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Biodiversity conservation and Climate Change Approach

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ABSTRACT
Climate change has been linked to well-documented changes in physiology, phenology, species distributions, and in some cases, extinction. Projections of future change point to dramatic shifts in the states of many ecosystems. Accommodating these shifts to effectively conserve biodiversity in the context of uncertain climate regimes represents one of the most difficult challenges faced by conservation planners. A number of adaptation strategies have been proposed for managing species and ecosystems in a changing climate. However, there has been little guidance available on integrating climate change adaptation strategies into contemporary conservation planning frameworks. In the last 100 years average global temperature has increased by 0.74°C, rainfall patterns have changed and the frequency of extreme events increased. Change has not been uniform on either a spatial or temporal scale and the range of change, in terms of climate and weather, has also been variable. Biodiversity is crucial to human wellbeing, sustainable development and poverty reduction. Acknowledging the important role of biodiversity and its inextricable linkage to human survival in the face of significant impacts of biodiversity loss on the survival of human beings such that biodiversity can shape the path economic development takes in a country i.e. the plants, animals and ecosystems within a country influence the type of livelihoods available to people and the types of industries that emerge. The paper reviews the different approaches being used to integrate climate change adaptation into conservation planning, broadly categorizing strategies as continuing and extending on "best practice" principles and those that integrate species vulnerability assessments into conservation planning. We describe the characteristics of a good adaptation strategy emphasizing the importance of incorporating clear principles of flexibility and efficiency, accounting for uncertainty, integrating human response to climate change and understanding trade-offs.
Keywords: biodiversity, climate change adaptation; conservation planning; species conservation

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INTRODUCTION

India, known for its rich heritage of biological diversity. The varied edaphic, climatic and topographic conditions and years of geological stability have resulted in a wide range of ecosystems and habitats such as forests, grasslands, wetlands, deserts, and coastal and marine ecosystem. The key criteria for determining a hotspot are endemism (the presence of species found nowhere else on earth) and degree of threat [5]. Out of the 34 global biodiversity hotspots, four are present in India. Climate change is a serious environmental challenge that could undermine the drive for sustainable development. Since the industrial revolution, the mean surface temperature of Earth has increased an average of 1° Celsius per century due to the accumulation of greenhouse gases in the atmosphere. Furthermore, most of this change has occurred in the past 30 to 40 years, and the rate of increase is accelerating, with significant impacts both at a global scale and at local and regional levels. While it remains important to reduce greenhouse gas emissions and reverse climate change in the long run, many of the impacts of climate change are already in evidence. As a result,

governments, communities, and civil society are increasingly concerned with anticipating the future effects of climate change while searching for strategies to mitigate, and adapt to, its current effects. There is little doubt that the ongoing human forced climate change event will become one of the main contributors to the global loss of biodiversity and has already caused accelerated rates of species' extinctions and changes to ecosystems across the Earth [8, 10, 13]. Two international conventions, the United Nations Framework Convention on Climate Change (UNFCCC) and the Convention on Biological Diversity (CBD), recognize that climate change is one of the greatest threats to biodiversity and that some of the actions proposed to mitigate climate change may also be threats to biodiversity. Within the CBD, there are key programs of work (e.g., forest biodiversity, mountain biodiversity) that address climate change adaptation. And the UNFCCC explicitly recognizes that adaptation is vital to reduce the impacts of climate change. Despite the importance placed on adaptation in these conventions, and the recent development of frameworks and work plans, there has been slow progress in the development of appropriate methodologies for integrating climate change adaptation strategies into conservation planning [6, 9]**.** One of the reasons for this slow progress is the considerable confusion over what an adaptation plan/strategy/action is in contrast to contemporary conservation [1, 11, 15]. This confusion is not bound in the ivory towers of academia-policy makers, practitioners and donors from all over the world are commonly asking for more guidance over what adaptation

