Financier performance standard misaligned with emerging nature positive requirements: an orangutan case study

Authors: Meijaard, Erik[1,2,3], Narain, Divya[4], Ancrenaz, Marc.[1,5], Wich, Serge A.[3], Dennis, Rona A.[1] and Maron, Martine.[6,7*]

[1] Borneo Futures, Bandar Seri Begawan, Brunei Darussalam
[2] Durrell Institute of Ecology and Conservation, University of Kent, Canterbury, United Kingdom
[3] School of Biological and Environmental Sciences, Liverpool John Moores University, Liverpool L3 3AF, United Kingdom
[4] Smith School for Enterprise and the Environment, University of Oxford
[5] Hutan, 88400 Kota Kinabalu, Sabah, Malaysia
[6] School of the Environment, The University of Queensland, Brisbane, Queensland, Australia

[7] Centre for Biodiversity & Conservation Science, The University of Queensland, Brisbane, Queensland, Australia

*__Corresponding author__: m.maron@uq.edu.au

__Author email addresses__: Erik Meijaard: emeijaard@borneofutures.org; Divya Narain: divya.narain@smithschool.ox.ac.uk; M Ancrenaz: marc.ancrenaz@gmail.com; Serge A Wich: sergewich@gmail.com; Rona A Dennis: rona.dennis@borneofutures.org

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Abstract

Aimed at conserving biodiversity and sustainably managing natural resources, the International Finance Corporation's (IFC) Performance Standard 6 (PS6) is a key environmental safeguard for development projects. Among the species most affected by projects subject to PS6 are great apes, whose survival depends on stringent conservation measures. Of these great ape species, the three orangutan species are rapidly declining due to habitat loss and fragmentation and unsustainable mortality rates. We assessed the types of net outcomes PS6 requires when development projects affect the habitat of Critically Endangered orangutans (*Pongo* spp.), which are highlighted in the PS6 for special protection needs. While PS6 may require relative gains—for example, slowing the rate of biodiversity decline compared to a deteriorating baseline—it falls short of requiring the absolute gains necessary to halt biodiversity loss by 2030, in line with international commitments such as the 2022 Kunming-Montreal Global Biodiversity Framework. Implementation of PS6 in areas of critical orangutan habitat is therefore unlikely to prevent further losses for species like orangutans. In the context of a review of the IFC's Performance Standards, which were last updated in 2019, we recommend revisions that align PS6 with global commitments to absolute improvements in biodiversity.

Introduction

Non-human great apes ('great apes' hereafter) are facing existential threats. Those that remain are concentrated in regions characterized by rapid population growth, poverty, and food insecurity, where they are under intense pressures from agriculture, mining, infrastructure development and poaching (Meijaard et al. 2023). Orangutans (*Pongo* spp.) are especially vulnerable due to a combination of slow reproductive rates and high mortality from habitat destruction, killing and removal from the wild (Emery Thompson and Sabbi 2024). Over two decades, an estimated 100,000 orangutans were lost, despite USD 1 billion in conservation investments (Santika et al. 2022; Voigt et al. 2022). To prevent further decline, it is essential to avoid habitat destruction, implement strict threat management, and ensure effective long-term habitat conservation (Meijaard et al. 2022) – an especially challenging task in the face of human development imperatives.

The challenge of reconciling the pressure to develop with the imperative to protect species like orangutans is reflected in policies and guidance of development project financiers including the International Finance Corporation (IFC), a part of The World Bank Group. The IFC finances private-sector projects in emerging economies, including in orangutan range states. In recognition of the risk of undesirable impacts from these projects, IFC requires clients to adhere to a series of performance standards. The IFC's Performance Standard 6 (IFC 2012), is often considered the industry's best practice standard for safeguarding biodiversity. Over 37 other development banks and 130 private banks (Equator Principle Financial Institutions) have benchmarked their financing requirements against the IFC standards (Narain et al. 2023). IFC Performance Standards (PS) are applied to billions of dollars in project financing globally on an annual basis, with 16.7 billion USD routed through IFC in 2023 alone (IFC 2024).

Launched in 2012 (IFC 2012), with updates in 2019 (IFC 2019), PS6 recognizes that protecting and conserving biodiversity, maintaining ecosystem services, and sustainably managing living natural resources are fundamental to sustainable development. PS6 requires that appropriate avoidance, minimization and restoration measures are applied. To achieve this outcome in situations where residual impacts remain after the application of the mitigation hierarchy, it requires biodiversity offsets.

