishing over other outcomes

WHY ISN'T CONSERVATION SCIENCE AS ACTIONABLE AS WE WANT IT TO BE?

- **Loading-dock problem** (Cash et al. 2006): scientists publish their results in a massive continuous flow of literature that is then left on a proverbial loading dock, assuming practitioners will pick it up and use it readily
- However, **publishing** research does not necessarily imply its **use**, and potential **knowledge users** are often excluded from the overall research process
- Various questions are implied by the traditional loading-dock approach: Whose **responsibility** is the pick-up? Can conservation practitioners **access** the literature on the dock? What does it **cost** them to access it? How would they know **where to look** for it? Is the published literature in an appropriate **format** to be used by practitioners?

ENGAGED RESEARCH

- Historically, natural sciences have sought **objectivity** by separating themselves from societal influences and concerns of decision-makers. However, this mode of knowledge production does not often result in actionable science to advance the public good.
- **Engaged scholarship** is the practice of collaboratively including the various perspectives and competencies of academics and practitioners to coproduce knowledge to solve our complex and pressing conservation problems
- **Knowledge produced collaboratively with practitioners** has a much greater likelihood of having real impact on policy and practice
- This process, often called **coproduction**, involves knowledge users and producers collaborating at every stage of a project's development
- However, this can be **difficult** and **time-consuming**. Scientists often lack the institutional support necessary to manage these complex processes.
- **New institutional models for engaged scholarship** are needed to better connect scientists with practitioners
- Universities increasingly promote engaged scholarship, yet few institutions have established formal **mechanisms for promoting and rewarding** such work



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Actionable Science Team



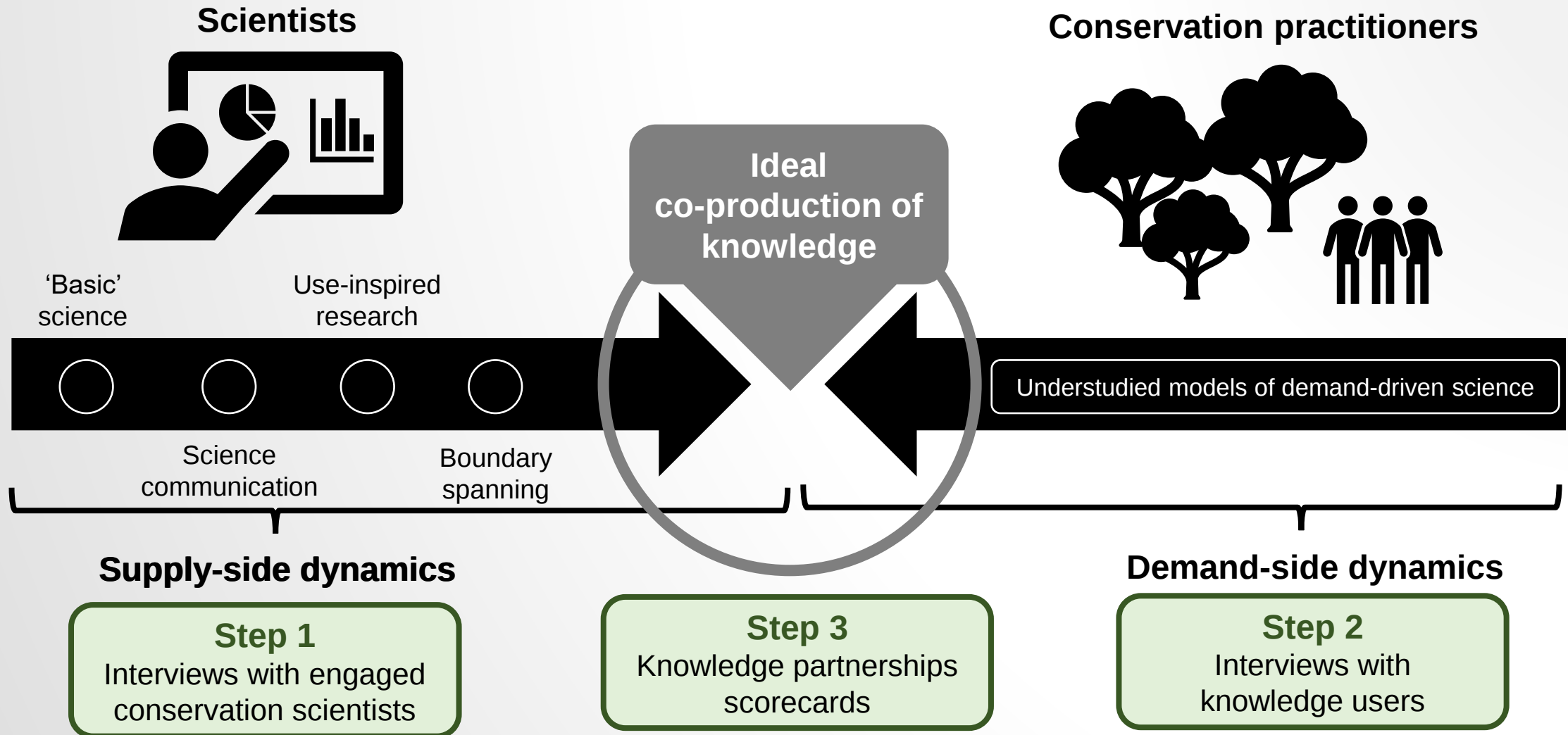
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Our website and publications: <https://sites.google.com/asu.edu/actionablesoci/home>

Actionable science to conserve biodiversity



How can we produce more actionable conservation science?

