Biodiversity and the UN's Sustainable Development Goals

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1. Introduction

The 2030 Agenda for Sustainable Development (which was adopted by all United Nations States in 2015) presents an ambitious set of goals for achieving sustainable development. According to a United Nations' source, "it provides a shared blueprint for peace and prosperity for people and the planet, now and into the future" (United Nations 2015a). "At its heart are 17 Sustainable Development Goals (SDGs), which are an urgent call for action by all countries—developed and developing in a global partnership. They recognize that ending poverty and other deprivations must go hand in hand with strategies that improve education, reduce inequality and spur economic growth—all while tackling climate change and working to preserve our oceans and forests" (United Nations 2015a).

While the purpose of this agenda is admirable, in reality, it promises much more than it is likely to deliver. This is partly because the statements of its SDGs and their related targets had to be crafted in a way to obtain their political acceptability by nations with diverse and often conflicting interests. In order to satisfy all countries ratifying the agenda, many of the targets are rather vague and open-ended and lack compatibility. Moreover, it is left to individual nations to decide which targets they will focus on and how these will be addressed. This includes the biodiversity targets present in this agenda. Furthermore, no penalties will be imposed on individual nations failing to address any of the SDGs adequately. Basically, the extent to which individual nations pursue the SDGs is voluntary. In addition, because individual nations report on their own progress in achieving the SDGs, this gives them scope to paint a more favourable picture of their achievements than may be warranted. These limitations all reflect the need of the UN to respect national sovereignty.

Despite these limitations, the SDGs provide nudges, prompts or reminders to individual nations and communities of the need to adopt policies to respond to significant global environmental and sustainable development problems. Furthermore, the SDGs and their associated targets provide platforms for the

academic community and for the general public to discuss and analyse pressing sustainable development issues.

This chapter focuses mainly, but not entirely, on examining the biodiversity targets listed or implied in SDG 15. SDG 15 is intended to promote the sustainability of life on land and lists several targets for doing this. This list includes objectives for forest conservation, for combatting desertification, for limiting and reversing land degradation, and for stopping biodiversity loss. The discussion of the SDG 15 biodiversity targets is preceded in this article by considerations on the nature of biodiversity and its valuation. This discussion is important for showing the types of challenges that have to be overcome in specifying biodiversity targets and for setting the biodiversity targets contained in the 2030 Agenda for Sustainable Development. After this, the biodiversity targets contained in SDG 15 are scrutinized, and then other relevant targets and additional biodiversity targets contained in the 2030 Agenda for Sustainable Development are considered, giving particular attention to their compatibility with the biodiversity targets listed in SDG 15. Subsequently, in order to provide a concrete example of how one country has decided to respond to the SDG 15 biodiversity targets, the approach of India is briefly outlined and critically examined. This is followed by a general discussion.

2. The Concept of Biodiversity and Its Valuation

2.1. The Complexity of the Concept of Biodiversity

Biodiversity is both a multi-layered and a multidimensional concept (Juhász-Nagy 1993; Magurran 2003). Two major layers include:

- The diversity of ecosystems
- The extent of genetic diversity

Within each layer, the dimensions of this diversity can be measured in different ways. For example, in relation to genetic diversity, one can account for the number of genera, the number of species and the diversity of sub-species and varieties in each category. The geographical extent of each of these can be another consideration, for example, the extent to which these biodiversities are locally present, their regional occurrence and their global prevalence. Given the multilayered and multidimensional nature of biodiversity, the prospect of constructing a general index which satisfactorily embraces all the characteristics of biodiversity seems to be slim. This (as well as differences of opinion about how best to value biodiversity) makes it difficult to determine appropriate sustainable development goals for biodiversity.

2.2. The Specification of SDG 15 Inadequately Related to the Nature of Biodiversity

To a large extent, the diversity of extant organisms depends on the variety of existing ecosystems and their adequacy for enabling varied organisms to survive. In other words, the number of available environmental niches has a major influence on the extent of species diversity. This is highlighted by the fact that loss of habitat is the main cause of the global reduction in genetic diversity in the wild (Joppa et al. 2016, p. 418). Economic development is the main contributor to this loss because of its impact on natural ecosystems. Unfortunately, this relationship is not explicitly mentioned in the specification of SDG 15. Instead, it focuses on objectives to reduce poaching and illegal trafficking in wildlife and the control of invasive organisms as measures to sustain biodiversity. While attention to both these threats to biodiversity is warranted, more significant threats ought to have been considered in formulating SDG 15. Moreover, not only the loss of wild biodiversity but also the loss of existing diversity in agriculture and other bio-industries (that is, other industries culturing or husbanding living resources, such as aquaculture) should have been taken into account in proposing targets for sustaining life on earth.

