# PERSPECTIVE

# Twenty actions for a "good Anthropocene"—perspectives from early-career conservation professionals

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**Abstract:** Humans are now recognized as the main drivers of environmental change, leaving the future of our planet dependent on human action or inaction. Although the outlook of our planet is often depicted in a "doom and gloom" manner due to recent troubling environmental trends, we suggest that a "good Anthropocene" (in which human quality of life may be maintained or improved without cost to the environment) is attainable if we engage in adaptive, multi-disciplinary actions capable of addressing the socio-ecological issues of today and tomorrow. Early-career conservation scientists and practitioners have an unmatched understanding of novel technologies and social connectivity and, as those left with the ever-growing responsibility to be the problem solvers of the attributed increasing environmental consequences of living in the Anthropocene, their perspectives on steps towards a good Anthropocene are valuable. Here we present a list of 20 actions derived by early-career conservation scientists and practitioners for conservationists to help achieve a good Anthropocene that utilize the social connectivity and technology of today. Central to these actions are the notions that multi-, inter-, and trans-disciplinary collaboratives that embrace diverse world views need to be integrated into decision-making processes; training and outreach platforms need to communicate both environmental challenges and solutions broadly; and conservation successes need to be acknowledged and disseminated in a forward-looking, adaptive capacity. Together the 20 actions identified here reinforce the underlying paradigm shift that must accompany living in the Anthropocene, given that biodiversity and healthy ecosystems are requisite for sustained human life. By sharing this list of actions, we look to promote positive socio-environmental changes towards the collective goal of achieving a good Anthropocene.

*Key words:* Anthropocene, positive futures, early-career researchers.

*Résumé :* On reconnaît maintenant que les êtres humains sont les principaux responsables des changements environnementaux, laissant l'avenir de notre planète dépendant de l'action ou de l'inaction humaine. Même si les perspectives de notre planète sont souvent dépeintes de manière pessimiste à cause des récentes tendances environnementales inquiétantes, les auteurs suggèrent qu'un « bon Anthropocène » (dans lequel la qualité de vie des humains peut être maintenue ou améliorée sans coût environnemental) est atteignable si nous nous engageons dans des actions adaptatives multidisciplinaires capables de s'attaquer aux problèmes socioécologiques d'aujourd'hui et de demain. Les scientifiques et les praticiens de la conservation en début de carrière ont une compréhension sans précédent des nouvelles technologies et de la connectivité sociale et, en tant que personnes à qui l'on confie la responsabilité de plus en plus lourde d'agir comme solutionneurs de problèmes en ce qui a trait aux conséquences environnementales croissantes que l'on attribue à vivre dans l'Anthropocène, leurs perspectives sur les étapes conduisant à un bon Anthropocène sont précieuses. Les auteurs présentent ici une liste de 20 actions proposées par des scientifiques et des praticiens de la conservation en début de carrière à l'intention des agents de protection de l'environnement pour les aider à atteindre un bon Anthropocène par l'utilisation de la connectivité sociale et de la technologie d'aujourd'hui. Au cœur de ces actions se trouvent des notions : de collaborations multi-, inter- et transdisciplinaires qui épousent diverses

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conceptions du monde qui doivent être intégrées aux processus de prise de décision; de plateformes de formation et de diffusion nécessaires pour communiquer largement les défis et les solutions en matière d'environnement; et de succès en matière de conservation qui doivent être reconnus et disséminés dans la perspective d'une capacité d'adaptation tournée vers l'avenir. L'ensemble des 20 actions identifiées ici renforcent le changement de paradigme sous-jacent qui doit accompagner la vie dans l'Anthropocène, puisque la biodiversité et des écosystèmes en santé sont nécessaires au développement humain durable. En partageant cette liste d'actions, les auteurs désirent promouvoir des changements socio-environnementaux positifs vers l'objectif collectif d'atteindre un bon Anthropocène. [Traduit par la Rédaction]

*Mots-clés :* Anthropocène, avenir prometteur, chercheurs en début de carrière.

## Introduction

Human actions have led planet Earth into the Anthropocene epoch (Crutzen and Stoermer 2000). Humans are now recognized as a predominant agent of ecosystem change on the planet, exemplified by changes to global biogeochemical cycles (Lewis and Maslin 2015) and by mass defaunation and reductions to biodiversity (Seddon et al. 2016; Young et al. 2016) that threaten to exceed natural thresholds deemed safe for humans and the ecosystems that support them (Hughes et al. 2013; Steffen et al. 2015). Although pinpointing the onset of the Anthropocene as a geological epoch continues to be debated (Smith and Zeder 2013), the impact of human activity on Earth's ecosystems has seen wide adoption as a conceptual narrative (Bai et al. 2016).