How can universities encourage actionable science?

How are conservation practitioners using science?

Five approaches to producing actionable science in conservation

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CONTRIBUTED PAPERS

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Five approaches to producing actionable science in conservation

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Interviews with 71 conservation scientists who participated in one of three fellowship programs focused on becoming agents of change: Leopold, Pew & Wilberforce Fellows

- **What do you do** to make your research more actionable?
- **What would you do differently** to make your research more actionable?
- Have you had **training / mentorship / experiences** that enhance your capacity to produce actionable science?
- What does your **institution / organization do to help you** produce actionable science?
- What are some **barriers from your institution/organization** to producing actionable science?
- Do you **work with others** to make your research more actionable?

Five approaches to producing actionable science in conservation

16 activities of action-oriented scientists:

1. Focus on real-world impacts 
2. Science communication to the public, policymakers, and other scientists 
3. Building agency / capacity / knowledge 
4. Focus on user needs 
5. Networking & building relationships 
6. Boundary spanning 
7. Creating long-standing partnerships with managers 
8. Collaborative interdisciplinary / transdisciplinary research 
9. Involving intended users in design of research & research questions 
10. Involvement in management / policy / action forums 
11. Strategic planning 
12. Deep listening / understanding 
13. Early engagement of stakeholders / end users of science 
14. Co-production of research questions, process, and results of value to both science and policy 
15. Face-to-face interaction 
16. Open access / open-source data or findings 

Five approaches to producing actionable science in conservation

3 Nested levels of actions: Why, How, What

Level of activity	Themes
Why respondents pursued actionable science: Motivations (Values / Overall intended outcomes / Goals of research activity)	Focus on real-world impacts  Building agency / capacity / knowledge 
How respondents pursued actionable science : Strategies	Science communication  Boundary spanning  Creating long-standing partnerships with managers  Collaborative inter/transdisciplinary research  Involvement in management / policy / action forums  Co-production 
What respondents did to pursue actionable science: Tactics (Specific behaviors & skills)	Focus on user needs  Networking and building relationships  Involving intended users in design of research  Early engagement of stakeholders  Strategic planning  Deep listening / understanding  Face-to-face interaction  Open access / open-source data or findings 

Five approaches to producing actionable science in conservation

	Real-world impact	Building capacity	Science communication	Boundary spanning	Partnerships	Collaborative research	Action forum	Co-production	Use-inspired research	Networking	Involving users in design	Early engagement	Strategic Planning	Deep listening	Face-to-face	Open access
Real-world impact	1															
Building capacity	0.32	1														
Science communication	0.09	0.09	1													
Boundary spanning	0.36	0.4	-0.1	1												
Partnerships	0.28	0.29	-0.02	0.53	1											
Collaborative research	0.26	0.12	0.04	0.32	0.1	1										
Action forum	0.24	0.23	0.18	0.15	0.15	0.08	1									
Co-production	0.26	0.27	-0.08	0.51	0.52	0.31	0.23	1								
Use-inspired research	0.43	0.49	0.04	0.56	0.35	0.31	0.03	0.49	1							
Networking	0.52	0.49	0.04	0.44	0.41	0.25	-0.03	0.37	0.57	1						
Involving users in design	0.33	0.3	-0.06	0.62	0.49	0.37	0.13	0.72	0.63	0.51	1					
Early engagement	0.28	0.24	-0.21	0.63	0.47	0.28	0.03	0.59	0.54	0.48	0.68	1				
Strategic Planning	0.24	0.3	-0.06	0.39	0.44	0.2	0.13	0.48	0.45	0.27	0.48	0.62	1			
Deep listening	0.31	0.28	-0.17	0.63	0.5	0.25	0.01	0.39	0.47	0.53	0.54	0.73	0.48	1		
Face-to-face	0.17	-0.13	-0.14	0.16	0.17	0.2	-0.08	0.1	0.25	0.1	0.15	0.14	0.15	0.25	1	
Open access	-0.24	-0.11	0.15	-0.1	-0.28	0.08	0.02	-0.16	-0.07	-0.25	-0.07	-0.19	-0.07	-0.22	-0.17	1

Co-occurrence matrix

- ➔ Some activities are strongly correlated
- ➔ Most correlations are **positive**, some are **negative**

Five approaches to producing actionable science in conservation



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5 levels of engagement in actionable science

5) The Pluralists

Coproduction requires that value be produced for – and by – both knowledge users (practitioners) and knowledge producers (researchers)