These shortcomings might have been overcome if more attention had been paid to the concept and nature of biodiversity and to establishing an overarching framework for the scientific discussion of policies to promote sustainable development. However, it is unrealistic to expect scientific precision in the formulation of the targets for the Global Agenda 2030. This is because this agenda had to be formulated and modified, for it to be accepted by existing nations and stakeholders with varied interests and aims.

2.3. Valuation, Biodiversity Conservation and the SDGs

Rationally determining biodiversity targets requires some acceptable and logical method of valuing objectives. Whether or not the consensus-type political method adopted in formulating the targets for the SDG goals and the biodiversity component embedded within these is adequate in this regard is open to question. The UN's sustainable development agenda appears to pay little or no attention to the type of methods that economists have been developing to value biodiversity conservation and to economic principles but appears to rely heavily on the opinion of natural scientists for its background formulation and for the determination of its targets for biodiversity conservation. This may be because ecologists and many other natural scientists have been prominent in portraying sustainable development as primarily an ecological problem.

This raises the question of why there is a lack of attention to economics in formulating the Global Agenda 2030 targets for biodiversity conservation. There are a number of possible reasons for this. These include:

- Lack of respect for the methods used by economists for valuing biodiversity conservation
- Possible dislike of the fact that economic methods, such as social cost–benefit analysis, often indicate that some modification of natural ecosystems to supply marketable goods can be economically optimal
- The partial nature of the results obtained so far by economists;
- The use of disparate methods of economic analysis which result in different policy conclusions

As far as the latter aspect is concerned, two different economic approaches to conservation of biodiversity (which can result in different policy conclusions) include:

- Methods based on the principles of welfare economics, as, for example, previously reviewed (Pascual et al. 2010)
- Methods based on economic impact analysis as, for example, applied to the conservation of ecosystems (Costanza et al. 2014)

The first mentioned approach is based on social cost–benefit analysis. In this case, estimates of the willingness to pay for marketed commodities as well as unmarketed environmental ones are often taken into account in determining social benefits. The second mentioned approach concentrates on the effect of the conservation of environmental resources on the level of incomes and employment. These effects are generated by marketed commodities, for example, by the sale of tourism services. This approach gives inadequate attention to the economic value of unmarketed ecological services. Disparities in the policy implications of the application of the methods of welfare economics and of economic impact analysis have been pointed out by Tisdell (2012; 2015, chp. 16). Nevertheless, all have a role to play in evaluating biological conservation.

With this background in mind, let us start to consider the nine conservation targets contained in SDG 15 (as well as three added policy proposals) and then subsequently explore additional dimensions of biodiversity conservation evident in the other SDG goals. As pointed out by Schultz et al. (2016, p. 23), targets listed under SDG 15 only directly refer to terrestrial ecosystems and biodiversity.

3. The SDG 15 Targets and Biodiversity Conservation

3.1. Background Information

The aim of SDG 15 is to "protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification and halt and reverse land degradation and halt biodiversity loss" (United Nations 2015b). It is accompanied by nine targets and three policy suggestions. *Target 15.1* is "by 2020, ensure the conservation, restoration and sustainable use of terrestrial and inland freshwater ecosystems and their services, in particular forests, wetlands and mountains and drylands, in line with obligations under international agreements". One of the questions that arises in that regard is whether all sustainable uses of ecosystems are compatible with one another and beneficial to biodiversity conservation. Cases will arise in which trade-offs are involved. How will or should the desirability of these trade-offs be determined? This remains an open question. If the three-pillar approach to analysing sustainability is adopted, it may be necessary to forgo some components of ecological sustainability (including biodiversity) in order to obtain economic and social sustainability (Barbier 1987; Barbier and Burgess 2017). As natural capital and biodiversity become scarcer due to economic growth, the economic case for their preservation becomes stronger (Tisdell 2005).

3.2. Forest Conservation and Restoration

Target 15.2 is "by 2020, promote the implementation of sustainable management of all types of forests and substantially increase afforestation and reforestation globally" (United Nations 2015b). This target raises a query about the type of services for which forests should be sustainably managed. For example, to what extent should they be sustainably managed for timber production rather than other valued services provided by the use or preservation of forests. These can be in conflict and may call for trade-offs. In developing countries, many poor rural communities depend heavily for their livelihoods on the utilization of non-timber forest resources (as illustrated by (Ren and Tisdell 2002)). The availability of these resources can be jeopardized when forests are sustainably managed for timber production (Tisdell et al. 2002). Furthermore, the sustainable management of forests is complicated by the fact that some local communities use these to their own advantage, which results in biodiversity losses or negative environmental consequences for other communities (Tisdell et al. 2002). This target does not take account of these issues.

