Ecosystem services as a contested concept: a synthesis of critique and counter-arguments

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Abstract

We describe and reflect on seven recurring critiques of the concept of ecosystem services and respective counter-arguments. First, the concept is criticized for being anthropocentric, whereas others argue that it goes beyond instrumental values. Second, some argue that the concept promotes an exploitative human–nature relationship, whereas others state that it reconnects society to ecosystems, emphasizing humanity's dependence on nature. Third, concerns exist that the concept may conflict with biodiversity conservation objectives, whereas others emphasize complementarity. Fourth, the concept is questioned because of its supposed focus on economic valuation, whereas others argue that ecosystem services science includes many values. Fifth, the concept is criticized for promoting commodification of nature, whereas others point out that most ecosystem services are not connected to market-based instruments. Sixth, vagueness of definitions and classifications are stated to be a weakness, whereas others argue that vagueness enhances transdisciplinary collaboration. Seventh, some criticize the normative nature of the concept, implying that all outcomes of ecosystem processes are desirable. The normative nature is indeed typical for the concept, but should not be problematic when acknowledged. By disentangling and contrasting different arguments we hope to contribute to a more structured debate between opponents and proponents of the ecosystem services concept.

Introduction

The ecosystem services (ES) concept emphasizes the multiple benefits of ecosystems to humans (MA 2005), and its use can facilitate collaboration between scientists, professionals, decision-makers, and other stakeholders. Although the concept has gained considerable interest inside and outside of science, it is increasingly contested and encounters multifaceted objections. We describe and reflect on seven critiques on the concept, summarize counter-arguments based on literature and intersubjective deliberation, and propose a way forward. Rather than providing an exhaustive overview, we synthesize recurring critiques that were distilled from the rapidly expanding literature on ES, discussions during conferences, and conversations with colleagues from different scientific disciplines.

We selected three types of critical arguments against the concept. The first one covers ethical considerations, which relate to how humans interact with nature. We

address critique regarding environmental ethics and regarding the human–nature relationship. The second type of argument deals with strategies for nature conservation and sustainable use of ecosystems, which relate to the science–policy interface. These arguments include supposed conflicts with the concept of biodiversity, issues related to valuation, and commodification and Payments for Ecosystem Services (PES). The third type of argument addresses the current state of ES as a scientific approach. We discuss issues of vagueness of terms and definitions as well as optimistic assumptions and normative aims.

Environmental ethics

Critique

The ES concept is criticized for its anthropocentric focus and exclusion of the intrinsic value of different entities in nature (McCauley 2006; Sagoff 2008; Redford & Adams 2009). This critique has its roots in a long-standing, unresolved debate within environmental ethics. This debate deals with the question whether our actions toward nature should be based on an anthropocentric view that constitutes instrumental values of nature, or whether they should be based on biocentric reasoning that constitutes intrinsic values of nature (Krebs 1999; Callicott 2006; Jax *et al.* 2013).

Counter-arguments

(a) The ES concept includes ethical arguments

Jax *et al.* (2013) have pointed out that it is misleading to juxtapose an ethical position with the ES concept, as environmental ethics also includes anthropocentric values (Krebs 1999; Callicott 2006). In our world, where most ecosystems are managed, anthropocentric values provide additional arguments to address the ongoing ecological crisis (Reid *et al.* 2006; Skroch & López-Hoffman 2010). The ES concept is not meant to replace biocentric arguments, but bundles a broad variety of anthropocentric arguments for protection and sustainable human use of ecosystems (Chan *et al.* 2012b; Luck *et al.* 2012). Such arguments include ensuring the fulfilment of basic needs of current and future generations through provisioning, regulating and cultural ES.

(b) The ES concept might allow for integration of intrinsic values

Broad values, which contribute to a genuinely good life in an Aristotelian sense, go beyond considering nature as a toolbox for satisfying material needs (Krebs 1999). For instance, aesthetic contemplation of an ecosystem requires the valued object to be valuable "in itself," i.e., for its own purpose while at the same time being valued by a human being (Krebs 1999). The cultural ES category shows overlaps between pure anthropocentric and intrinsic values. Certain forms of psychospiritual values (beauty, awe, knowledge) are instrumental values but may also "be lumped with intrinsic value" (Callicott 2006). Many people agree with the idea that nature has other purposes than just providing humans with the means and conditions to live well physically. This is particularly true for, but not limited to, ecosystems that have not been culturally shaped or degraded. People appreciate species and ecosystems simply because of their existence, an idea that has been acknowledged by many ES scientists (e.g., Chan *et al.* 2012b; Reyers *et al.* 2012). Although existence value is still anthropocentric, it contains elements of intrinsic value. The valued object is appreciated for what it is in itself—as an object of awe and respect.