4) The Collaborators

Engage in long-term, boundary-spanning knowledge partnerships

3) The Networkers

Two-way information flow;
Specific user groups

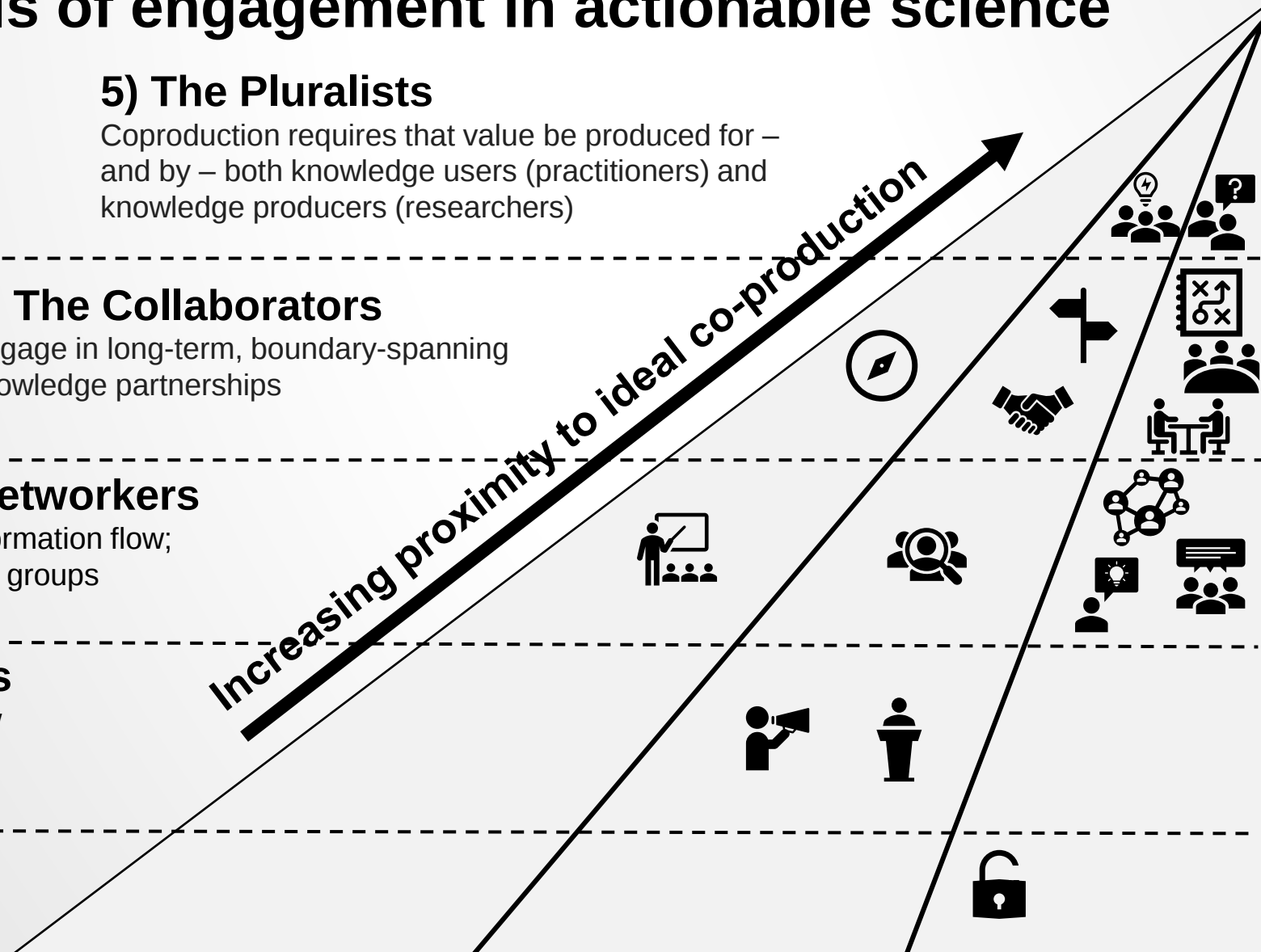
2) The Educators

One-way information flow

1) The Disclosers

Doesn't involve engagement

Increasing proximity to ideal co-production



Motivations

Strategies

Tactics

Which actionable science type are you?

The Pluralist

The Collaborator

The Networker

The Educator

The Discloser





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Policy analysis

The impact factor of engaged research: Metrics for conservation outcomes

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INTERVIEWS WITH CONSERVATION SCIENTISTS ON ACTIONABLE SCIENCE

Quote 1	<i>“To be directly involved in applying your research or even communicating it in non-academic settings becomes sort of an extra activity.”</i>
Quote 2	<i>“There's a term - the loading dock problem. You can produce a lot of research and stick it out there on the university's loading dock and there's all sorts of reasons society never can never use what you put on there. So, that gap is a multifaceted gap.”</i>
Quote 3	<i>“[...] the work we produce is not going to get used on its own. You can't just sort of put it out there and then expect that someone will pick it up and do things with it. And I do try to publish in journals that are read by managers... but in the end, there's just...a major, huge river of literature and it's constantly rushing back. And if there are key results that are likely to generate very direct recommendations, the only way to make sure that happens is to directly hand them to those people that you think can implement them. It becomes necessary to take that extra step and connect directly with people and say, ‘here's some results that I think you may find interesting.’ ”</i>