3.3. Target 15.3

Target 15.3 is "by 2030, combat desertification, restore degraded land and soil, including land affected by desertification, drought and floods and strive to achieve a land degradation-neutral world" (United Nations 2015b).

While at first glance this seems to be a desirable target, it also has some limitations. First, to what end or purpose should the degraded land be restored? Second, what ought to be the state to which it should be returned? Is it to a state that is supportive of some feature of biodiversity or to the state in which it was able to be used in the past? For example, if it is a forest restoration project, should the forest be restored (as far as possible) to its most recent natural state or should it be restored to a modified state? Because of altering natural conditions, the attributes of land are liable to vary with the passage of time and can become 'degraded'; therefore, which of the past states (if any) should the land be returned to?

Most importantly, consideration should be given to the costs and benefits of land restoration. Available resources for land restoration are scarce, and opportunity costs are involved in such restoration. It is unrealistic to ignore these costs. though some land restorations may be justified on economic grounds, it is unlikely that all restorations could be justified on these grounds. Nevertheless, economic considerations require to minimize the costs of whatever type of land restoration is planned. Moreover, in some cases, it may prove to be impossible for humans to prevent the spread of deserts or changes in the attributes of land that arise as a result of climate change (Tisdell 2017, chp. 2), due to either natural or anthropocentric causes. In turn, these changes alter the ecosystems and impact on the sustainability of biodiversity.

3.4. Target 15.4—*Conserving Mountain Ecosystems*

The purpose of *Target 15.4* is "by 2030, ensure the conservation of mountain ecosystems, including their biodiversity, in order to enhance their capacity to provide benefits that are essential for sustainable development." (United Nations 2015b)

A problem with this target is that, given climate change, it is likely to be impossible to conserve or maintain all mountain ecosystems and their associated biodiversity. It is necessary to tailor policies for ecosystem conservation so as to allow for the forces of climate change, which are, to a large extent, not controlled locally. Even if current anthropocentric contributions to global warming are significantly reduced in the near future, lagged climate effects will still take their toll on existing ecosystems and contribute to further biodiversity loss. To some extent, it may be

possible to mitigate some of these effects, but several can be expected to be irreversible and not preventable.

3.5. Target 15.5—Halting Biodiversity Loss by Reducing the Degradation of Natural Habitats and by Other Means

Target 15.5 calls for the taking of "urgent and significant action to reduce the degradation of natural habitats, halt the loss of biodiversity and by 2020, protect and prevent the extinction of threatened species" (United Nations 2015b). This in itself appears to be a desirable goal, especially for those holding ecocentric values. However, conserving biodiversity does not only depend on the conservation of natural habitats. A few species depend on human alterations to some natural habitats for their existence, and some are entirely dependent on human nurturing and the provision of suitable habitats for their survival. For example, the survival of avocados depends entirely on human efforts to cultivate them. It is also believed that the traditional land management practices of Australian Aborigines (such as systematic fire burns) were instrumental in ensuring the survival of some wild species of marsupials. The survival of threatened species sometimes undoubtedly depends on human alterations to natural habitats. This can increase their chances of survival, given, for example, the reduced size of the remaining available natural habitats and the lack of suitable natural resources for sustaining threatened species within these habitat pockets. In other words, human management and some alterations to natural (and other) habitats may be required to promote biodiversity conservation, because existing natural habitats are no longer adequate for this purpose. Of course, such human interventions involve an economic cost, and there are limits to improvements in biodiversity conservation which can be achieved by altering natural habitats.

3.6. Benefits from the Utilization of Genetic Resources

Target 15.6 states: "Promote fair and equitable sharing of benefits arising from utilization of genetic resources and promote appropriate access to such resources, as internationally agreed" (United Nations 2015b). This aspect is discussed at some length in Tisdell (2015, chp. 10). It might be noted that the emphasis in the above statement is on equity. In reality, two different aspects of this objective should be considered. These are the equity aspect and whether such payments make a positive contribution to biodiversity conservation. In some cases, even if the full 'excess economic return (rent)' received by those using genetic resources is paid to those initially having possession of these resources, this may be ineffective in providing adequate economic incentives for them to conserve these resources. Furthermore,

the amount received by holders of such resources could be negligible after the costs of benefit transfers (transactions costs) are taken into account.

