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Opinion

# Prevention Paradox in Global Biodiversity Conservation

**Gun Mardiatmoko***

Forestry Department, Faculty of Agriculture, Pattimura University, Indonesia

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***Corresponding author:** Gun Mardiatmoko, Forestry Department, Faculty of Agriculture, Pattimura University, Poka 9723, Ambon, Indonesia

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## Abstract

From the standpoint of human health, taking preventive actions tends to be less costly compared to providing treatment. On the other hand, when viewed through the lens of biodiversity preservation, the reverse is accurate since In-Situ conservation, as a preventive strategy, costs more than Ex-Situ conservation. Many species that have been declared extinct are genuinely lost forever and none exist anymore; however, there are instances where they surprisingly reemerge in their environments after a long absence. This highlights the significance of the paradox of In-Situ conservation along with the support from Ex-Situ conservation. Safeguarding the survival of wild plants and animals in their native ecosystems is significantly more strategic, vital and sustainable than merely relying on Ex-Situ preservation measures. Prioritizing the prevention of extinction in nature through In-Situ methods should be paramount as it shields species and their habitats, upholds greater genetic diversity and is inherently more ethical and financially sustainable. In practice, contemporary approaches to conservation require cooperative initiatives between In-Situ and Ex-Situ strategies. Within the realm of conservation development, Ex-Situ plays a crucial role as a necessary backup, providing vital resources like:

A. A source for germplasm and genetic material, where botanical gardens and seed banks act as "life reserves." Consequently, Ex-Situ conservation becomes essential for the efficient storage of germplasm via methods like tissue culture and cryopreservation.

B. Situations when wild populations become critical, especially for species with very limited numbers

C. Supplying individuals for restoration efforts, as seen in modern strategies such as the One Plan Approach that effectively merges both methodologies. There is a concern regarding the cuscus (*Phalangeridae spp*) a species typical of the forests in the Wallacea and Papua Regions of Eastern Indonesia, which is on the brink of extinction. Currently, it appears that not every type of cuscus has been granted protection by the Minister of Environment, despite the fact that nearly all are nearing extinction and there are no indications of progress towards In-Situ conservation development as a preventive measure.

## Introduction

From the viewpoint of human health, taking preventive actions is generally less costly than providing treatment. On the other hand, when looking at biodiversity conservation, the situation flips; In-Situ conservation, which serves as a preventive strategy, tends to be pricier than Ex-Situ conservation. Many species that have been labeled as extinct are truly lost forever and will not return, though there are instances where they resurface in their old habitats after many years. Therefore, the prevention dilemma surrounding In-Situ conservation gains significance and is better supported by Ex-Situ conservation. What stands out is the fast pace of habitat destruction that leads to biodiversity loss due to activities such as reforestation and forest degradation, poaching and illegal logging, illegal wildlife trade and other factors. This situation is made worse by the growing effects of climate change resulting from human activities.

## Discussion

### The importance of prevention in natural habitats as a top priority

In my opinion, stopping the disappearance of wild plants and animals in their natural environments is much more effective, vital and sustainable than creating off-site conservation efforts. Focusing on preventing extinction in natural settings should be prioritized as it safeguards species and their habitats, ensures greater genetic diversity and is inherently more ethical and economical. This approach addresses the main issue directly. Some reasons supporting this viewpoint are:

A. Genetic problems in limited populations. Even with advanced captive breeding facilities, genetic issues remain serious. In certain cases, genetic variation in captivity may be even lower than in the wild due to harmful inbreeding effects. A genetically weak population in captivity will find it hard to thrive long-term if wild individuals in their environment have already vanished.

B. Continuous Threats. This is due to the rising rate of extinction. Nearly all nations confront a major risk of wildlife extinction. In Indonesia, known for its rich biodiversity, dangers like deforestation, habitat loss and climate change threaten many species [1]. If we only focus on constructing off-site conservation spaces like Noah's Ark, we unintentionally overlook the fundamental issue: habitat destruction.

C. Preserving Ecosystem Functions and Connections. In-situ conservation enables species to exist within a complex network of life. When a species is safeguarded in its original environment, the whole ecosystem it depends on is also preserved. This cannot be replicated by botanical gardens or captive settings. Research shows that in-situ conservation is effective in protecting species while sustaining healthy ecological relationships.

D. Successful reintroduction is not assured. Returning animals from captivity to the wild pose's significant challenges. For illustration, birds that have been in quarantine for extended periods often resist flying far from their safe zone. In essence, simply rehabilitating species in captivity does not ensure their survival once they are put back into nature, which is filled with dangers.

### Modern conservation development practices require complementary measures between in-situ and ex-situ conservation

In methods of conservation development, their function is vital as an emergency backup, such as:

A. Providers of germplasm and genetics, where botanical gardens and seed banks act as "secure stores of life." Therefore, Ex-Situ conservation becomes essential for the successful safeguarding of germplasm through techniques like tissue culture and cryopreservation.

B. When wild species are critically at risk, with only a small number of individuals left, Ex-Situ conservation shifts from being a choice to an absolute requirement to avoid complete extinction.

C. Supplying individuals for restoration: modern strategies like the One Plan Approach merge both aspects. Research on fishing cats in India has revealed that well-organized captive breeding initiatives can supply healthy individuals for annual reintroduction into wild populations, thus ensuring the genetic stability of both groups. The environment of Ex-Situ conservation development resembles that of an emergency department. It should never replace natural habitats, but it plays a crucial role for species facing imminent extinction and for reintroduction efforts [2].

### Preventive measures for wildlife facing extinction have not yet been fully implemented

Indonesian legal frameworks, such as Law No. 5 of 1990 regarding the Protection of Biological Natural Resources and Ecosystems, forbid actions that might compromise the integrity of nature reserves, which includes the collection of safeguarded plants and animals. A lesser regulation is the Regulation of the Minister of Environment and Forestry No. 20 of 2018, which addresses protected species of flora and fauna. These safeguarded species are uncommon and thus are shielded by multiple laws, such as the cuscus (Phalangeridae spp), often located in the Wallacea and Papua regions, including Ambon Island [3]. However, not every cuscus is under protection, only specific types. Local hunters of cuscus usually do not make a clear distinction between those that are protected and those that are not. The hunting is mainly done by Christians, as cuscus is considered a highly valued dish during religious celebrations. This does not apply to Muslims, who do not eat it. Communities on small islands consist of neigh boring Christian and Muslim villages and at times, Christian hunts cross into Muslim territories. Additionally, parts of the cuscus are utilized as adornments for the ceremonial outfits of traditional leaders. Some cuscuses are sold openly in markets, while others are kept as pets. Therefore, these activities are likely to lead to the extinction of the cuscus, as initial efforts for In-Situ conservation have yet to be put in place [4,5].

## Conclusion

Preventive actions for safeguarding wildlife via In-Situ conservation remain insufficient when compared to the swift pace of species loss linked to shrinking forest areas in different locations. This situation is worsened by unlawful logging, poaching and the growing demand for exotic wild animal meat. Hence, it is essential to give priority to In-Situ conservation as soon as possible, despite the higher costs involved. I believe that the financial plan and regulations should designate around 70% for the preservation of natural habitats (preventive actions) and 30% for improving captive breeding centres and contemporary genetically informed breeding initiatives for species that are critically endangered.

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