There is little doubt that the ongoing human forced climate change event will become one of the main contributors to the global loss of biodiversity and has already caused accelerated rates of species' extinctions and changes to ecosystems across the Earth [8, 10, 13]. Two international conventions, the United Nations Framework Convention on Climate Change (UNFCCC) and the Convention on Biological Diversity (CBD), recognize that climate change is one of the greatest threats to biodiversity and that some of the actions proposed to mitigate climate change may also be threats to biodiversity. Within the CBD, there are key programs of work (e.g., forest biodiversity, mountain biodiversity) that address climate change adaptation. And the UNFCCC explicitly recognizes that adaptation is vital to reduce the impacts of climate change. For example, the Bali Action Plan, which was adopted at UNFCCC COP13 in Bali, December 2007, identified adaptation as one of the key building blocks required for a strengthened future response to climate change to enable the full, effective and sustained implementation of the Convention (UNFCCC) through long-term cooperative action, now, up to and beyond 2012. At the Cancun Climate Change Conference in December 2010, Despite the importance placed on adaptation in these conventions, and the recent development of frameworks and work plans, there has been slow progress in the development of appropriate methodologies for integrating climate change adaptation strategies into conservation planning [6, 9]. One of the reasons for this slow progress is the considerable confusion over what an adaptation plan/strategy/action is in contrast to contemporary conservation [1, 11, 15]. This confusion is not bound in the ivory towers of academia-policy makers, practitioners and donors from all over the world are commonly asking for more guidance over what adaptation is (and is not), and what adaptation strategies are most appropriate at particular localities [1,11]. It has not helped that many groups conducting conservation are advocating "business as normal" solutions as adaptation strategies at international conferences and policy meetings, so as to ensure they get continued funding. In order to encourage debate and discussion among the conservation arena, we wanted to first describe some of the different strategies being used to integrate climate change adaptation into conservation planning (with some examples) and then to compare them. Specifically, the main objectives of this review are to categorize adaptation strategies that are currently being implemented around the world, and analyze their effectiveness for conserving biodiversity in the context of human-induced climate change.

IMPORTANCE OF BIODIVERSITY AND ITS IMPLICATIONS FOR HUMAN WELL-BEING

The global potential for biodiversity conservation to support poor communities is high. The top 25% of conservation priority areas could provide 56%–57% of benefits. The aggregate benefits are valued at three times the estimated opportunity costs and exceed $1 per person per day for 331 million of the world's poorest people [17]. Biodiversity underpins the form and function of ecosystems, which are of high value due to the life-supporting services they provide that meet human needs, both material and non-material. Biodiversity supports

ecosystem services that have economic value for humans in terms of direct or indirect use. For millions of Indians, biodiversity supports their very livelihoods and ways of life. In the Indian context especially, a range of socio-cultural values are derived from biodiversity that are philosophical, cultural and religious. Biodiversity and ecosystem diversity are reflected in the cultural and religious diversity of India through the varied values attached to biodiversity components and landscapes. India's many traditional knowledge systems and ethno-medicinal practices are based on a close understanding of and dependence on biodiversity. The cultural or religious importance of species and designation of sacred areas are well-known in India. The socio-cultural as well as aesthetic values attached to species and landscapes are reflected not only in the age-old tradition of sacred groves but also through formal designation of natural heritage sites which are most often also sites of significant local, regional or national cultural heritage. Contemporary systems of accounting do not fully capture the value of India's biodiversity, natural resources and ecosystem services. The national Gross Domestic Product (GDP) so far incorporates mainly market-based commodities such as some Non Timber Forest Products (NTFPs) and timber from forestry. Forests are estimated to contribute barely1.5% to the GDP even though, with a geographical area of more than 20% of the country, they provide multiple benefits that are not reflected in the national accounts [7].

The intangible nature of many of the benefits that are derived from ecosystem services and the different values that are attached to biodiversity make it challenging to define these monetarily and have them reflected in national accounting. However, through concerted efforts made nationally over the last several years, this gap is being closed. Valuation studies are being carried out to capture specific ecosystem service values; at the same time, holistic approaches are being adopted to cover multiple values [12, 7, 2-4]. Direct contributions to economies through market values often contribute only a proportion to the total value of ecosystem services. For example, the value of direct consumptive benefits from forests in Himachal Pradesh was estimated to be approximately 1% of the total benefits, while the value of indirect benefits from their ecosystem services accounted for nearly 93% of the total benefits [13].

THE FRAMEWORK

STRATEGIES FOR BIODIVERSITY CONSERVATION IN INDIA

There are several strategies which are adapted for conservation of natural resources, environment and biodiversity. Some of these are as follows.

Legislation

Formal policies and programmes for conservation and sustainable utilization of biodiversity resources dates back to several decades. The concept of environmental protection is enshrined in the Indian constitution in articles 48 a and 51a (g).