There is the further complication that property rights in some genetic resources (such as property rights in new plant varieties, including genetically modified organisms (GMOs)) can have negative consequences for the stock of existing biodiversity and, in some instances, could have inequitable impacts on income distribution. Consequently, this target raises a few unresolved dilemmas.

3.7. Target 15.7

Target 15.7 calls for "urgent action to end poaching and trafficking of protected species of flora and fauna and address both the demand and the supply of illegal wildlife products" (United Nations 2015b). The intended biodiversity conservation aim of this target is clear. It does, however, overlook the fact that in some cases, the sustainable use of protected species and the marketing of wildlife products can contribute to their survival. For example, the managed commercial use of saltwater crocodiles in the Northern Territory (Australia) has made a significant contribution to their survival in the wild (Tisdell 2014, chp. 9). More attention needs to be given to the ways in which the market system (for example, via ecotourism) can promote the conservation of wildlife and supplement other means of conserving genetic diversity in the wild.

3.8. Invasive Alien Species

Target 15.8 is as follows: "By 2020, introduce measures to prevent the introduction and significantly reduce the impact of invasive alien species on land and water ecosystems and control or eradicate the priority species" (United Nations 2015b).

The introduction of invasive alien species to new territories has resulted in a substantial decline in global biodiversity. In many cases, natural ecosystems have been degraded, and significant economic losses have been experienced in agriculture and other bio-industries as a result of these introductions. Given growing global movements of people and goods, the risk of further unwelcome introduction of undesired alien species remains quite high. The human introduction of alien species to new territories may be deliberate or accidental (incidental). Sometimes, deliberate introductions are made by government bodies to increase the productivity of ecologically based industries. Some of these have had unintended negative environmental consequences, and the benefits of their introduction have been greatly exceeded by their negative environmental costs. The introduction to Australia of the cane toad from South America to control insects infesting the sugar cane

provides one such example. It can also happen that an alien introduction to assist one industry, such as agriculture, can have adverse consequences for natural biodiversity. For example, the introduction of the semi-aquatic grasses *Hymenachne amplexicaulus* and *Urochloa mutica* to increase the productivity of the pastoral industry in the Northern Territory (Australia) has led to their invasion of the Kakadu National Park, with negative consequences for the conservation of natural habitats in this park (Setterfield et al. 2013). Furthermore, individuals who deliberately (and sometimes secretly) introduce alien species to new territories rarely take account of any negative environmental externalities which their action may endanger.

Given the limited amount of resources available for regulating the introduction of invasive alien species to new territories and for controlling or eradicating those which are already present, it is desirable to establish priorities for all of these activities. Furthermore, attention should be given to determining the appropriate total amount of public funding for pest control. In addition, public finance considerations associated with addressing issues involving the exclusion and management of alien species should be considered. In the latter respect, to what extent should industry beneficiaries of efforts to exclude or manage alien species be required to contribute to the costs of the effort involved?

Although it is reasonable to recommend in SDG *target 15.8* that priority alien species (which are already in a new territory) should be controlled or eradicated, the time frame suggested for doing that is rather short. However, more importantly, there is no prevailing clear pathway for establishing priorities for the control or eradication of invasive alien species. Several different approaches to establishing these priorities are possible, but there is as yet no resolution as to what the ideal approach is, if there is one (Tisdell et al.). Furthermore, it is important for more research to be done on how resources are, in fact, allocated for the management and eradication of alien invasive species. This can help to uncover shortcomings in current pest control practices and how these might be addressed. The need should have been highlighted for more research funding to investigate the establishment of priorities for the control and eradication of alien invasive species, instead of ostensibly assuming that these priorities are already well established.

3.9. SDG Target 15.9

The objective of SDG *target 15.9* is to integrate, by 2020, ecosystem and biodiversity values into national and local planning development processes, poverty reduction and accounts. While this appears to be commendable as a scheme for the implementation of ecosystems and biodiversity conservation, one possible problem is

the lack of guidance about the relevant values which should be taken into account and how this valuation should occur. Furthermore, there is limited guidance about what actions should be taken in the light of this valuation. More extensive consultations between national and local government bodies (as is, for example, happening in India in order to implement its contribution to the SDGs) could have little practical effect, especially if the discussions involve mainly a limited number of public (civil) servants.