ACTIONABLE PRODUCTS ARE OFTEN DIFFERENT FROM SCIENTIFIC PAPERS

Quote 4	<i>“To make your work actionable, it usually has to be very specific and local, and that’s not going to get you a Nature paper.”</i>
Quote 5	<i>“Some of the most impactful work we've done has been quite focused, quite targeted, and quite hard to get published actually, in good journals, because it is so topic driven and so focused and yeah, you know, you get the reviews back and they're like, well, this doesn't matter at a national level or international level. And sometimes it doesn't even get sent out for review. And, and yet these papers are having big impact, they're getting submitted as evidence by first nations groups. They're determining the course of action for environmental NGOs, and yet they're barely squeaking into peer reviewed papers... I have published some higher tier journal papers, and in my experience, those don't have any impact. And so in my mind, there's a disconnect between the sort of review process and what sort of favored by sort of top level conservation or general journal and their impact.”</i>

WHAT UNIVERSITIES CAN DO

Quote 6	<i>“Universities need to be much more stakeholder engaged and need to be much more solutions driven. All of the problems are multifaceted, wicked problems that I feel like we should be working on. And those by definition require interdisciplinary approaches.”</i>
Quote 7	<i>“There is a net change towards actionability and recognition of actionability across the U.S., even in traditional “ivory tower” places, with more openness to actionability. It really depends on the local environment and the institutions/departements.”</i>
Quote 8	<i>“We are scientists. And we lack the people who are the bridge people that take this to the managers. And I think that there ought to be an agency whose job is solely to communicate the science to the practitioners.”</i>

THE NEED FOR NEW METRICS

Quote 9	<i>“We’ve got a lot of early career scientists who are very hungry to have an impact. [...] There's much more enthusiasm and commitment among younger scientists, early career scientists, whether they're graduate students, postdocs, or tenured faculty, to doing something besides just assembling publications and academic prestige and satisfying their curiosity and all the kinds of things that we would normally do in science.”</i>
Quote 10	<i>“It can double the work to try to publish gray literature in the academic literature. The problem is that the gray literature doesn't count for anything in the academic setting because it isn't in a peer reviewed journal. We need metrics to show the impact of this sort of publication as well.”</i>