Biodiversity

The Biological Diversity Act 2002 was born out of India's attempt to realize the objectives enshrined in the United Nations Convention on Biological Diversity (CBD) 1992 which recognizes the sovereign rights of states to use their own Biological Resources. The Act aims at the conservation of biological resources and associated knowledge as well as facilitating access to them in a sustainable manner and through a just process. For purposes of implementing the objects of the Act it establishes the National Biodiversity Authority in Chennai.

Biodiversity conservation strategies

Since the biodiversity affects every living being on this planet and to a great extent is influenced by the human activities, the responsibility to protect it must be a shared goal of all the nations and communities. In this context the Convention on Biological Diversity (CBD (signed in 1992) was inspired by the world community's growing commitment to sustainable development. It represents a dramatic step forward in the conservation of biological diversity, the sustainable use of its components, and the fair and equitable sharing of benefits arising from the use of genetic resources. India was one of the early signatories to the UN CBD. Prior to CBD, the following were the legal provisions to conserve the biodiversity.

- Indian Forest Act, 1927
- Wildlife (Protection) Act 1972

- Forest (Conservation) Act 1980
- Biological Diversity Act, 2002.
- No. 18 of 2003, [5/2/2003]-The Biological Diversity Act, 2002
- S.O.753(E), [01/07/2004]-Coming in to force of sections of the Biodiversity Act, 2002.
- S.O.497 (E), [15/04/2004]-Appointment of non-official members on NBA from 1st October, 2003.
- S.O.1147 (E)-Establishment of National Biodiversity Authority from 1st October, 2003.
- S.O.1146 (E)-Bringing into force Sections 1 and 2; Sections 8 to 17; Sections 48,54,59,62,63,64 and 65 w.e.f. 1st October, 2003.
- S.O.2708 (E)-Central Government authorizes the officers to file complaints with regards to offences punishable under the Biological Diversity Act, 2002, Notification.
- S.O.120 (E)-Central Government authorizes the officers to file complaints with regards to offences punishable under the Biological Diversity Act, 2002,Amendment Notification.
- Designation of repositories under the Biological Diversity Act, 2002.

Rule

- G.S.R.261 (E), [15/04/2004]-Biological Diversity Rules, 2004.

Subsequent to becoming a party to CBD, India has taken the following steps towards biodiversity conservation:

- India passed the Biological Diversity Act in the year 2002. The act mainly addresses to genetic resources and associated knowledge by foreign individuals, institutions or companies, to ensure equitable sharing of benefits arising out of the use of these resources and knowledge to the country and the local communities. A National Biodiversity Authority was set up at Chennai on 1st October, 2003 as per the provision of the Biological Diversity Act, 2002.
- Biodiversity Action Plan was approved in November 2008 to enhance natural resource base and its sustainable utilization. India has recently ratified the Nagoya Protocol. The Nagoya Protocol would contribute to fair and equitable sharing of benefits accruing from utilization of genetic resources and would act as incentive to biodiversity-rich countries and their local communities to conserve and sustainable use their biodiversity.
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- India hosted the 11th Conference of Parties (CoP-11) to the Convention on Biological Diversity. This is also the first such conference since the launch of the United Nations Decade of Biodiversity in 2011. At the CoP-11, India has launched the Hyderabad Pledge and announced that our Government will earmark a sum of US$ 50 million to strengthen the institutional mechanism for biodiversity conservation in India. India will use these funds to enhance the technical and human capabilities of our national and state-level mechanism to attain the CBD objectives.
- During the last twenty years, plans for biodiversity conservation have been developed by the WRI and the IUCN with support from World Bank and other institution. Basically, the conservation plan should have a holistic approach and encompasses whole spectrum of biota and activities ranging from ecosystems at the macro level to DNA libraries at the molecular level. There are two approaches of biodiversity conservation namely in situ (on site) conservation which tries to protect the specie where they are, i.e., in their natural habitat and ex situ (off site) conservation which attempts to protect and preserve a species in place away from its natural habitat.

What is a climate change adaptation strategy?

