



Biodiversity Conservation: Performance Measurement And Strategic Approaches

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Abstract:

Biodiversity conservation is a crucial component of environmental management, necessitating robust performance measurement systems to assess conservation effectiveness. This paper explores key considerations in designing evaluation frameworks for biodiversity initiatives undertaken by corporations, NGOs, and governmental agencies. It emphasizes the importance of setting clear objectives, selecting relevant performance indicators, and ensuring that monitoring aligns with predefined conservation goals. Given the complexity of biodiversity, traditional metrics such as species richness may be insufficient. Thus, the paper advocates for a more comprehensive approach incorporating species abundance, genetic diversity, ecosystem functionality, and socio-economic factors. By integrating SMART objectives and stakeholder perspectives, this framework enhances accountability and adaptability in conservation strategies. The proposed approach aims to guide future efforts in achieving measurable and sustainable biodiversity outcomes.

Keywords: Biodiversity Conservation, Performance Management, Conservation Monitoring.

Introduction:

The development of systems to evaluate the performance of biodiversity conservation measures is an increasingly critical aspect of conservation management. In recent years, there has been significant overlap between corporate biodiversity actions and conservation projects undertaken by non-governmental organizations (NGOs) and governmental agencies. This convergence arises due to the shared goals of preserving biodiversity, despite differences in scope, scale, and the actors involved. For instance, a conservation project may involve the management of an important habitat to enhance biodiversity by restoring degraded areas and regulating unsustainable use. Such actions could be viewed as biodiversity offset measures by corporations or as part of a protected area management program run by a conservation agency or an NGO.

Furthermore, corporations are increasingly developing and implementing Biodiversity Action Plans (BAPs), which often cover their landholdings and address broader biodiversity management opportunities beyond the immediate impacts of specific projects. Many corporations collaborate with local or national NGOs and statutory conservation agencies to carry out these plans and projects.

The need to measure biodiversity conservation performance arises from the need to understand whether conservation objectives are being achieved, how effectively biodiversity is being managed, and what improvements might be necessary. Establishing a clear framework for measuring conservation performance is essential to ensure that resources are allocated effectively and that conservation strategies are adjusted to enhance biodiversity outcomes. Monitoring and

assessing conservation performance require setting measurable objectives and selecting appropriate indicators that align with these objectives. These systems also need to be adaptable to varying scales and audiences, whether at the corporate level, for NGOs, or governmental agencies.

Importance of Measuring Biodiversity conservation Performance:

One of the first and most important steps in developing a conservation performance measurement system is to establish clear objectives. It is crucial to define what attributes of biodiversity need to be measured, why they should be measured, and who will benefit from the information. The necessity for clear objectives becomes evident when considering the complexities involved in biodiversity, which cannot be measured directly due to its inherent variability. Biodiversity encompasses a vast array of species, genetic variations, ecosystems, and functional roles within the environment. Therefore, it is not enough to measure biodiversity simply in terms of species richness; a more comprehensive approach is necessary.

Monitoring is a critical component of performance measurement. It is the process of collecting and analyzing repeated observations or measurements to assess changes in conditions and progress toward management objectives. To ensure the efficiency and effectiveness of monitoring, it should be directly tied to predefined conservation objectives. Often, monitoring is poorly planned, with data being collected without a clear understanding of what questions need to be answered, leading to ineffective outcomes. A well-designed biodiversity conservation performance monitoring program will focus on specific, measurable objectives and will help to determine whether these objectives have been achieved and how progress can be quantified.

What is to be Measured?

Defining what to measure in terms of biodiversity conservation performance is a complex task. The difficulty in measuring biodiversity stems from its multifaceted nature, where direct quantification is not feasible. For example, although species richness is often used as an indicator of biodiversity, it has limitations and does not necessarily reflect the true ecological value of an area. Furthermore, biodiversity is often evaluated in terms of ecosystem services, which are even more challenging to define and measure.

A more comprehensive approach to measuring biodiversity involves considering various aspects such as species abundance, distribution, genetic diversity, and ecological roles. In practice, biodiversity indicators or proxy measures are often used, based on available data and the specific objectives of the conservation project. These indicators might focus on key species, habitat quality, ecosystem functioning, or other attributes critical to biodiversity conservation. By focusing on specific, measurable targets for conservation features, it becomes possible to assess whether the project or management program is achieving its intended outcomes.

When setting biodiversity conservation objectives, it is important to include all relevant stakeholders, such as local communities, to ensure that the conservation goals reflect the social, economic, and cultural values of biodiversity. In addition to traditional scientific measures, conservation objectives should address biodiversity components that are of critical importance for local communities, ecosystem services, and overall ecological integrity. To this end, objectives should be specific, measurable, achievable, realistic, and time-bound (SMART), ensuring that progress can be effectively monitored and adjusted as necessary.

Key Biodiversity Features for Conservation Focus:

The identification of key biodiversity features is essential for determining which elements of biodiversity will be the focus of conservation efforts. These features might include globally or nationally threatened species, important habitats, species with high ecological or cultural value, or those that provide vital ecosystem services. A well-defined list of key biodiversity features should be developed in consultation with stakeholders, considering both ecological and socio-economic factors. Moreover, attributes of these features—such as population size, habitat area, reproductive success, and overall condition—should be identified to set measurable targets for monitoring and evaluation.