Joining the call of others who urge that positive futures resulting in a "good Anthropocene" are achievable (Ellis 2011; Bennett et al. 2016; Pereira et al. 2018); it is our contention that the quality of human life may increase without hindering the environment, that functioning ecosystems are central to socio-economic successes and human well-being, and that dynamic and adaptive conservation actions are vital to managing current and future environmental realities. The field of conservation science has grown considerably since its origins, with emerging paradigms reflecting our understanding of ecosystems as dynamic and socially interconnected systems (Bennett et al. 2009; Ellis et al. 2018). Here we present a comprehensive, but not exhaustive list derived by early-career conservation scientists and professionals of 20 forward looking Actions in the pursuit of a good Anthropocene that consider the social connectivity and technology of today and tomorrow. Please note that not all action items apply to all conservation professionals (see Table 1.). Many of the concepts and ideas in this work are not novel, yet they are presented here cohesively in a re-imagined way through the lenses of early-career scientists. Past and present generations of conservationists have argued for and have participated in such actions, yet more is still needed. It is our contention that this list promotes collaborative actions within the field of conservation science as it highlights the relativeness and applicability of actions across groups of conservation professionals.

Perceptions from early-career conservation scientists are of interest as these scientists are of the first generations to face increasingly substantial environmental consequences resulting from climate change and other Anthropogenic stressors (Balmford and Cowling 2006). Furthermore, they are at the fore of emerging technologies and paradigms, and thus can provide new perspectives on issues and needs for conservation in the Anthropocene. Early-career scientists completed their education plugged into computers and the internet giving them an up-to-date understanding of the connectedness of todays' society and an inherent comprehension of the digital language of computers and the internet (Aktan et al. 2014; Prensky 2001; Lim et al. 2017). As well, as students or recent graduates, they are familiar with emerging conservation tools and initiatives. Moreover, early-career scientists are likely to be unsatisfied with the idea that "this is always how we have done things", which is known to be a pervasive way of thinking in environmental management (Pullin et al. 2004). Also, it is they who will be tasked with implementing many of the

**Table 1.** Listings of Action items in accordance to a nonexhaustive list of conservation professionals.

| Conservation professionals | Relevant Action items |
| --- | --- |
| The scientific community | |
|   Researchers | 1, 7, 8, 11, 13, 16, 17, 18, 19 |
|   Scientific communicators | 2, 3, 4, 5, 8, 9, 10, 11, 14, 15, 17 |
| Policy-makers or governing bodies | |
|   Regional or national Levels | 7, 8, 12, 18, 20 |
|   International levels | 8, 12, 18, 19, 20 |
| Youth educators | 2, 3, 4, 5, 7, 8, 9, 10, 11, 14, 15, 17, 19 |
| Resource managers | 2, 7, 13, 17, 18, 19, 20 |
| Resource stakeholders | 2, 7, 14, 15, 17, 18, 19, 20 |
| Funding agencies | 1, 3, 4, 6, 7, 8, 10, 12, 13, 14, 15, 16, 19, 20 |
| Indigenous knowledge holders | 3, 4, 5, 6, 7, 8, 9, 10, 11, 13, 16, 17, 19 |

**Note:** Action items are as follows: 1, Explore new partnerships to achieve and secure environmental gains; 2, Reconcile the inequitable division of conservation funding; 3, Find what works and scale appropriately; 4, Embrace, celebrate and share progress no matter how small; 5, Follow the evidence and act accordingly; 6, Redefine our relationship with the environment; 7, Support and promote international agreements for global governance; 8, Engage in dynamic and adaptive conservation management; 9, Engage in long-term conservation-minded thinking and management; 10, Learn from past mistakes to avoid need for restoration; 11, Use financial levers to encourage desirable conservation outcomes; 12, Seek ways to make technology an ally; 13, Foster the incorporation of conservation values into existing institutions, religions, belief-systems and cultures; 14, Include diverse voices in conservation science; 15, Engage local and Indigenous communities; 16, Promote the reduction of human consumption; 17, Provide opportunities for women and exploited peoples; 18, Prioritize youth, whose opinions and attributions are not yet well established; 19, Attach a responsibility to include outreach and engagement in the scientific method; 20, Rethink education and training to focus on effective communication strategies.

Sustainable Development Goals (SDGs), defining future goals, as well as playing a role in ensuring that we strive to achieve a good Anthropocene (Lim et al. 2017). The 20 listed actions (presented in no order other than similarity in theme) emerged over the course of a semester-long graduate course focused around the concept of a good Anthropocene. The intended audience for this paper is the conservation professional—whether scientist or practitioner. We explicitly avoid fully exploring the concept of human population growth given that the core problem is overconsumption (Stern 1997). That is not to say that there is no need for difficult discussions regarding means of addressing human population growth, but that is beyond the scope of this paper. Relatedly, we recognize that some scholars and conservationists have argued for the need for transformational change (Kates et al. 2012; McAlpine et al. 2015.) rather than the incremental and less drastic approaches discussed here. The approach we have decided to adopt is consistent with the "seeds of a good Anthropocene" concept (Bennett et al. 2016) where we have identified actions that are attainable with comparatively little effort.