Biodiversity offsets are measures taken to counterbalance negative impacts on biota. Effective offsetting requires that for a given residual negative impact, an equivalent benefit in type, amount and duration is created elsewhere (BBOP 2012; Gardner et al. 2013). The aim is to achieve at least no net loss, or net gain. While this sounds straightforward, net gain can vary in its meaning, depending on the baseline or counterfactual approach adopted (Bull et al. 2013; Maron et al. 2018). Most offset approaches only require no net loss, or net gain, to be achieved relative to a

counterfactual scenario – what would have happened without the impact and the offset (Maron et al. 2025). It is therefore possible for offsets to achieve relative no net loss or net gain, but for there to be less of the biota in question after the impact than before it.

The requirements set out in IFC PS6 have been guided by the Convention on Biological Diversity (CBD) (IFC 2019). However, the 2022 Kunming-Montreal Global Biodiversity Framework (GBF) has raised the ambitions of the CBD, to 'take urgent action to halt and reverse biodiversity loss to put nature on a path to recovery'. The overarching goal of the Kunming-Montreal Global Biodiversity Framework is to halt and reverse nature loss by 2050 from a 2020 baseline (CBD 2024). This is conceptually aligned with Nature Positive, a global societal goal to have more nature by 2030 than in 2020 (Nature Positive Initiative 2023).

We examined how the provisions of IFC PS6 apply in the context of impacts on an iconic group of species, the Critically Endangered orangutans (*Pongo* spp.). All three species of orangutan (*P.* pygmaeus, *P. abelii*, and *P. tapanuliensis*) are in decline (IUCN 2026); therefore, any project development impacting them would occur in contexts of declining past and likely ongoing population declines. More than 50% of wild orangutans occur outside legally protected areas (e.g., national parks, nature reserves) (Meijaard et al. 2022), where IFC PS6 or similar standards do not automatically prevent financing of mining, plantation agriculture, plantation forestry, energy, infrastructure and other developments.

Our key question is whether the IFC PS6 guidelines are designed to result in an absolute net gain in orangutan populations, measured across impact and offset sites, or whether the guideline is only likely to yield relative net gain outcomes, such as a slowing of the rate of decline. The former is necessary for alignment with the GBF and with nature positive objectives. To examine this question this, we analysed the requirements in IFC PS6 and its supporting Guidance Notes (IFC 2019) and investigated how they might apply to the on-the-ground conservation contexts of orangutans. We find that much more stringent compensation requirements are needed than currently required by IFC PS6 if absolute gains for orangutans are to be achieved. We recommend changes to the standard and its use to align with the GBF and nature positive ambitions.

IFC PS6 guidance on great apes

IFC PS6 requires habitat that may be affected by a proposed development to be classified as Modified, Natural, or Critical. Potential impacts on each are treated differently (Table 1). Modified Habitats—areas significantly altered by human activity—are prioritized for sustainable use, while Natural Habitats require careful management to minimize impact. Critical Habitats, which include areas of habitat crucial for the

survival of Endangered or Critically Endangered species, are subject to the strictest standards.

Table 1. Key concepts in PS6 and their definitions (IFC 2012, 2019).

Key PS6 terminology	**Definition**	**Passage in PS6 or Guidance Note**
Critical Habitat	Areas with high biodiversity value, including (i) habitat of significant importance to Critically Endangered and/or Endangered species; (ii) habitat of **significant importance to endemic and/or restricted-range species**; (iii) habitat supporting globally significant concentrations of migratory species and/or congregatory species; (iv) highly threatened and/or unique ecosystems; and/or (v) areas associated with key evolutionary processes.	PS6. Paragraph 16
Natural Habitat	Areas composed of viable assemblages of plant and/or animal species of largely native origin, and/or where human activity has not essentially modified an area's primary ecological functions and species composition.	PS6. Paragraph 13
Modified Habitat	Areas that may contain a large proportion of plant and/or animal species of non-native origin, and/or where human activity has **substantially modified** an area's primary ecological functions and species composition.	PS6. Paragraph 11
Restoration offsets	Restoration offsets remediate past damage to biodiversity (due to factors unrelated to the client's project) via rehabilitation or enhancement of biodiversity components (or even re-creation of ecosystems and their associated biodiversity values) at suitable offset sites.	GN 31
Averted loss offsets	Protection or averted loss offsets protect biodiversity and prevent its decline in an area demonstrated to otherwise be under threat of imminent or projected loss (due to factors unrelated to the client's project).	GN 31