Human–nature relationship

Critique

Several scholars warn that the economic production metaphor of ES could promote an exploitative human–nature relationship (Fairhead *et al.* 2012; Raymond *et al.* 2013), in which ES are seen as a "green box of consumptive nature" (Brockington *et al.* 2008). ES will turn people into consumers that are increasingly separated and alienated from nature (Robertson 2012). Furthermore, the prevailing transactional nature of ES might neglect societal demand and access. This would not account for, or might even contradict other forms of human–nature relationships such as holistic perspectives of indigenous and long-resident peoples (Fairhead *et al.* 2012).

Counter-arguments

The ES concept can be used to reconnect society and nature

Society has become increasingly disconnected from nature, especially in the Western world, and the ES concept can challenge dominant "exploitative" practices. For instance, a more holistic perspective toward the use of nature can be offered by emphasizing sustainable provision of multiple ES. Therefore, using the concept provides the potential to build bridges across the modernization gap between consumers and ecosystems. It offers a way to reconceptualize humanity's relationship with nature. ES reflect human dependence on Earth's life-support system by including reciprocal feedbacks between

humans and their environment (Borgström Hansson & Wackernagel 1999; Folke *et al.* 2011; Raymond *et al.* 2013). Nonmaterial, intangible values that are important in holistic perspectives of nature can be captured by the cultural services domain, to include peoples' diverse values and needs.

Conflicts with the concept of biodiversity

Critique

An important concern is that ES are used as a conservation goal at the expense of biodiversity-based conservation. For instance, planning and executing conservation strategies that are based on ES provision might not safeguard biodiversity, but only divert attention and interest (e.g., McCauley 2006; Ridder 2008; Vira & Adams 2009). Some see inconclusive evidence of a "win–win" scenario for ES and biodiversity protection (Thompson & Starzomski 2007; Vira & Adams 2009). Empirical proof of relationships between ES provision and components of biodiversity is perceived as weak, which is a cause for concern (Cardinale *et al.* 2006; Ridder 2008; Norgaard 2010).

Counter-arguments

(a) Conceptual overlaps between ES and biodiversity

Biodiversity and ES are two complex concepts, neither of which can be fully captured in a single measure. However, there are important overlaps between both concepts (Mace *et al.* 2012; Reyers *et al.* 2012). The frameworks by the Millennium Ecosystem Assessment (MA) and The Economics of Ecosystems and Biodiversity (TEEB) have been influential in ES science and communication to policy-makers. Both frameworks have acknowledged overlaps between biodiversity and ES by including aspects of biodiversity within the habitat, supporting, and cultural service categories (MA 2005; De Groot *et al.* 2010). For instance, the habitat service category of TEEB includes the maintenance of life cycles and migratory species, and of genetic diversity. In addition, other components of biodiversity are included in the cultural and amenity service category of TEEB and MA, through the components' roles in the ES cultural heritage, spiritual and artistic inspiration, and aesthetic appreciation.

(b) Biodiversity underpins ES

Clarifying biodiversity–ES relationships is a complex task. This is because of the stochastic environment in which they are embedded, and the difficulty to identify and measure various components of biodiversity and ecosystem conditions and processes that underlie ES provision. Nevertheless, there is a solid, growing body of empirical evidence on how different components of biodiversity underpin the ecosystem conditions and processes that influence ES provision (e.g., Balvanera *et al.* 2006; Cardinale *et al.* 2006; Hector & Bagchi 2007). Evidence suggests that high levels of biodiversity are necessary to maintain multiple processes at multiple locations and over time (Isbell *et al.* 2011). Cardinale *et al.* (2012) suggest that for certain provisioning and regulating services there is sufficient evidence that biodiversity directly influences these or strongly correlates with them. However, they also state that for some ES there is still insufficient data to assess their relationship with biodiversity.