## Actions towards a good Anthropocene

### Action 1. Explore new partnerships to achieve and secure environmental gains

Environmental geopolitics are changing rapidly (Dalby 2014), while rapid communication is eroding old logistical and cultural barriers to forming collaborative relationships. In the face of such

changes, groups looking to build a good Anthropocene must be nimble. Old partnerships (i.e., long-lasting, existing working relationships around environmental decision-making) must be re-invigorated or even re-examined and new ones quickly forged. For example, in the space of a few months from 2017–2018, many key components of US government environmental protection were dismantled (Popovich et al. 2018). Meanwhile, China is emerging as a leader in trying to control greenhouse gas emissions through reiterating its support for the Paris Accord and introducing a carbon trading scheme (Zhang et al. 2018). Conservationists may need to rethink the roles of governments as primary enablers of large-scale change as existing and emerging political projects shift past norms (see Actions 8 and 9). Myriad social movements have emerged in response to these changes, which conservationists may join and empower to achieve goals that align with a good Anthropocene (Forsyth 2004; Schwartzman et al. 2010). Communities are also increasingly acting to conserve biodiversity and promote sustainability at a local scale when regional and national governments fail to do so, a paradigm increasingly utilized by conservationists (Berkes 2007; Calfucura 2018). Indigenous communities and group conservation priorities describe prevalent climatic changes and anthropogenic concerns. Indigenous perspectives on how to respond to anthropogenic change are increasingly being advanced, which can create opportunities for partnerships and viable solutions (Parlee et al. 2005). Private businesses have important roles to play in building a good Anthropocene (O'Higgins and Zsolnai 2018) and in many cases are taking leadership roles where governments are lagging behind such as eco-tourism models that help fund local conservation initiatives (Stem et al. 2003). Furthermore, private landowners, whose lands are crucial habitats for many species, must also be engaged in creative partnerships (including market-based incentives (see Action 11)) for conservation (Wilson et al. 2017). Finally, the role of individual citizens has never been so important (Doak et al. 2015), as exemplified by well-organized social media campaigns that have gained increased attention for their potential and successes in amplifying environmental concerns and encouraging sustainable behaviour (see Actions 12 and 18; Sogari et al. 2017; Zhang and Skoric 2018).

## Action 2. Reconcile the inequitable division of conservation funding

Nature conservation is chronically underfunded in most of the world due in part to an inequitable distribution of wealth and resources among and within countries, making the globe's biodiversity and ecosystem services at risk of loss or degradation. Estimates of global conservation funding have found that more than 90% of annual spending occurs in wealthy countries, and that these wealthy countries consistently do not meet their conservation aid commitments to poorer countries (Miller et al. 2013; Waldron et al. 2013, 2017). Conservation finance equality between wealthy and poorer countries will therefore be necessary to ensure conservation for a good Anthropocene, which at present is difficult to envision without profound change to the global economic system. Global biodiversity and ecosystem services have been estimated to be worth tens of trillions of dollars annually, yet half a century of liberalized global capitalism has proven ineffective at valuing this appropriately (see Action 11) and instead generally values the accelerated destruction of biodiversity and ecosystems in the name of short-term profits (James et al. 2001; Balmford and Whitten 2003; Costanza et al. 2014). While this issue transcends the realm of conservation science, the challenges of the Anthropocene demand we reframe our discipline and our actions as conservationists to address these macroscopic barriers to a sustainable future. Diverse conservation professionals and leaders must therefore continue to identify and define the conservation needs of biodiversity hotspots worldwide and vocally promote the idea of funding distribution based on conservation need.

## Action 3. Find what works and scale it appropriately

Actions towards a good Anthropocene should be inspired by tangible examples in which an action has led to environmental, economic, and social successes of some degree. We should adopt an approach that builds off existing successful initiatives by recognizing the presence of bright spots among the doom and gloom scenarios often presented, referred to as seeds of a good Anthropocene (Bennett et al. 2016). Bright spots are positive outliers that can provide examples of successful actions (Cinner et al. 2016). They can be implemented in other systems or scaled up to increase the scope of bright spots (Bennett et al. 2016). With the technology and social connectivity of today, one might assume that scaling up and sharing initiatives has never been easier. However, complexities to scaling conservation initiatives remain. Spatial and temporal factors associated with scaling or relocating conservation initiatives may change the workings of social relationships, institutional frameworks, and ecosystems considered at the start of conservation initiatives (Wyborn and Bixler 2013). These changes must be acknowledged, accounted for, and managed when looking to adopt or scale initiatives (see Actions 5, 14, and 15). Working from existing successful initiatives is less daunting than starting from the ground up and allows an optimistic, solutions-oriented perspective for the potential of our actions to result in meaningful change (Bennett et al. 2016; Van Doren et al. 2016) and thus should be considered by conservation professionals.