IFC PS6 is distinct from other standards in including a guidance note that requires specific consideration of great apes (GN73). Any area where there are great apes is 'likely' to be treated as Critical Habitat (Guidance Note 6, GN 71) (IFC 2019, Table 1). Depending on the interpretation of the "substantially modified" part of the Modified Habitat definition (Table 1), about half of remaining orangutans occur in areas that would otherwise be considered Modified Habitat (agricultural and silvicultural areas) with small patches of Natural Habitat, and the remainder in areas otherwise considered Natural Habitat (timber concessions and protected areas) (Meijaard et al. 2022). However, as per the provisions (GN73) in Guidance Note 6, these areas should all 'likely' be treated as Critical Habitat (given that orangutans occur there), although they vary in the extent to which they are modified.

According to IFC PS6, projects in Critical Habitat areas 'are acceptable only in exceptional circumstances' (GN 73, IFC 2019) and require offsetting measures that result in a 'net gain'. Thus, all projects within orangutan range that proceed with IFC funding—or other funding adhering to the same standard—must establish what impacts they may have on orangutans and achieve a 'net gain' in orangutan population outcome overall. The Guidance Note 6 also states that 'where great apes may potentially occur, the IUCN Species Survival Commission (SSC) Primate Specialist Group (PSG) Section on Great Apes (SGA) and its Avoid, Reduce, Restore, and Conserve (ARRC) Task Force must be consulted as early as possible by the client to assist in the determination of the occurrence of great apes in the project's area of influence.'

The meaning of 'net gain' in PS6 for great apes

The basic starting point for any project adhering to IFC PS6 is to apply the mitigation hierarchy which offers offsetting as the final option when residual impacts remain after avoidance, minimization and remediation (Figure 1). Project developers, however, tend to use offsetting as the preferred option (Phalan et al. 2018). IFC PS6 mandates that the 'net gain' from biodiversity offsets is to be measured against a baseline trajectory. The trajectory is meant to represent a counterfactual scenario in which neither the impact nor the offset occurred. This means that, in theory, the baseline trajectory against which a net gain is measured could be one of declining, stable, or increasing biodiversity (Maron et al. 2018; IFC 2012). As such, the 'net gain' required is a relative net outcome (Figure 1c), not an absolute increase over time (Figure 1f).