CHALLENGES TO REAL-WORLD IMPACT

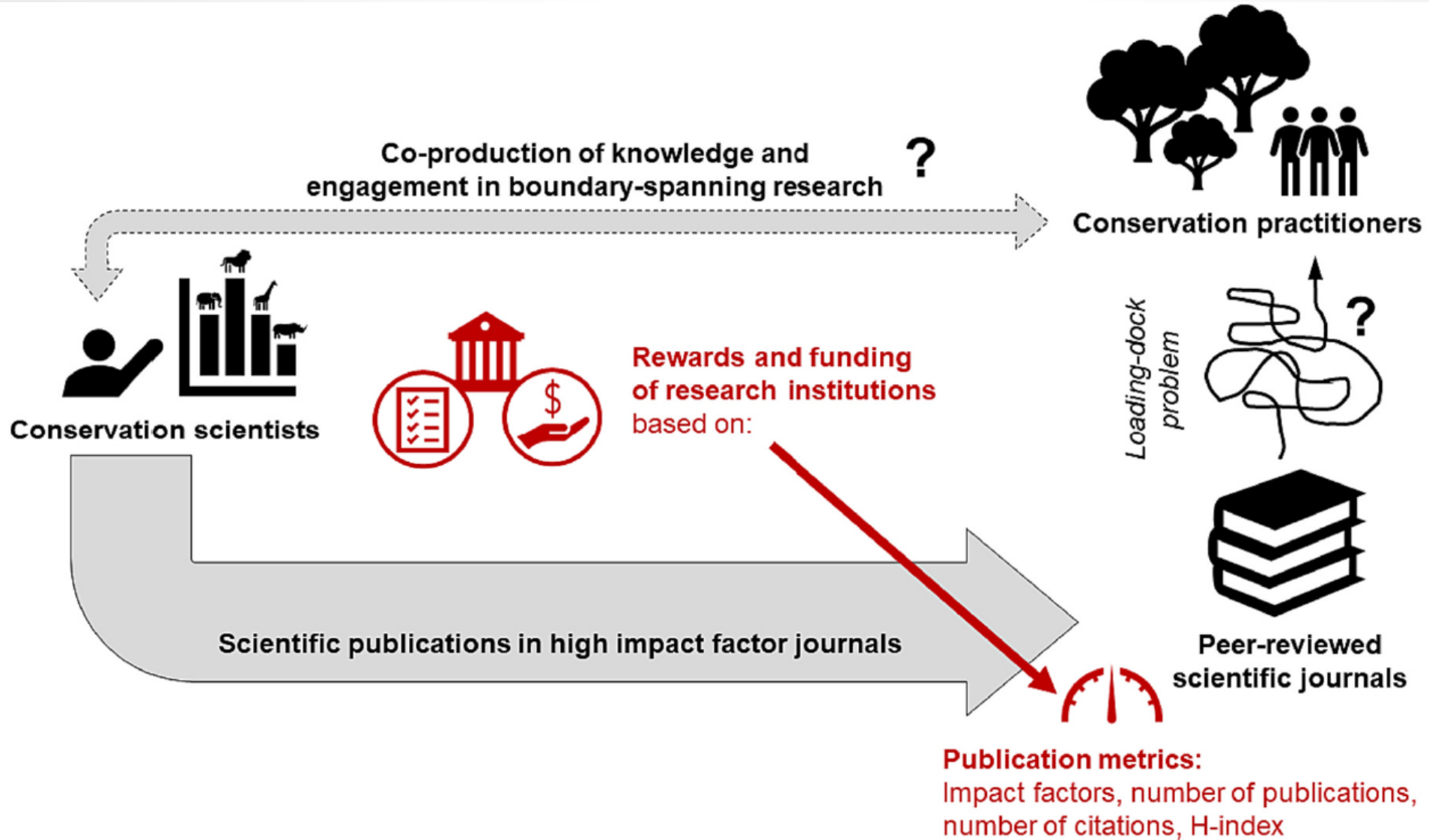


Fig. 1. Current problematic situation for research production, evaluation, and funding. The primary consideration of individual research metrics (journal impact factors, number of publications, number of citations, H-index) for the evaluation and funding of scientists by research institutions does not incentivize researchers to engage in boundary-spanning work. The width of gray arrows represents the research effort dedicated to publishing articles in peer-reviewed scientific journals (bottom arrow) and engaging in co-production of knowledge and boundary-spanning work (top arrow).