3.10. Recommendations 15A, 15B and 15C

Three recommendations are added to the targets for SDG 15 to provide extra policy guidance on how some of its targets might be achieved. Recommendation 15A is to seek more finance from all sources to conserve and sustainably use biodiversity and ecosystems. While extra finance for this purpose would help achieve this aim, finance alone is not sufficient to ensure that it is achieved. Another unresolved issue is whether it is desirable to maintain all existing ecosystems and the whole of the existing stock of genetic diversity, both the genetic stock developed by human effort as in agriculture and that present in the wild. The opportunity costs associated with the implementation of this recommendation need to be considered.

Policy recommendation 15B advocates increasing the funding for sustainable forest management and the provision of "adequate incentives to developing nations to advance such management, including for conservation and reforestation" (United Nations 2015b). It is, however, unclear what types of sustainable forest management are proposed for support. Forests can be managed sustainably to satisfy different targets. These targets can include maintaining their maximum economic yield for timber and ensuring the lasting availability of non-timber products, as well as the conservation of wild biodiversity (and other) services provided by forests. Attention to trade-offs is usually involved in utilizing and managing forests. Consequently, this policy recommendation is too open-ended to provide practical guidance for desirable forestry management.

Recommendation 15C is to "Enhance global support for efforts to combat poaching and trafficking of protected species, including by increasing the capacity of local communities to pursue sustainable livelihood opportunities" (United Nations 2015b). This implies, among other things, that more attention should be given to ensuring compliance with the Convention on International Trade in Endangered Species (CITES). While undoubtedly there is a case for greater control of poaching and trafficking of some endangered species, this recommendation ignores the fact that the managed sustainable use of some endangered species

is likely to be more effective in ensuring their conservation. In some cases, ranching and farming as well as other commercial uses of endangered species can be more effective in conserving endangered species. The possibilities are quite complex (Tisdell 2005, chp. 6).

Again, the proposal that local communities be provided with sustainable livelihood opportunities in order to reduce their economic motivation to engage in poaching and trafficking can contribute to biodiversity conservation in the wild. Nevertheless, one needs to take account of the limitations of such a policy. The economic opportunities open to many remote communities for increasing incomes are often quite limited (see, for example, Tisdell 2014, chp. 16). In addition, the illegal use of protected ecosystems may still remain comparatively profitable for some individuals. The main economic beneficiaries from such illegal use are often the richer and more influential members of societies (see, for example, (Wibowo et al. 1997)). This adds to the difficulty of curbing the illegal use of protected wildlife and ecosystems.

4. Biodiversity Conservation and Goals Other Than SDG 15

4.1. How Well Are the Biodiversity Targets for SDG 15 Integrated with the Other SDGs?

Although it is recognized by the UN that the SDGs and their associated targets should be implemented in an integrated manner in order to progress the 2030 Agenda for Sustainable Development, the actual statement of these goals and their associated targets display limited integration. The outlines of these items tend to be compartmentalized. This improves their comprehension but fails to take account of several of their cross-effects on biodiversity.

In order to illustrate this problem, consider first SDG14, life below the water, which focuses on life in the seas and the use of marine resources and then let us pay attention to selected targets for achieving SDG2, that is, achieving zero hunger by 2030.

4.2. Conservation on Land and the Sustainability of Marine Biodiversity

Rather surprisingly, the targets for meeting the 2030 Agenda for Sustainable Development make no allowances for the impacts of terrestrial activities of the humankind on the conservation of marine biodiversity. It is well known that several terrestrial activities of humans can have negative effects on life in the ocean. These effects are additional to those climate changes which are attributable to human activities.

Negative effects of activities on land on marine ecosystems include:

1.   Soil and fertilizer run-off from agriculture entering oceans to the detriment of coral reefs;
2.   Similarly, increased soil erosion and run-off as a result of some forest practices and deforestation;
3.   Loss of habitat for marine animals that breed and rest on the shores of oceans, for example, yellow-eyed penguins, (Tisdell and Wilson 2012, chp. 13) and sea turtles (Tisdell and Wilson 2012, chp. 9);
4.   Loss of mangroves and tidal marshes due to human activities, the consequence of which is a reduction in the populations of several marine species which depend on these resources;
5.   The entry of plastic waste into the oceans to the detriment of some marine species, for example, some species of sea turtles;
6.   The building of dams and infrastructures on inland waterways which prevent some marine creatures from completing their life cycles.