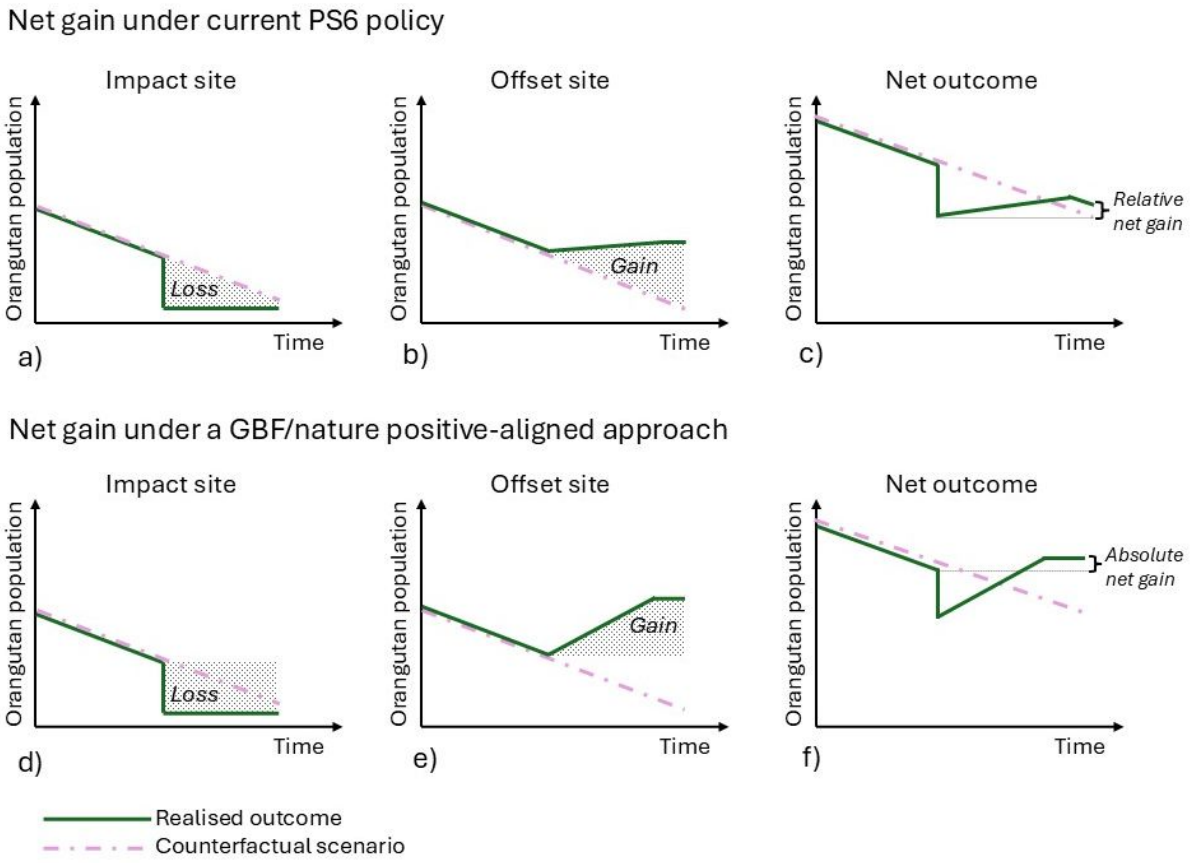

Figure 1. Population trends in impact and offset sites, and in net terms across both, under IFC PS6 and an alternative approach aligned with the GBF and nature positive. 1a) The impact from a project development becomes the residual impact that needs to be offset. 1b) Using averted loss, even with some absolute population increase in addition, to counterbalance this loss results in a net outcome (1c) of relative gain, but absolute loss, even though the gain is greater than the residual impact. An offset that required the absolute population increase at a site to be larger (1e) than the absolute decrease at the impact site (1d) would yield an overall net outcome of absolute gain (1f).

For orangutans, the counterfactual scenario is commonly one of declining populations (Figure 1), because very few populations are stable, and none is demonstrably growing (Meijaard et al. 2018). This means that net outcomes are likely to be evaluated against expected declines rather than a stable population baseline. Because of this, an offset that prevents decline, or reduces a rate of decline, at a site can be used to compensate for the loss of a population elsewhere, and the outcome of this exchange referred to as 'net gain'. This is despite the fact that the net result is still one of fewer orangutans after the development than before. This approach—called 'averted loss' offsetting (Table 1)—means that an overall net outcome of orangutan decline across the impact and offset site combined can still be considered a successful net gain outcome (Figure 1b).

Relative net gains that result in absolute declines mean that a growing gap appears between the desired societal outcome of halting and reversing nature losses, and the

realized outcomes from development activities. Instead, to meet global biodiversity targets, 'absolute' no net loss or, indeed, absolute net gain (Figure 1f) is required (Simmonds et al. 2020). The IFC requirements do not, at present, align with this.

Generating absolute net gains for orangutans

While absolute gains for orangutans are theoretically possible, achieving this through offsetting is highly challenging in practice. Achieving absolute gains requires improvements in the target biota over time at the offset site, in a quantity that is greater than the absolute residual losses at the impact site (Figure 1d). Conservation strategies differ significantly, however, in their ability to generate gains for orangutans (Santika et al. (2022).

Orangutans have low reproductive rates, which result in low population growth rates. Orangutan populations under no external threats can theoretically grow at a maximum of 2% annually (Marshall et al. 2009), but most orangutan populations are at ~5% annual rates of decline and at unnaturally low densities (Sherman et al. 2022), because threats are not effectively negated, even in legally protected areas (Meijaard et al. 2012). If all threats would be eliminated, detectable population growth could occur over decades (Seaman et al. 2024).