RECOMMENDATIONS FOR ENABLING REAL-WORLD IMPACT

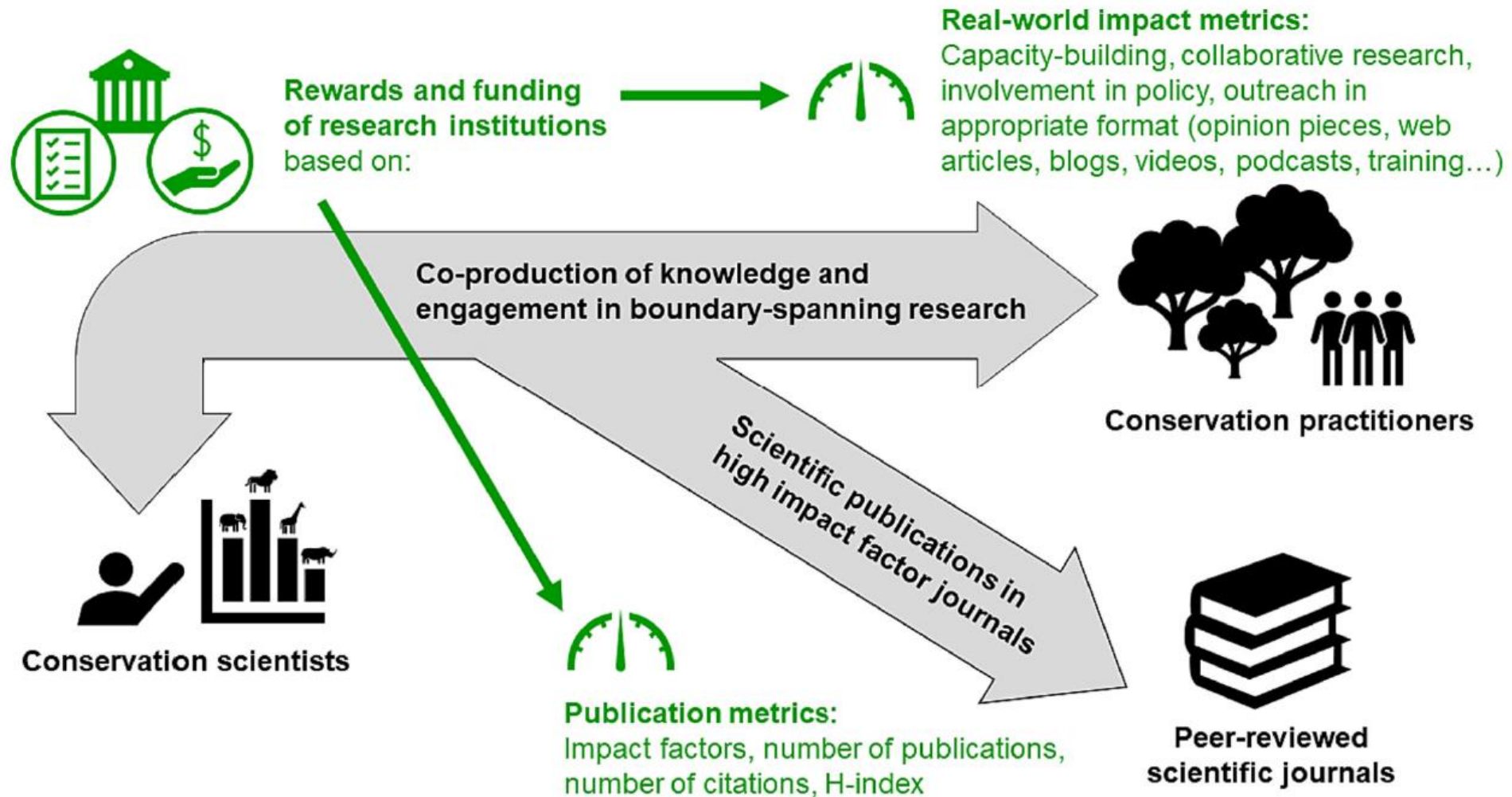


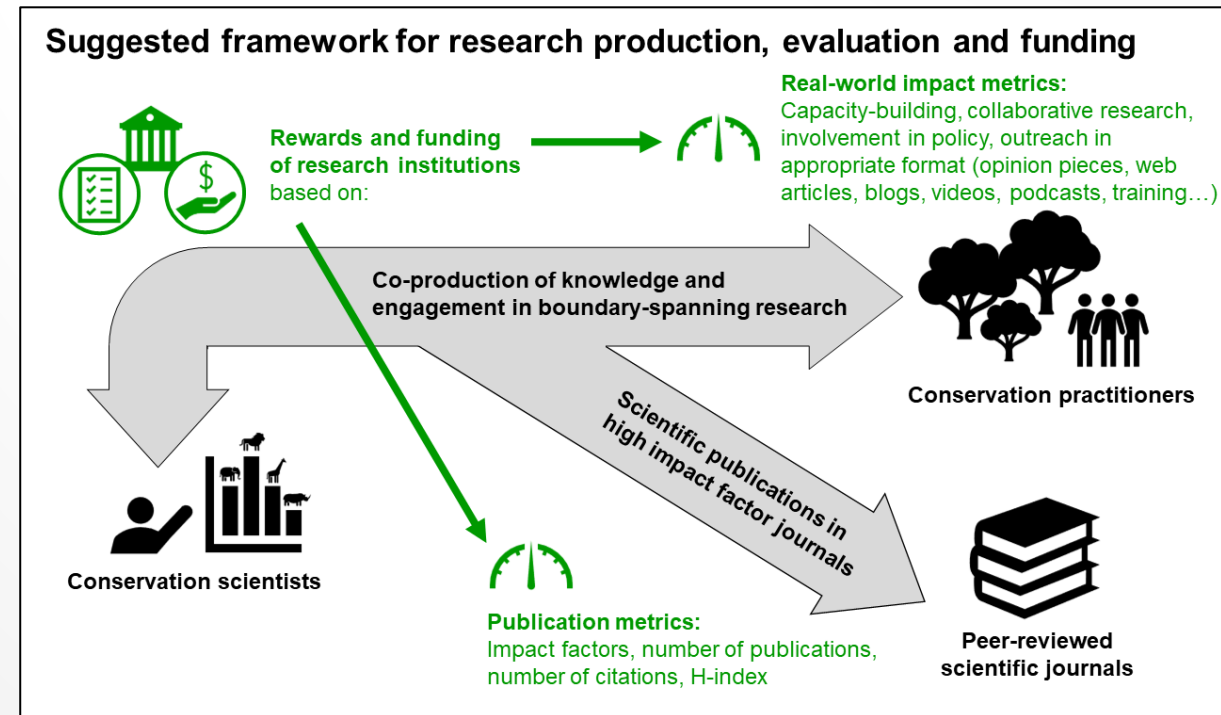
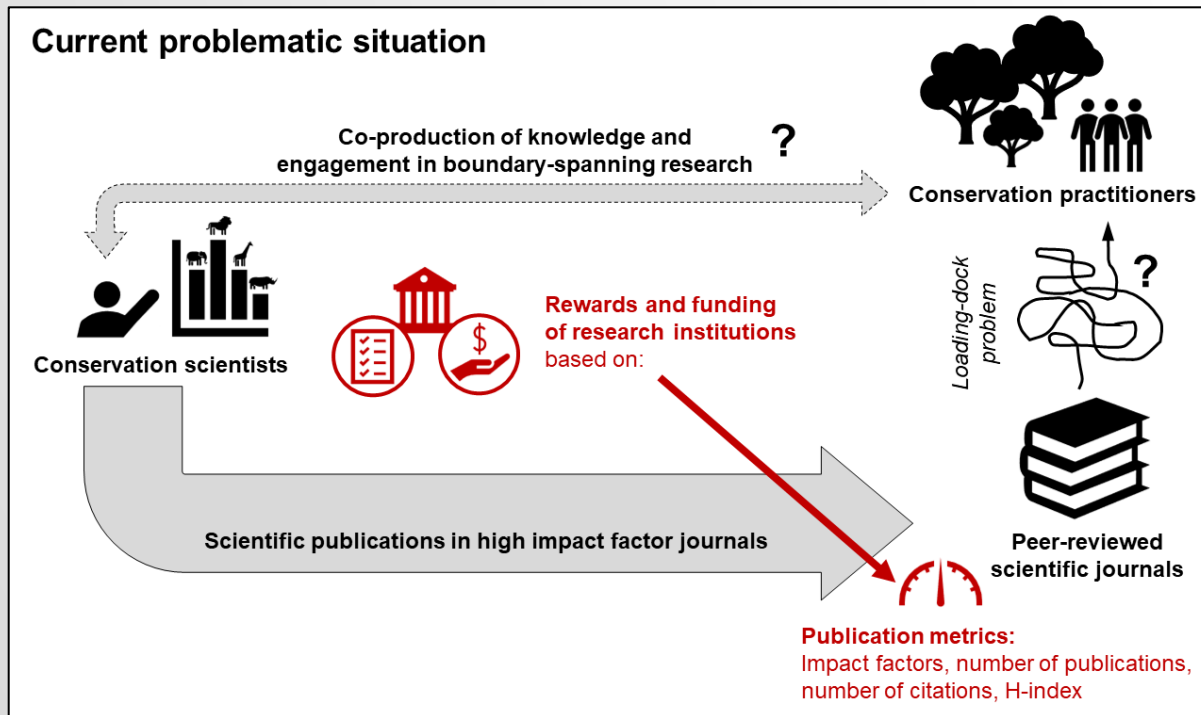
Fig. 2. Suggested framework for research production, evaluation, and funding of conservation scientists in academia. Beyond publication metrics, scientists' evaluation and funding criteria used by research institutions must also include the engagement in knowledge co-production and boundary-spanning research. The width of gray arrows represents the research effort dedicated to publishing articles in peer-reviewed scientific journals (bottom arrow) and engaging in co-production of knowledge and boundary-spanning work (top arrow).