4.3. SDG2—The Zero Hunger Goal and Biodiversity Conservation

Five targets for ending hunger by 2030 and three measures to support this goal are outlined in the 2030 Agenda for Sustainable Development. Although each of the targets appears to be desirable, no attention is paid to considering trade-offs between the targets. It is unlikely to be possible to achieve all the targets simultaneously, and no attention is paid to the obstacles that have to be overcome to achieve them. For example, to what extent is the target of doubling the agricultural productivity and incomes of small-scale food producers by 2030 (target 2.3) compatible with the conservation of genetic diversity as set out in target 2.5? How is it proposed to ensure this compatibility? The statement of SDG2 provides no information about these matters.

Policy recommendations 2B and 2C call for reduced international trade restrictions and market 'distortions' in accordance with the Doha Development Round and suggest ways to ensure the "proper functioning of food commodity markets and their derivatives" (United Nations 2015a). It does not take into account the possibility that the extension of and the increasing reliance of agriculture on the market system can result in losses in agricultural biodiversity (Tisdell 2015, chps. 5 and 6) as well as in wild biodiversity. Nevertheless, policy recommendation 2A states that there should be greater investment in plant and livestock gene banks "in order to enhance agricultural productivity in developing countries, in particular least

developed countries" (United Nations 2015a). This seems to be intended as a way to offset reductions in the agricultural genetic pool resulting from market extension.

A couple of observations are in order as far as gene banks are concerned. First, the economics of these banks is poorly researched (Tisdell 2016). Second, it is not clear that developing countries will be the main beneficiaries of these gene banks. It is quite possible that large companies (with headquarters in higher income countries) engaging in the development and marketing of improved agricultural seed varieties and the upgrading of livestock breeds could be the prime economic beneficiaries. Nevertheless, there could still be global benefits. For example, agricultural seed varieties could be developed which are better able to cope with climate change than the current ones. This might not happen in the absence of these gene banks and without the presence of larger companies with a goal to develop improved seed varieties.

It is not being argued that the type of targets and policy recommendations stated in the 2030 Agenda for Sustainable Development are irrelevant but rather that they are too simplistic and, in many cases, vague. Their shortcomings are further exposed because individual nations are given considerable freedom about what targets to focus on and how. Aspects of India's plans for implementing the 2030 Agenda for Sustainable Development are revealing in that regard.

5. Brief Notes on India's Implementation of the Biodiversity Targets in the 2030 Agenda for Sustainable Development

India has developed its plan for implementing the 2030 Agenda for Sustainable Development (United Nations and NITI Aayog 2018). In relation to SDG 15, it proposes an increase of 33% in its tree cover by 2030 compared to 2015. In the same time period, it plans to raise the surface area of its inland waters in forested areas by the same percentage. Just what policy measures it will adopt to achieve these ends are not specified, and the targeted qualities of the tree cover and of its inland water bodies are not mentioned. At present, India's inland water bodies are highly polluted by effluents and human wastes (Lélé et al. 2018). This presumably has negative consequences for biodiversity.

As for SDG target 15.5 which calls for "action to reduce the degradation of natural habitat, halt the loss of biodiversity and, by 2020, protect and prevent the extermination of threatened species" (United Nations 2015b), India intends to measure its success in satisfying this target by the extent to which it is able to increase its wild elephant population. It intends to maintain this population at its 2017 level.

The choice of wild elephant numbers as a barometer of India's progress in conserving wild biodiversity is based on the belief that their presence is positively associated with healthy natural ecosystems. Wild elephants are also sometimes seen as an umbrella species (one that enables the diversity of other species) and a flagship species (species favoured by the public for conservation). Nevertheless, wild elephants are only present in a limited geographical area in India. In areas where they are not present, and especially in areas where the habitat is unsuited to their presence, other indicators of success in the conservation of wild biodiversity would be required. There is also the problem that wild elephants can cause significant crop losses and consequently reduce the amount of food available for humans (Bandara and Tisdell 2002). The effects can be devastating for the subsistence of small-scale farmers.

In response to target SDG 2.3 (increasing agricultural food productivity), India plans to double its average yield of rice, wheat and coarse grains from the 2015 baseline figure of 2509.22 kg/ha to 5018.44 kg/ha by 2030. No indication is given of how this doubling will be achieved, and in fact, the target is probably unrealistic (Tisdell 2019). No mention is made of how this strategy will benefit small-scale farmers and other disadvantaged food producers who are identified in the UN's specification of SDG target 2.3 as being most worthy of support for increasing their food production and incomes. In addition, there is no discussion of how the doubling of these yields will affect biodiversity conservation.

India's plans for implementing the 2030 Sustainable Development Goals appear to be piecemeal. However, in this regard, it is not unique among nations. Its focus on the level of population of just one wild species, wild elephants, is inadequate as a measure of its success in conserving wild biodiversity. Furthermore, its procedures for conserving agricultural biodiversity have not been spelt out. Greater attention to the quality of its tree cover and its inland water rather than just concentrating on increases in these areas would also be appropriate from the point of view of biodiversity conservation. Additional discussion of these issues is available in Tisdell (2019).