(c) The ES concept can support biodiversity conservation

Several ES-based initiatives aim to broaden biodiversity conservation practices, which can help strengthen arguments and tools for protecting ecosystems (e.g., Balvanera *et al.* 2001; Armsworth *et al.* 2007). Some of these initiatives, including international agreements such as REDD+ and the CBD's Biodiversity 2020 targets, comprise the principle that biodiversity can be, directly or indirectly, safeguarded by managing, restoring or enhancing ES provision. This principle is based on the identified conceptual overlaps, the effect of biodiversity on ecosystem functioning, geographical overlaps between hotspots of biodiversity and ES, and evidence that restoring degraded ecosystems can have positive effects on biodiversity and ES provision (e.g., Benayas *et al.* 2009). In practice, however, most ES-based projects do not monitor whether their actions also safeguard biodiversity.

ES valuation

Critique

The ES concept is contested because it comprises economic framing, and ES assessments often involve economic valuation (e.g., McCauley 2006; Sagoff 2008; Turnhout *et al.* 2013). A summary of this critique can be found in Goméz-Baggethun & Ruiz-Pérez (2011). Some argue that if we start to value ES we might as well economically value the sun, wind, and gravity (Sagoff 2008). There is also considerable critique on specific economic valuation methods (e.g., Chee 2004), which we do not address here.

Counter-arguments

(a) Valuation of ES leads to more informed decisions

Humans make choices and thus implicit value judgments about the state of ecosystems every day. Economic aspects are involved in these choices, because economists study the choices people make on how to utilize resources that have alternative uses (Robbins 1932). Arguments that compare ES valuation with the valuation of wind, sun or gravity can be dismissed, because these phenomena are not scarce and humans usually cannot make choices about their availability. Different types of economic valuation can be applied to ES, of which monetary valuation is the most common. It helps to raise awareness about the relative importance of ES compared to man-made services, and highlights the undervaluation of positive and negative externalities. Monetary valuation thus provides additional arguments for decision-making processes and does not replace ethical, ecological, or other nonmonetary arguments (De Groot *et al.* 2012). Despite its methodological shortcomings, monetary valuation enables the calculation of the total sum of multiple ES, because of the same unit of measurement. This enables comparisons, for example between the value of multiple ES from a natural ecosystem (e.g., forest, wetland) and that of a converted ecosystem (e.g., cropland, aquaculture farms). Such comparisons can help to highlight trade-offs between private benefits and public costs as well as short-term and long-term consequences.

(b) Alternatives to economic valuation

It is a common misconception that monetary valuation is the only method to compare ES, and that monetization is included in each ES assessment (Chan *et al.* 2012a; Chan *et al.* 2012b). Biophysical assessments of ES can also be used as an input for deliberative decision-making. The ES concept can be used to assess human well-being according to the capability approach, which deals with people's freedom to live a good life (Polishchuk & Rauschmayer 2012).

In several settings, such as community-based governance, trade-off analyses with both monetary and sociocultural (i.e., nonmonetary) valuation of nature are being used to account for the limitations of a single method of valuation and different economic views in multiple geographies (Gómez-Baggethun & Ruiz-Pérez 2011). The concept can be used to involve stakeholder perceptions about ES in decision-making without economic valuation (Lamarque *et al.* 2011), while considering carefully that these perceptions vary with context and scale (Hauck *et al.* 2013).

Commodification and PES

Critique

There are fears that economic valuation would lead to "selling out on nature" (McCauley 2006) and commodification (Turnhout *et al.* 2013). Some see an increased focus on PES schemes, stating that the ES approach is based on "the assumption that such remuneration will ensure their provision" (Fairhead *et al.* 2012), whereas others consider the ES concept and PES as the same (Redford & Adams 2009).

Counter-arguments

ES are not the same as PES

Contrasting common misunderstandings, Wunder (2013) argues that PES schemes seldom use economic valuation, nor do they depend on markets. Instead, PES schemes enable participation and equitable conservation outcomes through their negotiated compensation logic. Furthermore, ES can be used as a basis for different policy instruments, and PES is just one way (Skroch & López-Hoffman 2010). Other policy instruments exist for the regulation of benefits and associated losses from ecosystems. Economics can help in designing experiments that study how policy instruments might work (e.g., incentives for collaboration between farmers to produce ES, or taxes paid by landowners for ES lost through land-use change). This is not necessarily connected to marketization.