Achieving absolute gains for orangutans—absolute population increase across the impact and offset sites over time—is challenging, but possible. It requires direct, effective in-situ management to fully mitigate threats causing declines, in conjunction with increasing populations in areas where past declines have reduced them below carrying capacity. This goal is now more attainable as deforestation rates on Borneo and Sumatra have slowed (Gaveau et al. 2022), though achieving the required population growth also demands further reduction of mortality rates through ongoing patrolling and law enforcement (Seaman et al. 2024; Sherman et al. 2022). The easiest absolute gains could be achieved in landscapes where organizations implement effective management activities in areas over which they have long-term tenure rights. These gains are most likely to be achieved if delays in implementing conservation management are minimized. Ideally conservation management should start even before the conservation impact is created, i.e., the residual impacts are predicted and the conservation strategies to offset them initiated before the impacts occur (Bekessy et al. 2010). As the actual impacts are then quantified during project implementation, the conservation strategies can be amended.

Offset multipliers for orangutans

Generating gain through offsets generally requires offsets that are much larger than the impacted areas (Bull et al. 2017; Moilanen and Lehtinen 2025), primarily because of implementation delays, uncertainty and additionality considerations (Laitila et al.

2014). Such multipliers vary in practice from less than 1 to about 10, although greater multipliers exist (Bull et al. 2017). Such multiplier considerations, however, do not generally consider species-specific reproductive parameters. Here we show through a simple example that such considerations result in even greater multipliers.

The size of an offset area required for generating absolute population gains sufficient to counterbalance a given area of loss will depend on the density of orangutans at the impact site at the time of the impact, the density of orangutans at the offset site prior to the offset intervention, the amount of time that passed between impact generation and offset implementation, and the extent to which management can effectively negate threats so that positive population growth is achieved. If we assume that impact and offset population densities are the same, then over, for example, 5 years (from 2025 to 2030 when absolute gains are needed for CBD), a population growing at 2% annually increases by $(1.02)^5 \approx 1.104$, or a ~10.4% net increase. This means the 5-year population gain per km^2 is 0.104 × offset population density (d). To replace the individuals lost from 1 km^2 of habitat, the offset area (A) must satisfy: $0.104 \times d \times A = d$, giving $A \approx 9.6$ km^2. In other words, about 9.6 km^2 of habitat at the same starting population density, managed to sustain 2% annual growth for 5 years, is needed to offset the population decline from 1 km^2 of habitat lost, assuming threats are fully controlled, so growth is actually achieved. If no area-based multiplier is used, so 1 km^2 of impact area is compensated with 1 km^2 of offset, it would take 35 years to reach absolute gains. This, however, would require that offset site populations start enormously below habitat carrying capacity and that carrying capacity is very high. Once carrying capacity is reached, only habitat improvements or dispersal into adjacent areas can generate absolute gains.

If starting densities in the offset area are lower than in the impact area, or if growth falls below 2%, the required area increases accordingly. For example, a low starting density in the offset area of 0.5 individuals/km^2 would require a multiplier of 19.2 at 2% annual growth, and if annual growth was only 1%, as it often is in low-quality habitat (Marshall et al. 2009), at a density of 0.5, a multiplier of 39.1 would be needed. All these estimates assume that orangutan densities in offset areas are below carrying capacity so that population growth is possible. Once carrying capacity is reached, growth can only occur through spill-over into adjacent areas with depleted populations or by increasing the carrying capacity. Finally, further increases in the above multipliers may be needed to reflect uncertainty and time delays.

Way forward

Standards such as IFC PS6 can play a critical role in biodiversity conservation. There are instances where their application has prevented project financing, such as a hydroelectric dam in the habitat of the Tapanuli orangutan (*P. tapanuliensis*), which IFC

and the Norwegian state pension fund declined to support (Jong 2023). Although other banks filled the gap, analysis suggests they failed to meet IFC's environmental benchmarks (International Rivers 2021). This underscores the need for international harmonization of robust standards and effective enforcement (Narain et al. 2023).

Current IFC standards require updating to reflect the global shift toward nature-positive outcomes, as emphasized in the Kunming-Montreal Global Biodiversity Framework. The upcoming review of PS6 (Geary and Willis 2025) is a timely opportunity to mandate absolute biodiversity gains from a 2020 baseline, replacing the current focus on relative gains. Avoidance should be prioritized in the mitigation hierarchy. Critical Habitat supporting viable orangutan populations should be off-limits for development, as successful offsetting in these areas is extremely unlikely. Where development is unavoidable, offsets must be large, initiated early, and financed over the long term (Pope et al. 2021). Effective orangutan management requires long-term institutional authority, secure funding, and clear accountability, supported by transparent monitoring of measurable outcomes (Meijaard et al. 2022). Ring-fenced trust funds should finance only proven, like-for-like conservation actions that deliver demonstrable gains.