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HOW COULD / SHOULD SCIENCE CHANGE?

Universities can reward actionable science

Faculty evaluation criteria that includes scientific outreach to research users and boundary-spanning work allows researchers to **engage** in impactful and actionable science production.



STRUCTURAL BARRIERS TO ENGAGED SCHOLARSHIP AT UNIVERSITIES

1. Engagement is rarely recognized or rewarded (e.g. products coproduced for partner organizations do not “count” as academic products toward tenure and promotion)
2. Only a small minority of scholars find time to engage with non-academic stakeholders in boundary-spanning work (Quote 1)
3. It is unreasonable to expect most academics to engage in this work without additional incentives. Universities need to adjust their organizational and incentive structures to recognize, value, encourage, facilitate, and reward impactful research to train the next generation of leaders in this sort of work (Beyond the Academy 2022).

WE RECOMMEND THAT UNIVERSITIES:

1. Actively support faculty engagement in boundary-spanning work, providing an interface between research and society
2. Meaningfully reward faculty work that makes a genuine impact on efforts to solve real-world problems, beyond academic publications
3. Use appropriate metrics to recognize the value of impacts on society and contributions to practical conservation outcomes

MEANINGFUL REWARDS AND METRICS

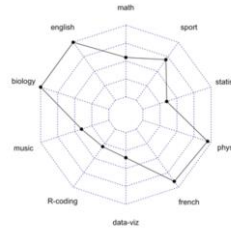
- <https://beyondtheacademynetwork.org/about/>
- Impact File
- Altmetrics
- Adapt the Impact Compass
(<https://www.gsb.stanford.edu/experience/about/centers-institutes/csi/impact-compass>)

BEYOND THE ACADEMY BEST PRACTICES RECOMMENDATIONS

- 1. Use “baskets of indicators”
Evaluation should include a suite of quantitative and qualitative measures
- 2. Adopt a “narrative with numbers” approach. Quantitative measurements should complement rather than replace qualitative data and stories.
- 3. Limit the use of journal impact factors, which measure journal prestige rather than research impact or quality
- 4. Recognize and correct systemic and personal biases embedded in assessment processes
- 5. Measure performance or merit against the mission statement of the research group, unit, or institution
- 6. Encourage researchers to develop individual professional development plans and use these plans as a basis for annual evaluation. Collectively develop and agree upon the suite of metrics that will be used to measure research impact.
- 7. Evaluate and update indicators regularly