Adaptation, as defined by the IPCC [2007], is an "adjustment in natural or human systems in response to actual or expected climatic stimuli or their effects, which moderates harm or exploits beneficial opportunities". Accordingly, a key aspect of integrating adaptation into conservation planning is to ascertain what the future will look like (and accepting the uncertainties around this), and then integrate this knowledge into all activities (and not just conservation-oriented planning) that are currently in place. While this is simple on paper, reviews of the conservation literature when searching on terms such as "climate change",

"climate adaptation", and "conservation planning and climate change" highlight that this integration of knowledge about future conditions into current planning is very rare [16]. There has been little critical review of what distinguishes some of the very familiar conservation approaches and actions (e.g., protecting corridors) touted as adaptation strategies as truly addressing the new or enhanced challenges faced by species in the context of rapidly changing climate conditions and their impacts. It is unclear which activities are appropriate and which are not. We hope to overcome some of this uncertainty by classifying some of the adaptation strategies that are currently being conducted. In order to do the following classification, we have reviewed much of the planning literature in academic journals as well as the grey literature generated from governments and nongovernment organisations over the past decade. We have also spent considerable time talking to conservation practitioners around the world who are undertaking climate change adaptation planning or action (some of these are captured in Andrade *et al.* [1] and Seimon *et al.* [11]. We note that our classification is highly subjective, and we provide this as not the final statement on the issue but rather to encourage discussion and debate over what is a suitable adaptation activity and what is not.

Integrated biodiversity conservation and climate change adaptation approaches can be instrumental in making people, places and wildlife more resilient to climate change. Beneficial outcomes may include improved food and water security, protection against the impacts of extreme weather events, more-secure livelihoods, the safeguarding of critical ecosystems and habitats, and carbon sequestration.

On Thursday, October 12, 2017 Climate links and World Wildlife Fund (WWF) hosted a Twitter chat to explore the benefits of integrating biodiversity conservation and adaptation. Chat participants weighed in on why conservation and climate change adaptation integration is important for achieving development goals, the co-benefits of integrating biodiversity conservation and adaptation, challenges to integration, and the role that ecosystem services play in supporting conservation and adaptation. Throughout the chat, participants also shared examples of successful integrated initiatives, including ecosystem-based adaptation approaches, that have benefited biodiversity and increased climate resilience. For example, WWF highlighted a project that is helping mountain communities in the snow leopard range in Asia coexist with the big cats, prepare for a resilient future and continue local stewardship of the environment.

Key takeaways and highlights from the chat:

- Integrating biodiversity conservation and climate change adaptation into development programming is important because healthy ecosystems underpin human well-being and economic development. This is especially true for vulnerable communities that directly rely on ecosystems for their livelihoods.
- Climate change is impacting wildlife habitats as well as human communities. In the case of the snow leopard, an integrated conservation-adaptation approach to protect its habitat in Asia can also strengthen water security. The snow leopard habitat overlaps with the Third Pole, a moniker for the Himalayan and Tibetan Plateau region because it stores the largest amount of permanent ice outside of the North and South poles. This serves as an important water source for over 1 billion people in Asia. Learn more by exploring the Third Pole Geo Lab.
- There are many ways to integrate conservation and adaptation. The Natural Capital Project shared how the Belize coastal management plan aims to protect mangroves, sea grass and coral reefs which in turn protect shorelines from extreme weather events leading to a decrease in coastal hazard risk, an increase in biodiversity and better economic opportunity for those who depend on fishing and tourism for their livelihoods. The Mountain Institute discussed how their Ancestral Technologies project in Peru restores wetlands, peat lands, and grasslands of the Puna ecosystems in the central Andes. Working with local families to revive ancestral water regulating systems has led to improved availability of local water for people and wildlife, increased livestock and crop productivity, and greater abundance of biodiversity in the surrounding ecosystem.
- Ecosystem-based adaptation (EbA) approaches can help bridge the gap between biodiversity conservation and climate change adaptation. Read about a new tool developed by IISD in collaboration with IUCN that helps practitioners identify and prioritize EbA options.

- Although the practice of integrating conservation and climate adaptation in development is growing, substantial challenges remain to making it wide scale. Participants described challenges such as:
  1. Rigid, separate funding that can pose challenges to integrated program design (take a look at USAID's report Integrating Biodiversity and Climate Change Adaptation in Activity Design for potential solutions to this challenge)
  2. Adaptive measures, like infrastructure, can negatively impact water systems and biodiversity
  3. Uncertainty about how and to what degree specific species, communities or habitats will be impacted by climate change. Lack of sufficient historical data means there is also uncertainty about which climate change effects to plan for
  4. Women, indigenous peoples, youth and other important stakeholders are often left out of the conversation which means their views priorities, needs and ideas will likely not be represented in activities. This impacts community buy-in and distribution of benefits, risking long-term success and sustainability of activities
  5. Finding community adaptation measures (food, water, energy) that deliver maximum benefits for wildlife as well as people
  6. Limited knowledge about status of biodiversity limits informed decision-making