6. Discussion

A significant limitation of the UN's SDGs is that they lack integration. Furthermore, insufficient consideration is given to the trade-offs likely to be involved in pursuing individual SDG targets. Pursuing some of the targets (for example, substantially raising food production) is likely to require alterations to existing ecosystems and changes in the stock of biodiversity. It is unrealistic to assume that

maintaining the status quo in the stock of biodiversity is compatible with satisfying all the anthropocentric targets stated in the 2030 Sustainable Development Agenda. Therefore, it is necessary to take account of these trade-offs and of the opportunity costs involved in the implementation of this agenda. The provision of an extra set of targets by the UN stating how this might be done (that is, a set of guidelines on how to harmonize the targets) would have been of great practical value. Alternatively, some indication of the type of research required to elucidate these trade-offs would have been useful.

Why are the UN's targets frequently vague, presented in a somewhat piecemeal manner, and why are trade-offs not specified? Most likely, this reflects the need for supplying a document which could be agreed to by nations and parties with diverse interests in it. Because the UN is administered by several bodies (many of which have different objectives, not all of which are entirely compatible), this probably influenced the composition (e.g., the piecemeal nature) of the 2030 Agenda for Sustainable Development. Documents of this type play an important role in helping to secure ongoing funding for the bodies operating under the umbrella of the UN, and therefore, each probably looked for support from the 2030 Agenda. After all, the organization of the UN involves a bureaucracy which has an interest in its financial survival, as does each of the bodies operating under its auspices. Hence, it is reasonable to suppose that it takes into account its own interests and political considerations in preparing documents like that drawn up for its 2030 Agenda for Sustainable Development (cf. Svizzero and Tisdell 2016).

The UN was presumably subject to internal organizational constraints in drafting the 2030 Agenda for Sustainable Development and by the need to consider the possible varied political reactions of member states of the UN to its draft. Given all these constraints, it is, therefore, a major achievement for this agenda to have been articulated and accepted by most nations. Although the biodiversity conservation implications of this agenda display inconsistencies and imprecision (as highlighted in this chapter), it does ensure that attention continues to be focused, globally, on the importance of biodiversity as an influence on the sustainability of development. There is a continuing need both to evaluate this diversity from the point of view of its contribution to anthropocentric economic goals and to allow for the felt obligations of much of humankind to conserve the web of life and natural ecosystems, even when doing so is of little or no apparent material economic value to humankind.

Conflicts of Interest: The author declares no conflict of interest.

References

Bandara, Ranjith, and Clement. A. Tisdell. 2002. Asian elephants as agricultural pests: Economics of control and compensation in Sri Lanka. *Natural Resources Journal* 42: 491–519.

Barbier, Edward B., and J. C. Burgess. 2017. The Sustainable Development Goals and the systems approach to sustainability. Economics Discussion Papers, No 2017-28. Available online: http://www.economics-ejournal.org/economics/discussionpapers/2017-28 (accessed on 1 July 2020).

Barbier, Edward B. 1987. The concept of sustainable economic development. *Environmental Conservation* 14: 101–10. [CrossRef]

Costanza, Robert, Rudolf De Groot, Paul Sutton, Sander van der Ploeg, Sharolyn J. Anderson, Ida Kubiszewski, Stephen Farber, and R. Kerry Turner. 2014. Changes in the global value of ecosystem services. *Global Environmental Change* 26: 152–58. [CrossRef]

Joppa, L. N., B. O'Connor, P. Visconti, C. Smith, J. Geldmann, M. Hoffmann, J. E. M. Watson, S. H. M. Butchart, M. Virah-Sawmy, B. S. Halpern, and et al. 2016. Filling in biodiversity threat gaps. *Science* 352: 416–18. [CrossRef] [PubMed]

Juhász-Nagy, Pál. 1993. Notes on compositional diversity. *Hydrobiologia* 249: 173–82. [CrossRef]

Lélé, Sharachchandra, Veena Srinivasan, Bejoy K. Thomas, and Priyanka Jamwal. 2018. Adapting to climate change in rapidly urbanizing river basins: Insights from a multiple-concerns, multiple-stressors, and multi-level approach. *Water International* 43: 281–304. [CrossRef]

Magurran, Anne E. 2003. *Measuring Biological Diversity*. Oxford: Blackwell Publishing.