FUTURE WORK

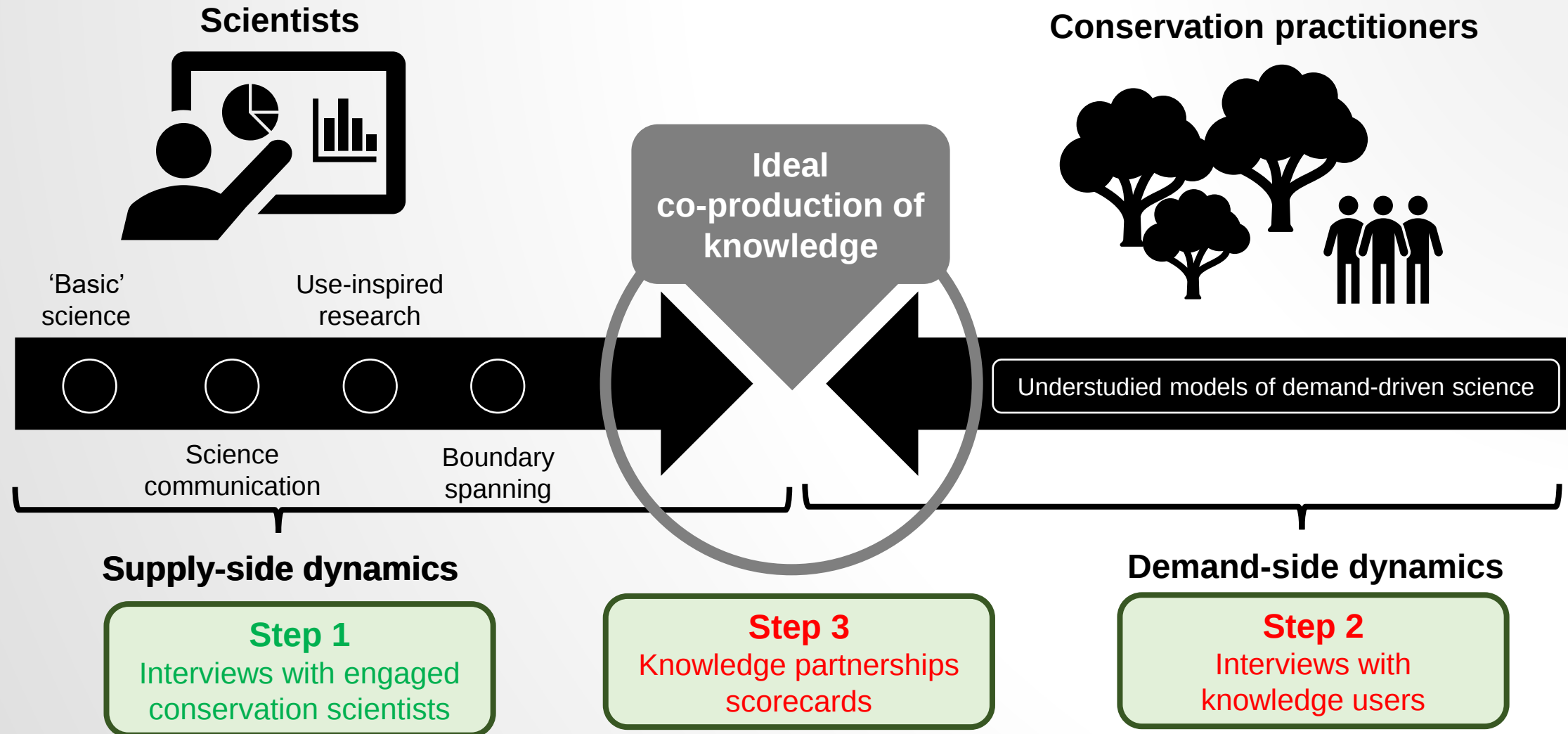
- Create multiscale and multifaceted metric that incorporates a variety of types of impact – maybe like a spider chart
- In assessing impact, use actionable science typology to create a “4th leg of the stool” for evaluation
- Assess new funding approaches like [Civic Innovation Challenge \(CIVIC\)](#)
- Recommend more specific actions that the University can take: create a fund for open-access publishing, [make deals](#), [pressure](#) or sue the publishers ([see statement](#) from Europe)
- Assess effects of [2023 EU Council recommendations](#) or [2023 Elsevier board resignations](#)



- 1. publish open access
- 2. share your work with the audience that can use it directly
- 3. be really good at science communication ([shark guy](#))
- 4. be a boundary spanner
- 5. coproduce your work with the people who can use the work – from research question through communication of findings and recommendations



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How can we produce more actionable conservation science?

How are conservation practitioners using science?

What are the best practices for conservation knowledge partnerships?

SCIENCE-TO-ACTION: CONSERVATION PRACTITIONERS USE & PRODUCE KNOWLEDGE

- Evidence-based practice / Knowledge-action gap?
- Conservation practitioners are using published science
 - when they can access
 - when it is actionable enough (*Is there a need for practice-based evidence?*)
- They are also knowledge producers
 - Most conservation practitioners interviewed so far have placed themselves between 5-8 on this spectrum

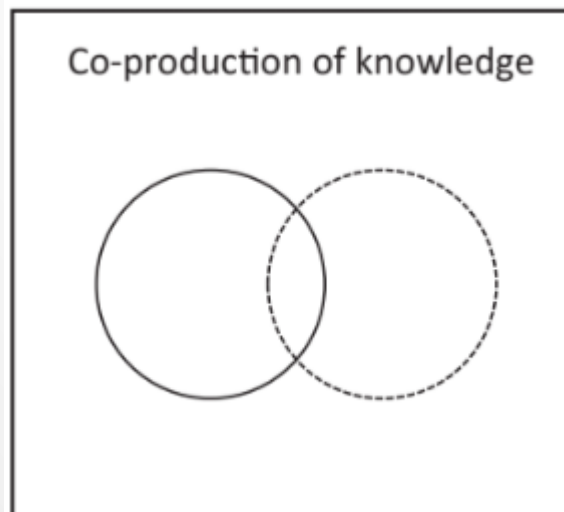
Knowledge Production

Use of knowledge



KNOWLEDGE PARTNERSHIP SCORECARD GALAPAGOS PILOT STUDY

- Use of science by the Park
- Knowledge partnership with the Charles Darwin Research Station



THANK YOU

Questions?