Vagueness

Critique

Most definitions and classifications of ES are based on the MA (2005). Although many authors have proposed ways to define ES more consistently, these attempts have been criticized for being impractical, open to interpretation, and inconsistent (Nahlik *et al.* 2012). As a result of the ambiguity around the concept, the term ES has become a popular "catch-all" phrase that is used to represent ecosystem functions or properties, goods, contributions to human well-being, or even economic benefits (Nahlik *et al.* 2012).

Counter-arguments

(a) Definitions tend to continuously improve

The MA has kept the definition of ES intentionally vague (Carpenter *et al.* 2009) and this tends to be appropriate for most ES assessments (Costanza 2008). Imprecision has often spurred creativity and led to refined or new ideas

(e.g., Wallace 2007; Nahlik *et al.* 2012). Successful examples of such progress include definitions and classifications by TEEB (De Groot *et al.* 2010) and CICES (Common International Classification of ES, Haines-Young & Potschin 2010). Such continuous improvement is characteristic of the development phase that this increasingly popular scientific concept is in. Finally, ES definitions and classifications depend on the aim and perspective of the assessment (Costanza 2008).

(b) Flexibility inspires transdisciplinary communication

The ES concept could be characterized as a boundary object. A boundary object is robust enough to bind opposing views and values within a communication, scientific or work process, while remaining adaptable or vague enough for participants to maintain their identities across themes, contexts, and networks (Star 2010). Furthermore, the flexible nature of boundary objects allows creativity and facilitates cooperation between groups or disciplines with different paradigms or interests without achieving consensus (Strunz 2012). Another important aspect of a boundary object is that it can foster transdisciplinary research processes (Jahn *et al.* 2012), i.e., processes that focus on socially relevant contextual problems and are characterized by a permeable science–society boundary (Hirsch Hadorn *et al.* 2006). The concept has inspired dialogue and cooperation between economists and ecologists, and between scientists and policy makers. Stakeholders can use the ES concept to initiate and facilitate transdisciplinary research processes. This can be attributed to the concept's interpretive flexibility.

Optimistic assumptions and normative aims

Critique

McCauley (2006) criticized the concept for implying that all outcomes of ecosystem processes are good or desirable. This masks the fact that some ecosystems provide "disservices" to humans, such as an increased risk of diseases (Zhang *et al.* 2007). Sagoff (2002) stated that this can lead to narrative "parables," in which the positive nature of the ES concept remains largely unquestioned by environmental scientists. Such an optimistic perception on nature could lead to normative aims of the concept that go beyond a cognitive interest. This means that the ES concept might be based on an idea of how the world should be: ecosystems are benevolent, hence protect them.

Counter-arguments

(a) "Services" are the research interest

Choosing terms that evoke positive associations, such as "services," "goods," and "benefits," shows the optimistic intention as well as the research interest of scientists working with the ES concept. These terms essentially relate to the interplay between ecological and socioeconomic systems, which is at the basis of both the concept and the science that builds on it.

(b) ES as one of many normative concepts in environmental sciences

Research on environmental problems, such as in the fields of sustainability (Hirsch Hadorn *et al.* 2006), conservation biology (Reyers *et al.* 2010), or ecological economics (Baumgärtner *et al.* 2008) has both a cognitive and a normative aim. Many normative concepts are used within environmental sciences, with ES being one of them. Such "umbrella concepts" are postnormal (Funtowicz & Ravetz 1993), value-laden, and often strategic. Consequently, they influence or are influenced by normative ideas (Callicott *et al.* 1999). Although an issue-oriented, normative approach to science is rejected by some (e.g., Lackey 2007), others state that total value freedom is impossible, as science is often embedded in sociocultural contexts. The latter statement would characterize science based on the ES concept.