## Action 4. Embrace, celebrate, and share progress no matter how small

By deconstructing conservation actions into smaller subcomponents, we can point to practical and attainable targets, and celebrate success along the way. The often negative narrative surrounding conservation challenges in our increasingly accessible popular media may discourage rather than encourage sustainable behaviour (Bennett et al. 2016). Numerous social science theories of fear predict no behavioural change in circumstances where the subject feels incapable of producing an effective response to the threat (Peters et al. 2013). In fact, situations with a high perceived threat and a low perceived ability to react often lead to denial of the threat, rather than eliciting a response. In contrast, celebrating small wins has been shown to foster progress (Weick 1984; Amabile and Kramer 2011). For example, Urpelainen's (2013) Model of Dynamic Climate Governance suggests that successful international climate cooperation may result from the development of achievable small wins, centered around an optimal end goal. When achieved, small wins within climate governance symbolise progress, demonstrating tangible results and thus providing encouragement and motivation to continue to work towards climate governance end goals.

## Action 5. Follow the evidence and act accordingly

The idea of evidence-based conservation and environmental management emerged in the last two decades (Sutherland et al. 2004) and represents a promising path forward. Furthermore, scientific information is more accessible than ever before, and technology continues to facilitate our ability to collect "big" scientific datasets, facilitating the synthesis of scientific information (Nye 2014; Keck et al. 2017). Yet, the concept of evidence-based conservation and environmental management has yet to be fully embraced. Many of the management interventions and policies enacted today are not based on the best available scientific evidence and do not consider diverse sources of knowledge across disciplines, cultures, and regions. It is well documented that many managers "do what they know" (Pullin et al. 2004) rather than use an adaptable, transparent, comprehensive, repeatable, rigorous, and holistic approach to evidence synthesis (e.g., systematic reviews; Pullin and Knight 2009). Scientists should therefore be trained to understand socio-political systems to allow them to

know how, when, and why evidence-based science is used to promote the development of timely and influential science (see Action 20). Further, because of the robustness of such approaches, systematic reviews can facilitate governments when navigating through tough decisions, especially when unpopular (Haddaway and Bilotta 2016). Given that conservation actions necessitate the efficient use of limited resources (e.g., for restoration or other interventions) often in controversial decision-making settings, the adoption of evidence-based approaches by conservation professionals in the Anthropocene allows for appropriate management strategies for resources.

It is important to note that under the current socio-political climate where scientific evidence is often under attack (Otto 2016), conservation professionals will also have to overcome criticism and thus change the general conversation around evidence-based decision-making by highlighting its advantages to the public (Bonell 2018).

## Action 6. Redefine our relationship with the environment

Sustainability science attempts to understand and improve the dynamic relationship between ecosystem services and human well-being in a changing world (Wu 2013). In doing so, one of the central goals is to identify win–win scenarios that benefit biodiversity, ecosystems, and human well-being (Howe et al. 2014). Individuals have unique relationships to their environment based on observational and experiential interactions specific to them and their surroundings. Through direct contact with the natural world, we may develop compassion beyond our own interests and foster an attitude of environmental stewardship (Leopold 1949). Furthermore, the philosophy of human interconnection with ecosystems is also central to many nonwestern and Indigenous communities (Kohler et al. 2019). Human connection with a healthy environment is necessary to achieve SDGs (Reid et al. 2017). For example, this is apparent for the food insecure communities in southeast Asia who depend on wild inland fish to sustain life and ensure proper development of infants (Lynch et al. 2017). However, even in cities, exposure to nature improves public health and wellness (Shanahan et al. 2015; Soga and Gaston 2016). It is therefore concerning that human interactions with nature, especially in children, are being replaced with virtual experiences facilitated by technology (Soga and Gaston 2016). Conservation professionals should promote the continued development of methods and incentives allowing for nature to play an integral role in society (Soga and Gaston 2016). Examples include the promotion of green spaces in cities (Haq 2011) or encouraging exploration of natural environments (such as marketing for national parks in Canada and Australia; Hogenauer 2002).