Pascual, Unai, Roldan Muradian, Luke Brander, and et al. 2010. *The Economics of Ecosystems and Biodiversity: Ecological and Economic Foundations*. Edited by P. Kumar. London and Washington: Earthscan, Available online: http://www.teebweb.org/our-publications/teeb-study-reports/ecological-and-economic-foundations/ (accessed on 1 July 2020).

Ren, Zhuge, and Clement A. Tisdell. 2002. Community-based poverty in Yunnan: Dictates of environment and socio-economics. In *The Economics of Conserving Wildlife and Natural Areas*. Edited by C. A. Tisdell. Cheltenham and Northampton: Edward Elgar Publishing, pp. 274–86.

Schultz, Maria, Tristian P. Tyrrell, and Torbjörn Eberhard. 2016. The 2030 Agenda and Ecosystem—A Discussion Paper on the Links between the Aichi Biodiversity Targets and the Sustainable Development Goals. Available online: http://tentera.org/wp/wp-content/uploads/2017/03/The-2030-Agenda-and-Ecosystems_web.pdf (accessed on 1 July 2020).

Setterfield, Samantha A., Michael M. Douglas, Aaron M. Petty, Peter Bayliss, Keith B. Ferdinands, and Steve Winderlich. 2013. Invasive plants in the floodplains of Australia's Kakadu National Park. In *Plant Invasions in Protected Areas: Patterns Problems and Challenges*. Edited by L. C. Foxcroft, P. Pyšek, D. M. Richardson and P. Genovesi. Dordrecht: Springer, pp. 167–89.

Svizzero, Serge, and Clement A. Tisdell. 2016. The post-2015 development agenda: A critical analysis. *Journal of Self-Governance and Management Economics* 4: 72–94. [CrossRef]

Tisdell, Clement A., and Clevo Wilson. 2012. *Nature-Based Tourism and Conservation: New Economic Insights and Case Studies*. Cheltenham and Northampton: Edward Elgar Publishing.

Tisdell, Clement A., Bruce A. Auld, and Stephen B. Johnson. Forthcoming. Models and strategies for prioritizing the control of invasive exotic weeds in protected areas: Theoretical and pragmatic challenges. In *Environmental Assessments: Schenarios Modelling and Policy*. Edited by K. N. Ninan. Cheltenham and Northampton: Edward Elgar Publishing.

Tisdell, Clement A., Kartik. C. Roy, and Ananda Ghose. 2002. Joint forest management: Villagers and the conservation of Indian forests. In *The Economics of Conserving Wildlife and Natural Areas*. Edited by C. Tisdell. Cheltenham and Northampton: Edward Elgar, pp. 287–304.

Tisdell, Clement A. 2005. *Economics of Environmental Conservation*, 2nd ed. Cheltenham and Northampton: Edward Elgar.

Tisdell, Clement A. 2012. Economic benefits, conservation and wildlife tourism. *Acta Turistica* 24: 127–48.

Tisdell, Clement A. 2014. *Human Values and Biodiversity Conservation*. Cheltenham and Northampton: Edward Elgar Publishing.

Tisdell, Clement A. 2015. *Sustaining Biodiversity and Ecosystem Functions: Economic Issues*. Cheltenham and Northampton: Edward Elgar.

Tisdell, Clement A. 2016. Genetic loss in food crops in the Pacific: Socio-economic causes and policy issues. *The Journal of Pacific Studies* 36: 23–40.

Tisdell, Clement A. 2017. *Economics and Environmental Change: The Challenges We Face*. Cheltenham and Northampton: Edward Elgar Publishing.

Tisdell, Clement A. 2019. India's biodiversity conservation responses to the UN's Sustainable Development Goals: Are they adequate? In *Economics, Ecology and The Environment*. Brisbane: The University of Queensland.

United Nations and NITI Aayog. 2018. *SDG India Index: Baseline Report 2018*. New Delhi: United Nations and NITI Aayog.

United Nations. 2015a. Transforming our World: The 2030 Agenda for Sustainable Development. Available online: https://sustainabledevelopment.un.org/post2015/transformingourworld/publication (accessed on 1 July 2020).

United Nations. 2015b. Sustainable Development Goal 15. Available online: https://sustainabledevelopment.un.org/sdg15 (accessed on 12 September 2019).

Wibowo, Drajad, Clement A. Tisdell, and R. Neil Byron. 1997. Deforestation and capital accumulation: Lessons from Kerinci-Seblat National Park, Indonesia. *Asia Pacific Journal of Environment and Development* 4: 11–28.