A way forward

ES as a platform for integration of different worldviews

The environmental ethics behind the concept form a crucial point of contention (Jax *et al.* 2013). The anthropocentric framing of the ES concept could be used for broad argumentation in support of conservation and sustainable use. It could convince opponents of nature protection, especially in Western cultures. Furthermore, using the ES concept offers a "platform" for bringing people and their different views and interests together. Many ES scientists who often also believe in intrinsic values of nature, advocate the ES concept as a strategy to get the conservation idea across in societal discourses by appealing to people's own interests (e.g., Gretchen Daily in Marris 2009). A democratic representation of a broad range of instrumental values that are traded off against each other can be seen as an advantage over limiting decisions on intrinsic values (Justus *et al.* 2009). Stronger acknowledgement of existence aspects within the cultural services category (e.g., parallel to aesthetic or spiritual experience) could integrate use and nonuse considerations of

ascribed values. This would present a more encompassing picture of the multiple benefits that humans derive from nature. Although the principle foundation of ES is anthropocentric, acknowledging existence aspects could bring different worldviews within environmental ethics together. However, it remains to be discussed within the ES domain whether the concept is broad enough to also address nature for its own sake without the purpose of any utilization. Furthermore, awareness is needed to move beyond the Western origin of the ES concept and acknowledge the different visions on nature in multiple geographies to appropriately integrate these within ES assessments.

Biodiversity conservation and ES

Although conflicts between biodiversity conservation and the provision of ES might arise, we have highlighted the possibilities for biodiversity conservation offered by the ES concept. The ES concept does not undermine the scope or validity of the biodiversity paradigm as a focus point in nature conservation. Biodiversity is both directly and indirectly included in several ES categories, and therefore biodiversity conservation can improve the provision of these ES. More long-term research, such as biodiversity monitoring embedded in ES management and restoration schemes, is needed to elucidate the relationships between the provision of ES and biodiversity. Such combined research will help evaluate the constraints and opportunities for biodiversity conservation within ES-based management, as well as for consideration of ES within biodiversity-based management.

Alternatives to monetary valuation based on the ES concept

Scientists have an important role in contributing to the design of suitable policy instruments. One role of ES scientists lies in the development of interdependent biophysical and sociocultural value indicators of ES which explain the relation between humans and nature in a comprehensive way. Such value indicators will vary, depending on the decision-making process for which they are designed.

A form of valuation by humans is needed to establish the existence and importance of ES so that relevant ES can be selected for a scientific assessment or in participative planning processes. Therefore, valuation provides the basis for any biophysical analysis of flows of energy, matter and information related to ES. Measurements of ES in biophysical terms can subsequently strengthen economic and sociocultural cost–benefit analysis or an informed deliberative discourse. The combination of biophysical and social indicators for ES embraces a wider range of values than can be captured by monetary estimates. Hence, there are reasons to be hesitant about ES approaches that focus solely on the regulating power of markets, as there are potential negative impacts of ES markets, for instance on the poor (Landell-Mills & Porras 2002). Therefore, we underline the importance of nonmarket instruments.

ES could foster transdisciplinary research processes

One of the main characteristics of the ES concept is its interdisciplinary nature, i.e., it offers common ground for debate and methodological progress in different scientific fields. The concept embraces ecological, economic, and social mechanisms and as such connects the environmental system with politics and decision-making. Next to fostering interdisciplinary science, using the concept also builds bridges between science and practice, enabling for integrated, transdisciplinary approaches to solve "wicked problems" such as the many environmental challenges the world faces today (Hoppe 2011). Whether ES will play a role as a boundary object depends on whether it can be taken up by societal actors and incorporated in local environmental governance processes. At present, this does not seem to be the case, which might be related to the flexibility and ambiguity of the concept. Moreover, ES research and application of the concept does, at local and regional scales, currently not arise as a result of information needs of society, which is a crucial characteristic of a boundary object (Star 2010).

Where scholars work together with practitioners and stakeholders, transparency about methods, uncertainty, knowledge limitations (Laws & Hajer 2006), and the shortcomings of ES assessments should be provided. Moreover, it is important that scientists construct their knowledge tools in such a way that the inherent normative choices of the ES concept are made explicit and open for amending by those who make decisions about conserving land and adapting landscapes. Furthermore, ES scientists are challenged to find ways to systematically consider implicit assumptions and perceptions by stakeholders and practitioners, regarding either the ES concept itself or the values people attach to their environment (Menzel & Teng 2010; Raymond *et al.* 2013).