## Action 7. Support and promote international agreements for global governance

Global connectivity has fostered international agreements that allow trans-boundary management of wildlife and resources. Furthermore, it allows a worldwide collective effort towards achieving a good Anthropocene. Examples of international agreements such as the Montreal Protocol (United Nations 1989) and the Paris Accord (United Nations 2015) have and continue to demonstrate worldwide environmental concerns and desires for sustainability in the Anthropocene (Kates et al. 2005). This being noted, the success of international agreements relies heavily on the commitment of nations to such agreements and the power of global governance (Biermann et al. 2017). Conservation professionals must continue to encourage and contribute to international agreements for global governance and continue to aid in the development of novel ways to engage in action at a global scale. SDGs developed by the United Nations, governments, and other representatives, are an example of innovative global governance with which conservation professionals may wish to engage (see Action 8). The SDGs present the principle of "governance through goals"

(Biermann et al. 2017), a new nonlegal strategy that can be voluntarily adopted by a wide range of government actors, institutions, and economies (see Action 2).

## Action 8. Engage in dynamic and adaptive conservation management

In the face of complex environmental change, the path toward a good Anthropocene will require adaptiveness and flexibility from conservation institutions and decision-makers (Grantham et al. 2010). Conservation professionals will need to adopt forward-looking goals and implement dynamic strategies specifically designed to prepare for and adjust to current and future drivers of environmental change and the associated nonlinear impacts on ecosystems and human communities (Watson et al. 2011). For example, a charity called The British Trust of Ornithology has monitored populations of British breeding birds over 40 years using bird surveys. This work flagged severe declines, which quickly led to public awareness and greater governmental support for bird conservation (Greenwood 2003). Conservation planning, management, and research can be resilient and adaptive in the face of changing climatic conditions and thus capable of engaging in continuous learning and dynamic adjustment to accommodate uncertainty (Grantham et al. 2010). This is more achievable in the Anthropocene because of increased access to information through the internet (Carrasco et al. 2017). Fostering adaptiveness, flexibility, and learning can conflict with the conventional desire for stable governmental institutions (Armitage et al. 2012). Truly adaptive environmental management will require conservation professionals to work collaboratively to inform policies that allow flexibility in operational practices and the incorporation of learning processes within decision-making, as demonstrated in the example above involving The British Trust of Onithology (Wyborn and Dovers 2014).

## Action 9. Engage in long-term conservation-minded thinking and management

Human views towards nature are dynamic (Mace 2014). Shifts in mainstream views coupled with the short-term nature of policy agendas (Meadowcroft 2009) lead to difficulties in addressing conservation issues in need of long-term management and societal support. Development and support for long-term conservation goals built on scientific evidence are now necessary, as it is well known that human wellbeing is dependent on ecosystem services (Díaz et al. 2006). For example, the impending consequences of the state of our freshwater resources, as indicated by sound scientific studies, should spark long-term and uninterrupted management, actions, and support for freshwater conservation from all sectors of society (Dudgeon et al. 2006). The development of conservation management plans that outlive short-term policy agendas should be a main priority for all individuals and governing bodies. An example of such initiatives is the Private Protected Area Action Plan developed by the International Union for Conservation Nature (IUCN) that protects areas based on biodiversity and conservation needs without government involvement (as they are owned or managed by nongovernment organizations, individuals, corporations, or communities; Langholz and Krug 2004).

## Action 10. Learn from past mistakes to avoid need for restoration

Sustainable resource management is fundamental to ensuring a good Anthropocene. We can learn from past mistakes to incorporate more sustainable practices in the future that minimize the need for mitigation and restoration for anthropogenic activities. As a case in point, the collapse of the Atlantic Cod fishery in Newfoundland and Labrador taught us that population sustainability indices (i.e., realized population growth) provide a means by which the susceptibility and resilience of exploited populations of fish can be assessed and the probability of commercial

extinction of fish populations reduced (Hutchings and Myers 1994). To learn from our mistakes, we need to emphasize adaptive management and governance (see Actions 8 and 9). "Leapfrogging" over destructive cycles allows us to skip directly into sustainable cycles. For example, up and coming electricity markets in developing countries, such as in sub-Saharan Africa and India, represent opportunities to "leapfrog" intensive fossil energy economies and adopt renewable energy economies (Batinge et al. 2017).

## Action 11. Use financial levers to encourage desirable conservation outcomes

Innovative policy tools utilizing financial incentives to encourage biodiversity and ecosystem conservation have considerable potential to advance environmental stewardship goals. Market-based instruments (MBIs) are popular examples of such tools as they look to work in service to the environment by addressing environmental externalities—where market transactions fail to account for the value of ecosystems (Kenny et al. 2011). Examples include cap and trade markets, carbon pricing, offsets, payment for ecosystem services schemes, property tax breaks, and subsidies. MBIs are particularly attractive as cost-effective alternatives to conventional command and control regulation. This is especially true in situations where the natural capital and ecosystem services in question are considered public (nonrival) goods and lack well-defined property rights (Kinzig et al. 2011). Such situations are common in conservation policy and result in a lack of private sector incentives for environmental protection. These instruments have already been shown to be effective in accommodating diverse environmental policy goals from reducing the amount of waste that ends up in municipal landfills (Portney 2003) to species at risk recovery (McFatridge and Young 2018). Properly designed MBIs avoid the maximization of single-ecosystem-service provision (see Redford and Adams 2009; Kinzig et al. 2011) while incorporating elements of flexibility, additionality, stringency, and scalability. Although innovative economic policy tools like MBIs have demonstrated some potential, it is unknown whether such tools are fully capable of accounting for all the relevant environmental externalities required for their long-term success (Muradian et al. 2010). Furthermore, such tools may not account for the spatio-temporal distribution of conservation costs (Hartig and Drechsler 2009). Such caveats must be considered as conservation professionals should contribute to further develop and utilize these tools in the Anthropocene.