The identification of such features and the setting of clear, measurable objectives will guide the development of conservation action plans, making it possible to assess whether biodiversity conservation efforts are on track and where adjustments are needed. Through effective measurement and monitoring systems, conservation programs can be made more accountable, adaptive, and ultimately more successful in preserving biodiversity for future generations.

Conservation Measures of Biodiversity:

Ex-situ conservation: It refers to conservation of components of biodiversity outside their natural habitats, e.g. zoos, museums, gene banks, botanical gardens/arboretums, used for threatened and endangered species to avoid their extinction, also known as captive conservation. A lot of effort is under way to collect and preserve the genetic material of crops, animal, bird and fish species (Agarwal et al., 2009; Agarwal, 2011). This work is being done by institutions such as the National Bureau of Plant Genetic

Resources, National Bureau of Fish Genetic Resources, the National Bureau of Animal Genetic Resources, etc. Conservation measures have also included reintroduction, captive-breeding programs and artificial feeding. Reintroduction of an animal or plant into the habitat from where it has become extinct is another form of ex situ conservation. For example, the Gangetic gharial has been reintroduced in the rivers of Uttar Pradesh, Madhya Pradesh and Rajasthan where it had become extinct. Seed banks, botanical, horticultural and recreational gardens are important centers for ex situ conservation. Ex-situ conservation measures complement to in-situ conservation.

In-situ conservation: It refers to conservation of ecosystems and natural habitats including maintenance and recovery of viable populations of species in their natural habitats. Approximately, 4.2 % of the total geographical area in India has been earmarked for extensive in-situ conservation of habitats and ecosystems. A protected area network of 102 national parks, 18 biosphere reserves and 448 wildlife sanctuaries has been created. The results of this network have been significant in restoring viable population of large mammals such as tiger, lion, rhinoceros, crocodiles and elephants.

Community Participation in Biodiversity Conservation:

It is being recognized that no legal provisions can be effective unless local communities are involved in planning, management and monitoring conservation programmes. There are several initiatives to do this, both by government as well as non-governmental organizations. For example, the Joint Forest Management philosophy stresses involvement of village communities in regenerating and protecting degraded forest land in the vicinity of villages. Successful conservation strategies will have to have the

confidence and participation of the local communities (Dobhal et al., 2011).

International efforts for biodiversity conservation: Conserving biodiversity is not an issue confined to any one country or community. It is a crucial global concern. Conservation of biological diversity and sustainable use of its components came into the limelight in 1972 (United Nations Conference on Human Environment; Stockholm). In 1973, UNEP

identified conservation of biodiversity as a priority area, hence there was need to get the legal mandate for conservation of world resources. There were negotiations for a legally binding instrument to address biological diversity and its loss to enhance fairness and equity in sharing of the benefits of biodiversity; this led to the opening of the Convention on Biological Diversity in 1992; (CBD, 2011). The convention was inspired by the growing concern all over the world for sustainable development.

The convention objectives were:

- Conservation of the biological diversity;
- Sustainable use of its components;
- A fair and equitable sharing of its benefits.

This was the first global comprehensive agreement that addressed all the aspects of biological diversity; genetic resources, species diversity and ecosystem diversity. Several international treaties and agreements are in place in the attempt to strengthen international participation and commitment towards conserving biodiversity. Some of these are:

- Rio-de-Janeiro under the United Nations Conference on Environment and Development (UNCED)/ Earth Summit
- African Convention on Conservation of nature and natural resources.
- The Ramsar Convention on Wetlands of international importance.

- International Union for the Conservation of nature (World Conservation Union).
- Convention on International trade for endangered species (CITES).
- International Convention for the Protection on birds.
- International Board for Plant genetic resources.
- World Resources Institute.
- World Wide Fund for Nature.
- Convention on Conservation of migratory species of wild animals.
- International Convention for the Regulation of whaling.
- UNESCO programme on Man and biosphere.

Indian Efforts for Biodiversity Conservation:

In India, protecting and promoting biodiversity has always been an integral part of culture and civilization. This can be seen in the thousands of sacred groves that are found all over the country. The Indian traditional systems of agriculture and medicine depend on plant and animal biodiversity. India is one of the early signatories to the UN Convention on Biological Diversity (CBD). Even prior to CBD, India has already been having legal provisions dealing with aspects relating to biodiversity. Indian Forest Act 1927 and Forest (Conservation) Act 1980 deal with management of forests and conservation of forest land respectively. Wildlife (Protection) Act 1972 is for the protection of wild animals, birds and plants, and basically aims at protecting, propagating or developing wildlife or its environment through national parks, sanctuaries etc. Besides, the Act has a provision to prohibit picking and uprooting of specified plants. Despite population pressure on land, India has more than 600 Protected Areas, covering approximately 5% of the total geographical area of the country, in a network of National Parks, Wildlife Sanctuaries, and Conservation

Reserves. India has special programmes for some high-profile endangered species like tigers and elephants. In 2010, the country level status assessment for tigers showed an increase in their number to an estimated 1706 from an estimated 1411 in the year 2006. Subsequent to becoming a party to the CBD, India has taken the following steps towards maintenance of biodiversity.