MAJOR RECENT ADVANCES

Below we highlight four commonly proposed adaptation strategies for biodiversity conservation given climate change. In this overview report we focus on a selection of commonly proposed *in situ* adaptation strategies in response to the impacts of climate change. For a journalistic overview of *ex situ* strategies, such as captive breeding, seed and gene banking, in the context of responding to climate change, the reader is referred. The first three approaches seek to reduce extinction risk primarily by addressing the effects of climate change on species distributions (the pattern), and in part by passively influencing mediating drivers (for example, providing corridors for movement). The last considers a more controversial interventionist option

Managing the matrix as a buffer should both protect core populations (but often not in the matrix, rather by insulating reserves) and also facilitate shifts across a landscape; new and dynamic reserves function primarily by protecting core populations and also by accommodating (rather than facilitating) target movement.

New reserves and corridors

The most common proposed approach for conservation adaptation is to expand linked networks of protected areas including migration corridors. These researchers argue that the existing network does not provide enough area to allow for organisms to respond autonomously to changing climatic conditions.

The principal purpose of new protected areas is to mitigate the risk of extinction by providing the potential for species distributions to shift; a secondary contribution is that they may also enhance micro-evolutionary potential through enhanced population size and diversity. Therefore, corridors may reduce extinction risk by enabling the passive shifting of some species to new geographic ranges, and by reinforcing species distributions (in a metapopulation context).

A crucial challenge for this approach is determining where to site corridors and new reserve areas. The current state-of-the-science is to use species distribution models or bio-climate envelope models to generate projections of future species' responses to various climate scenarios. Many view this information as providing essential insight into the strategic siting of new protected areas. At the same time, myriad uncertainties impact the validity of these projections. Efforts to address these uncertainties are ongoing, but many uncertainties may remain (or even increase) within decision-making time frames nonetheless.

Matrix as buffers

As a complement to protected areas expansion, many researchers highlight the importance of matrix areas or the wider landscape, as being particularly crucial for biological adaptation in an era of change. For example, some land uses, such as forestry or agro-forestry (or lower impact marine activities), may provide a spatial buffer for populations as they respond to climate change and move outside core reserves. In order for this proposal to be effective, matrix areas must be of sufficient size, and landowners must be willing to

adjust their activities as monitoring indicates. Incentives may increase the viability of this proposal. The logic of this approach is similar to new protected areas and corridors: more benign matrix areas may passively facilitate species shifts by promoting movement across land- and seascapes; they may also reinforce species distributions at fine scales (around reserves).

Dynamic reserves

The management of matrix areas for biodiversity objectives further supports a third proposal. Dynamic reserves implemented on managed landscapes (or seascapes) are areas whose locations and levels of protection change through time and space. This approach may be particularly important in areas where there is little spatial opportunity available for new core protected areas. At the same time, the issue of ownership and property rights requires further examination in different contexts in order to more fully understand the implementation challenges of this potential approach in particular localities. This approach involves the future passive facilitation of shifting species distributions in response to future conditions, rather than prediction of conditions.

Assisted colonization

More controversial is the interventionist proposal for 'assisted migration' or 'assisted colonization'. Both describe a management option in which species are deliberately introduced into an area where it has not existed in recent history for the purpose of achieving a conservation objective. This proposal has emerged in response to the mounting evidence that some species may not be able to track changing climatic conditions quickly enough, or because there are natural or human barriers in the way. This approach would involve actively shifting species distributions.

The assisted colonization proposal is at odds with current reserve management in which substantial efforts are directed at keeping non-native species out. It also carries with it substantial risks because introduced species may become invasive and displace other valued ecosystem elements. Nevertheless, assisted colonization may be seen as a necessary last resort in some cases. Other researchers have inferred the risk of potential invasion of assisted colonization from comparisons of intra-continental and inter-continental past invasions.

Future Directions

In this last section we identify a collection of key challenges and issues to be resolved for reserve management suited for an era of change. We divide these challenges into five categories: focus on processes, projections and uncertainties, monitoring, implementation, and norms and expectations.