## Action 12. Seek ways to make technology an ally

Technology alone will be unlikely to produce "silver-bullet" conservation solutions (Chapman et al. 2015) but will contribute to our action items. As such, technology should be embraced as an ally for achieving a good Anthropocene. Conservation issues are often socio-ecological (Guerrero and Wilson 2017), and technological innovations offer an effective means for bridging social and ecological divides. For example, the Indigenous Guardianship programs throughout Canada prioritize and develop local environmental stewardship programs that are derived from Indigenous ways of knowing the environment whilst building technology capacity within the involved Indigenous Guardians (Nature United & Nature Canada 2019). Perhaps the most prominent uptake of technology integrating social and ecological realms will be exemplified by increasing social connectivity via social media and mobile platforms. Conservation action can utilize these platforms to foster cost-effective campaigns, deliver rapid science communication, and engage a diversity of stakeholders, actors, and stewards (Theobald et al. 2015). Increased connectivity afforded from technological innovations will also undoubtedly play a role in implementing alternative resource management strategies (e.g., co-management; Guerrero and Wilson 2017), socio-ecological integrated modelling techniques (Hamilton et al. 2015), and adaptive capacity approaches to environmental changes (Cinner et al.

2018). Technology offers powerful tools for advancing scientific knowledge to develop evidence-based approaches for conservation actions (see Action 5) and enhanced monitoring of conservation outcomes (e.g., genetic tools, drones, telemetry). However, there are limitations in the scope and reach of initiatives relying on technology as many communities lack access to popular technological advancements of today.

## Action 13. Foster the incorporation of conservation values into existing institutions, religions, belief-systems, and cultures

Shared values define a social group's perceptions and actions towards human and nonhuman worlds and are shaped by collective behaviours, culture, and institutions (Manfredo et al. 2017). Tapping into social values can help with addressing conservation issues by providing reason for the adoption of conservation strategies. The integration of conservation standards into existing belief systems can make use of marketing strategies to understand existing value systems, identify commonalities with conservation efforts, and develop mutual opportunities. Spiritual and faith-based institutions have great influence on societal norms. Fostering a synergy between religious ideals and environmental standards presents a great potential for conservation professionals to promote conservation ethics through nontraditional partnerships (see Action 1). For example, the Catholic Church (a conservative institution) could recognize and address their history of focusing on "the man and nature" dualism associated with ecological devastation in Western societies (White 1967). In Pope Francis' *Laudato si*, the importance of respecting nature is highlighted, as well as the need for unified action to save our natural resources (Francis 2016). Religious notions promoting environmental stewardship can give rise to consensual ideals, as seen in the example given on the Catholic church. These notions are present in belief systems such as Jainism, Buddhism, and the Baha'i Faith (Palmer and Finlay 2003). Conservation professionals may therefore look towards building partnerships with cultural and (or) religious groups to promote the need for environmental conservation.

## Action 14. Include diverse voices and democratic processes in conservation science

The magnitude of the good Anthropocene challenge is such that conventional science alone is not enough to succeed (Hulme 2014). Embracing concepts associated with other worldviews and knowledge systems on human–nature relationships can not only help inform and interpret solutions, but also lead to innovation and identification of meaningful trajectories into the future. Conservation professionals should include diverse voices in conservation policy formation to ensure different knowledge sources and perspectives are considered and represented in all conservation projects. The respectful collaboration amongst varied groups on conservation projects would facilitate the development of efficient and effective conservation projects that are considerate of local priorities and interests (Liu et al. 2007; Tallis and Lubchenco 2014). It may be important to note democratic processes can compromise the efficiency of conservation policy development, particularly when conflicting stakeholder values are apparent (Peterson et al. 2005). Addressing potential conflicts is possible through ethical and respectful communication and relationship building with all involved (Grimble and Wellard 1997). Conservation professionals should also consider that creating interactions between knowledge systems requires the development of functioning tools for valid, transparent, and valuable ways of integrating knowledge (Tengö et al. 2014; Grimble and Wellard 1997). Berkes (2017) proposed a socio-ecological framework that examines the issue in ways that promote collaboration and enable multi-level governance, considering government agencies and strategies as part of the ecosystem. This framework allows us to

respond and adapt to difficulties that come with integrated socio-ecological systems yet requires collaboration between government agencies, scientists, Indigenous communities, and other stakeholders. Respecting and including diverse stakeholder perspectives is imperative in a changing climate (Parlee et al. 2005) as co-management has yielded better results within conservation projects (such as the development of protected areas; Oldekop et al. 2016).