- India has passed and notified the Biological Diversity Act, 2002. The act primarily addresses access 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 people.
- As per the provision of the Biological Diversity Act 2002, a National Biodiversity Authority has been set up at Chennai on 1st October, 2003 to facilitate implementation of the Act. In compliance with the provisions of the Act, states have formed State Biodiversity Boards and at local level, Biodiversity Management Committees have been formed.
- India chaired the Group of Like Minded Mega diverse Countries (LMMCs) for a period of two years (March, 2004 to March, 2006). India played an important role in the development of a common position of LMMCs for the negotiations for developing an international regime on access and benefit sharing.
- Subsequent to the approval of the National Environment Policy (NEP) by the Cabinet in 2006, National Biodiversity Action Plan (NBAP) was approved in November 2008 to augment natural resource base and its sustainable utilization. In the recent past, India has taken the following steps in the direction of biodiversity conservation.
- India has recently ratified the Nagoya Protocol and formalized the commitment

to it. The Nagoya Protocol on access and benefit sharing has been negotiated under the aegis of CBD, and adopted by the Tenth Conference of Parties (COP-10) held in Nagoya, Japan in October 2010. The Nagoya Protocol would contribute to fair and equitable sharing of benefits ensuing from utilization of genetic resources would act as incentive to biodiversity-rich countries and their local communities to conserve and sustainably use their biodiversity.

- India has, for the first time, 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 during India's presidency of the Conference of Parties to the Convention on Biological Diversity 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 mechanisms to attain the Convention on Biological Diversity objectives.
- India has also earmarked funds to promote similar capacity building in developing countries.
- In recent years there has been concern that this public knowledge may become restricted in its use because of the application of the modern intellectual property system. India has tried a unique approach to protection of traditional knowledge by establishing a Traditional Knowledge Digital Library. This database has 34 million pages of information in five international

languages in formats easily accessible by patent examiners. This Library promotes the objectives of the Nagoya Protocol on the issue of protection of codified traditional knowledge systems such as the celebrated Ayurveda. India decided to build this knowledge database because of the patent on the use of 'neem' extract in Europe and another on the use of 'turmeric' as a healing agent. Since then, because of this database, over 1000 cases of biopiracy have been identified and over 105 claims withdrawn or cancelled by patent offices.

- Many development schemes have been realigned to provide biodiversity-related benefits. This is vital to protect habitats, including our water bodies, which are beyond our protected areas. The Mahatma Gandhi National Rural Employment Guarantee Scheme, for example, aims to create legally mandated green jobs for every rural household in our country.

Suggested Strategic goals for Biodiversity Conservation:

- Address the underlying causes of biodiversity loss by mainstreaming biodiversity across government and society.
- Reduce the direct pressures on biodiversity and promote sustainable use.
- Improve the status of biodiversity by safeguarding ecosystems, species and genetic diversity
- Enhance the benefits to all from biodiversity and ecosystem services.
- Enhance implementation through participatory planning, knowledge management and capacity building.

Conclusion:

The effectiveness of biodiversity conservation efforts depends on a robust

performance measurement system that incorporates scientific, ecological, and socio-economic dimensions. A well-structured monitoring framework ensures that conservation strategies are effective, adaptable, and inclusive. International collaborations, national policies, and community participation play a crucial role in achieving sustainable biodiversity outcomes. Strengthening biodiversity conservation frameworks with SMART objectives and key stakeholder engagement will enhance long-term conservation success.

References:

1. Agarwal, N.K.,(2011). Cryopreservation of Fish Semen In. J.P. Bhatt, Madhu Thapliyal and Ashish Thapliyal (eds.), Himalayan Aquatic Biodiversity Conservation & New Tools in Biotechnology, Transmedia Publication, Srinagar (Garhwal) Uttarakhand. pp: 104-127.
2. Agarwal, N. K., Raghuvanshi, S.K. and Saini, V., (2009). Cryopreservation of snowtrout (*S.richardsonii*) milt as a means for propagation and ex-situ conservation of species In. W.S. Lakra, A.K., Singh and P.C. Mahanta (eds.), Fish Genetic Resources, Narendra Publishing House, New Delhi. pp: 273-284.
3. CBD.(2011). Incentive measures for the conservation and sustainable use of biological diversity: Case studies and lessons learned. CBD Technical Series No.56. pp 64
4. CBD.(2014). Fast facts: Biodiversity supporting development' in CBD- Get ready for 2015. In www.cbd.int/spIUCN, Facts and figures on biodiversity. Retrieved on 02 sep 2015
5. Dobhal, R., Kumar, A. and Rawat S., (2011). Conservation and management of bio-resources In Uttarakhand, India In. Y. Gokhale and A.K. Negi (eds.), Community based bio-diversity conservation in the Himalay, The Energy and Resource Institute (TERI), New Delhi. pp: 1-19.