Potential problems in applying the ES concept

The ES concept faces additional critique, most of which is aimed at its application in land management and science. One critique deals with the maximization of a single service at the expense of other services (Bennett *et al.* 2009). Such co-occurring detrimental effects can be

Table 1 Overview of the seven points of critique against the ES concept, responses to these critiques, and an envisioned way forward

Critique	Arguments	Counter-arguments	Way forward
Environmental ethics	The ES concept excludes intrinsic value of nature. Nature conservation should be based on intrinsic instead of anthropocentric values.	The ES concept bundles valid anthropocentric arguments. The cultural ES domain includes values with elements of intrinsic values, for instance existence value.	Anthropocentric framing could be used for broad argumentation in support of conservation and sustainable use of ecosystems. Stronger acknowledgement of existence aspects within the cultural services domain could bring different worldviews together.
Human–nature relationship	The focus on ES could promote an exploitative human–nature relationship. This might contradict holistic perspectives of indigenous people.	The ES concept could re-connect society to nature. Nonmaterial values can be covered in the cultural ES domain, to include peoples' values and needs.	The ES concept offers a "platform" for bringing people and their different views and interests together. Attention is needed to move beyond the Western origin of the ES concept.
Conflicts with the concept of biodiversity	The ES concept might replace biodiversity protection as a conservation goal. There is inconclusive evidence of a "win-win" scenario between biodiversity and ES. ES might not safeguard biodiversity, but instead divert attention and resources.	There are conceptual overlaps between ES and biodiversity. There is a growing body of evidence that biodiversity underpins the ecosystems functions that give shape to ES. Current initiatives based on ES lead to a broad perspective on land management and conservation.	Indirect inclusion of biodiversity in several ES categories can pave the way for potential "win–win" scenarios. Further research and monitoring are needed to clarify the relationships between biodiversity and ES.
ES valuation	The ES concept comprises economic framing. ES assessments often involve economic valuation.	Monetary valuation provides additional information in decision-making processes. ES assessments do not necessarily involve valuation and valuation does not necessarily involve monetization.	Develop both biophysical and sociocultural value indicators of ES to explain human–nature relationships.
Commodification and PES	The ES approach is based on the assumption that payment for ES will ensure their provision.	Assessing ES in monetary terms does not necessarily equate to using market instruments.	Focus on ES approaches that include nonmarket instruments.
Vagueness	ES has become a "catch-all" phrase because of its many vague definitions.	Imprecision of the ES concept can spur creativity and refinement of definitions. Use of the ES concept can facilitate multiple societal actors to interact without consensus on the precise meaning and can foster transdisciplinary research.	ES offer common ground for debate and methodological progress in different scientific fields. Use of the ES concept can build bridges between science and practice, enabling for integrated, transdisciplinary approaches to solve "wicked problems."
Optimistic assumptions and normative aims	The ES concept is too optimistic. Ecosystems outputs may not always be beneficial to humans.	Positive terminology shows the optimistic intentions and research interests. ES is one of the many normative concepts used within environmental science. Total value freedom is impossible for science embedded in sociocultural contexts.	Scientists should be explicit and transparent about whether research aims and provided information are normative. ES scientists are challenged to find ways to systematically consider implicit assumptions and perceptions of stakeholders and practitioners on ES and connected values.

seen as a shortsighted application of the ES concept, but not as a critique on its essence. Taking a broad systems perspective, which emphasizes the multiple services of ecosystems, lies at the core of the concept. Maximizing a single service, in contrast, is an implementation of interests and values of certain actors that favor this specific service, which is based on power distribution and happens irrespective of the use of the ES concept.

Although the flexibility of the concept has proven to have its merits, a pitfall is that ES assessments regularly compare and bundle resources from intensively managed ecosystems with those of near-natural ecosystems, without making the relative contribution of ecosystems to the provision of ES explicit enough (Power 2010). Some, for instance, see products resulting from intensive agriculture and aquaculture as an ES, although the contribution of natural processes (fertile soil, available water) here is relatively low. We argue that the concept should be limited to the contribution of natural processes to the production of these "man-made" goods and not consider these goods themselves as ES.

Conclusion

Critical debates are essential for the development of the ES concept in science and practice. The quality and outcome of an informed debate depends on inputs of both opponents and proponents of the concept. We perceived that in a rising number of critical articles on the ES concept, most authors sharpen or build on each other's critiques, rather than addressing the origin of the critique and exploring potential refutations. In this article, we aimed to contribute to the debate on ES by disentangling recurring critical arguments and by providing and exploring counter-arguments (for a summary see Table 1). Unraveling and contrasting different arguments can be seen as a first step toward an informed and structured dialogue between opponents and proponents of the concept.

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