### Action 15. Engage local and Indigenous communities

Partnerships with Indigenous communities must always be fostered when conducting conservation projects on their traditional lands and (or) for projects with which they may share interest. According to the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services such partnerships are essential for advancing knowledge and political legitimacy of conservation science (Díaz et al. 2018). Indigenous communities typically have extensive knowledge of ecosystem processes derived from local, long-term, cumulative ways of knowing that can help to guide conservation planning and conservation strategies (see Action 16). It is important to note that the involvement of local and Indigenous communities in conservation projects should not be seen as a means to an end, and conservationists must not attempt to incorporate Indigenous knowledge into their own belief systems as if it were additional "data". Cooperation with local and Indigenous communities should include understanding and consideration of group- or community-specific value systems, cultural beliefs, and socio-economic needs throughout the duration of the project. Thoughtful collaboration should continue to develop alongside projects' priorities, concerns, methods, results, and outputs—emphasizing the importance of sincere relationship building with Indigenous collaborators on conservation projects. Meaningful inclusion of local and Indigenous communities and accommodation of interests (Andrade and Rhodes 2012) can improve conservation outcomes (Brooks et al. 2012), facilitate the development of socio-economic benefits to communities (Horowitz 1998), and help to ensure the continuance of cultural practices for involved Indigenous communities and groups (Ljubicic et al. 2018).

### Action 16. Promote the reduction of human consumption and production

According to the World Summit for Sustainable Development, our current and past methods of production and over-consumption as a function of our ever-growing population are largely to blame for the degree of environmental degradation in the Anthropocene (Kucukvar et al. 2014). Technology is often viewed as a way to decrease the effects of production on the environment, as it allows for more efficient production with lower costs and environmental impacts. Unfortunately, technology has yet to curb most of the environmental impacts associated with production, especially in more developed countries as higher efficiency and lower costs seem to promote higher consumption and waste (Sanne 2002). For example, there is almost double the amount of food needed per person per day available in Canada and United Kingdom food retailers (Smil 2004). This overabundance of available food promotes over consumption (associated with increased rates of obesity) and high amounts of food waste that further degrades the environment. Overconsumption of food and other goods quickly exploits natural resources beyond sustainable levels (Stern 1997; Giljum et al. 2009) and contributes to losses in biodiversity (Cafaro et al. 2006). Changes in individual behaviour can yield reductions in consumption, yet industry incentives advertised to consumers as well as social structures and pressures create barriers to such changes (Sanne 2002). Conservation professionals can alter social attitudes on consumption by actively educating the public on the negative environmental effects of waste and the importance of recycling, reusing, and reducing consumption when possible, and they can promote

alternatives to the current means of production that lead to over-consumption and waste, such as democratic control of the economy. This can be done through social media campaigns or childhood education programs, as an example see Actions 19 and 20. Conservation professionals should also take a leadership role in initiatives that look to curb overconsumption and production (e.g., those aimed at unnecessary production of goods, industry protocols on production and advertising, mis-matches and re-alignments between global supply and demand of goods via innovative trade networks, increasing production efficiency without increasing unnecessary consumption, and (or) waste).

### Action 17. Provide opportunities for women and exploited peoples

One of the significant challenges moving towards a good Anthropocene is managing the environmental impact of an ever-growing human population and resulting human consumption of resources (see Action 16). The human population is now over 7.5 billion worldwide and is projected to reach 8.6 billion by 2030 (United Nations 2017). The largest portion of this increase is projected to occur in a few countries such as India, Nigeria, the Democratic Republic of the Congo, and Ethiopia (United Nations 2017). Efforts to slow such population growth could have a far greater environmental impact than any environmental legislation (Wynes and Nicholas 2017). Women with higher education have easier access to income and more ability to decide timing and size of their families (Knodel and Wongsith 1991; Sperling and Winthrop 2015). A more equal distribution of wealth could also incentivize parents to have smaller families, as the potential financial benefit of having more children is reduced when wealth is increased (Becker et al. 1990). In a good Anthropocene, conservation professionals should increase access and accessibility of education to women and exploited peoples, perhaps by forging new partnerships (see Actions 1, 19, and 20). They may also join as advocates in pushing income equality (see Action 2). Women participate actively in the socio-political arenas of their community, region, and country. They may possess unique perspectives on their dynamic environmental surroundings derived from distinct social conditions, understandings, and roles. The lack of female involvement within these discussions of conservation strategies and projects may be limiting the breadth of knowledge used and known within current and dominant management practices (Dowsley et al. 2010).