Focus on processes

In the main, conservation activities have focussed on maintaining biodiversity patterns and indirectly enabling natural processes: for example, by protecting space for species to exist (represented by the first three categories referred to above). As climate change influences mediating drivers, the attributes that make certain places conducive to species flourishing (critical habitat) will change, and in some cases disappear. For species whose critical habitat changes dramatically or disappears, it will be increasingly necessary to consider approaches that involve the active management of mediating drivers.

Restoration activities have long involved management of disturbance regimes, ecosystem function, and species interactions. Adapting to the impacts of climate change may require more such active management, including assisted colonization, and other interventions, such as enhancement of evolutionary adaptation, and active maintenance of pre-climate change processes and conditions.

Projections and uncertainties

A key area of future research is to improve our capacity for forecasting species responses to changing climate - for example, by incorporating biotic interactions in bio-climate models, and refining species-specific process-based models. Other areas include the longstanding scientific challenge of understanding when a given species will become invasive in a given context Efforts to reduce the ecological uncertainties just mentioned will represent a key contribution to the literature on adaptive reserve management.

In addition to ecological uncertainties, there are various parametric and model uncertainties relating to species distribution models. This includes uncertainties relating to so-called 'unknown unknowns'; where key processes are not yet recognized, understood or

incorporated into model structure, or as parameters. Yet such processes may play critical roles in ecosystem dynamics nonetheless. Moreover, there are uncertainties relating to the climate scenario models that influence the outputs of envelope models. Lastly, there are critical socio-political uncertainties (in values, impacts, responses and feedbacks).

Thus, a second key area of future research is the development of conservation approaches that are robust to uncertainty, recognizing that many of the above uncertainties are irreducible. As ecological and social systems co-adapt, non-linear dynamics will lead to perpetually surprising outcomes. Therefore, even with the best scientific research and most comprehensive models, species responses may surprise us. Indeed, uncertainties may also increase with new research and insights. Thus, the implementation of safe-to-fail adaptive management policies may be as or more important than efforts to reduce uncertainties.

Monitoring

In many ways, conservation adaptation requires recognition of what is changing and where (for example, assisted migration, dynamic reserves). Thus, there is an urgent need for monitoring of impacts. While existing monitoring programs could be adapted and used for this purpose, programs specifically targeted to assessing the impacts of climate change would support the most effective adaptation responses possible under highly uncertain circumstances.

Implementation

So far, the adaptation proposals outlined above have focussed primarily on biological dimensions. This effort has provided a critical foundation, but land-use decisions, including reserves, are social decisions made in the context specific places. Therefore, a key area of future research is to identify through applied case studies the factors that determine the relative receptivity or resistance of communities to new and additional conservation measures. This effort will provide crucial insights by which conservationists can foster socially sustainable conservation action.

Changing norms and expectations for reserve management

To date, core protected areas have been managed with a preferred minimum intervention (with exceptions for active management including controlled burns, programs to limit grazers, and efforts to minimize the impacts and distributions of invasive species, for example). Proposals for more widespread intervention, including assisted colonization, raise many unanswered questions. When do we intervene and to what extent? To what extent and under what circumstances are we willing to sacrifice the persistence of one species to save another? Who decides? And by what decision process? Addressing these questions, including latent and even more controversial proposals for conservation triage, will be a key challenge moving forward.

Ultimately, one of the biggest challenges to fostering biological adaptation may be a willingness across stakeholders, scientists and managers to re-calibrate existing expectations of nature and reserves in responding to an era of global change.

CONCLUSIONS

It is imperative that the phenomenon of biodiversity is very vast, complex and interdependent and there is no single over-arching effect of diversity on either productivity or stability. The realized effects will depend heavily on environmental context and the time scale over which the effects are studied. However, it has become obvious that biodiversity is indeed important for both managed and natural ecosystems, though the relative contributions of diversity and composition remain unclear. It is therefore necessary for legislators to understand the basic science in order to maintain diversity at its current levels. If current human growth and resource management patterns do not change, it is likely that we will lose many important species, and the ecosystems of the world may never recover. In present paper the various conservation strategies by government, voluntary organizations, public participation as well as the individual efforts have been discussed, that how they commutatively plays a major role for the conservation of the biodiversity.

Human is only one more of natural creatures and should not be alien to the other life-forms. We have no moral right to destroy nature and other beings that dwell on earth. We should treat all animals and plants with compassion. Every individual can make a small and yet significant effort in the race to save our planet and conserve biodiversity.

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