### Action 18. Prioritize younger generations whose attributions are not yet well established

Prioritizing biodiversity and environmental sustainability with younger generations gives us a real chance of addressing and resolving the current planetary challenges we face. By targeting younger generations, whose preferences and opinions are more labile (Gomez et al. 2002), we may increase the efficacy of science communication and outreach. Exposure to important and up-to-date scientific data and concepts can be delivered through avenues that youth frequent most, such as formal education and online social media. Sustainability, biodiversity, and environmental ethics should be introduced in schools at an early age with an emphasis on evidence-based science. These educational values should be continued throughout primary and secondary education. Some techniques have been effective in successfully engaging youth in environmental issues, including primary education focused on multi-disciplinary educational integration (Dreyfus et al. 1999) and active development and engagement in real-world programs that endorse empowerment and student-centered learning (Stern et al. 2014). As a powerfully impactful aide, social media campaigns, educational videos, and youth outreach endeavors (Morar and Peterlicean 2012) can propagate topics and interests into mainstream popularity quickly through various social media platforms. Effective education produces well-

informed, scientifically literate future citizens capable of critical thinking and implementing solutions (Hollweg et al. 2011). However, it is also important to note that older generations, like younger generations, are often marginalized yet hold a lot of knowledge that can be of value to conservation efforts, and therefore worth consideration by conservationists (Frazão-Moreira et al. 2009).

### Action 19. Attach a responsibility to include outreach and engagement in the scientific method

Scientific findings provide intellectual gain, but uptake of that knowledge into conservation action requires enthusiasm towards the subject on the part of the community (i.e., audience; see Action 1) and appropriately scaled translation and dissemination of the knowledge on the part of the researcher. A scientific method that holds the scientist accountable to sharing information through engagement with the public may provide an opportunity for one message to be quickly shared among many (Fraser et al. 2006; note that special consideration and thought must be applied to this dissemination to ensure that all collaborators are comfortable and understand the knowledge that is to be shared). Conservation scientists should be catalysts for change, using the community as a partner in implementing change (see Action 1; Pound et al. 2003) and promoting a sense of ownership to influence participation towards conservation goals.

### Action 20. Rethink education and training to focus on effective communication strategies

It is well known that language and labels play an important role in shaping how people perceive themselves and act (Liberman et al. 2004). Public education and scientific communication in the Anthropocene should utilize positive and relatable language to describe the natural world and the Anthropocene to promote a connection between individuals and the natural world around them. Utilizing terms and phrases such as "nature's contribution to people" instead of "ecosystem services" (Díaz et al. 2018), or "wildlife" instead of "taxa", can help forge a connection between audiences and nature, leading to positive shifts in behaviour (Druschke and McGreavy 2016). Conservation scientists should look to partner with artists, social media influencers, and most notably media, to produce novel and aspirational communication strategies to convey a better Anthropocene to the greater public. Future conservation scientists should be trained to strategically use thoughtful, evocative, and inspiring communication strategies and language to help modify human behaviour. Young conservation scientists can turn to organizations that provide such training to build up their scientific communication tool-kit.

## Synthesis and conclusions

This work presented 20 Actions derived from a group of early-career researchers whose generation will be tasked with resolving the consequences of climate change; they are novel and critical thinkers (Pullin et al. 2004) with an unmatched understanding of modern social connectivity and technologies (Aktan et al. 2014; Prensky 2001; Lim et al. 2017). These Actions are meant to inspire collaborative action and thinking within conservation professionals to facilitate our path forward towards a good Anthropocene as now more than ever, aspiring and diverse groups of conservation professionals can play an active role in achieving and influencing this new reality (Bennett et al. 2016).

The scope of each Action is broad (see Table 1), thus demonstrating that Actions are not directed at single pockets of professionals but rather can be adopted by many. Such overlap leads to the possibility of fostering collaborative action across groups of conservation professionals. Conservation professionals should be engaging in such collaborations with others in their field and beyond to achieve environmental and social successes through conservation initiatives (Kark et al. 2015).

It is important to stress that the efforts by conservation professionals alone will not suffice in achieving a good Anthropocene. For that reason, successful outreach, communication and education, collaboration across sectors, and the development of new partnerships may help to ensure collective efforts towards positive change from all sectors of society. Furthermore, conservation professionals must keep a positive, humble, open-minded, and forward-thinking outlook to allow themselves to identify adaptations and new actions that can be taken as new technologies and novel methods of communication arise as we continue to define (and hopefully, refine) the Anthropocene to maximize planetary and human well-being.

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