While our case study focuses on orangutans, it likely applies to all great apes and other species with similar reproductive and ecological characteristics. The IUCN Red List of Threatened Species, for example, lists 3,465 Critically Endangered species, many of which are associated with steep (> 80% over three generations) population declines and require habitat protection, and IFC policies should reflect their recovery needs.

We recommend revising IFC PS6 to mandate clear, measurable gains against a 2020 biodiversity baseline, strengthen avoidance, and ensure any necessary offsets are large enough (requiring a multiplier), robustly managed and perpetually funded. Development banks and other financial institutions should adopt these stringent conservation goals to align with the Kunming-Montreal Global Biodiversity Framework's objective to halt and reverse biodiversity loss by 2030. By implementing these recommendations, the IFC and its partners can support a truly nature-positive future, preserving essential habitats and species.

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References

BBOP. (2012) Standard on Biodiversity Offsets. http://bbop.forest-trends.org/guidelines/Standard.pdf. Business and Biodiversity Offsets Programme (BBOP), Forest Trends, Washington D.C., USA.

298 Bekessy S.A., Wintle B.A., Lindenmayer D.B. *et al.* (2010) The biodiversity bank cannot
299 be a lending bank. *Conservation Letters* **3**, 151-158.

300 Bull J.W., Lloyd S.P., Strange N. (2017) Implementation Gap between the Theory and
301 Practice of Biodiversity Offset Multipliers. *Conservation Letters* **10**, 656-669.

302 Bull J.W., Suttle K.B., Gordon A., Singh N.J., Milner-Gulland E.J. (2013) Biodiversity
303 offsets in theory and practice. *Oryx* **47**, 369-380.

304 CBD. (2024) Kunming-Montreal Global Biodiversity Framework.
305 https://www.cbd.int/gbf. Accessed on 29 November 2024. Convention on Biological
306 Diversity.

307 Emery Thompson M., Sabbi K. (2024) Ch. 19. Evolutionary Demography of the Great
308 Apes. pp. 423–474 in O. Burger, R. Lee, R. Sear editors. *Human Evolutionary*
309 *Demography*.

310 Gardner T.A., Von Hase A., Brownlie S. *et al.* (2013) Biodiversity Offsets and the
311 Challenge of Achieving No Net Loss. *Conservation Biology* **27**, 1254-1264.

312 Gaveau D.L.A., Locatelli B., Descals A. *et al.* (2022) Slowing deforestation in Indonesia
313 follows declining oil palm expansion and lower oil prices. *PLOS ONE* **17**, e0266178.

314 Geary K., Willis D. (2025) Opinion: IFC standards review is chance for more responsible
315 global finance. https://www.devex.com/news/opinion-ifc-standards-review-is-chance-
316 for-more-responsible-global-finance-109695. Accessed on 13 April 2025. *Devex* **25**
317 **March 2025**.

318 IFC. (2012) Performance Standard 6. Biodiversity Conservation and Sustainable
319 Management of Living Natural Resources. International Finance Corporation (IFC).

320 IFC. (2019) International Finance Corporation's Guidance Note 6: Biodiversity
321 Conservation and Sustainable Management of Living Natural Resources. January 1,
322 2012 (updated June 27, 2019). International Finance Corporation.

323 IFC. (2024) IFC Project Information and Data Portal. Retrieved from
324 https://disclosures.ifc.org/#/landing. International Finance Corporation.

325 International Rivers. (2021) Riverscope. Case Study: Batang Toru, Indonesia. Summary.
326 TMP Systems, August 2021. p. 11.

327 Jong H.N. (2023) World's top sovereign fund latest to cut ties with dam in orangutan
328 habitat. https://news.mongabay.com/2023/07/worlds-top-sovereign-fund-latest-to-
329 cut-ties-with-dam-in-orangutan-habitat/. Accssed on 26 March 2025. *Mongabay*.

330 Laitila J., Moilanen A., Pouzols F.M. (2014) A method for calculating minimum
331 biodiversity offset multipliers accounting for time discounting, additionality and
332 permanence. *Methods in Ecology and Evolution* **5**, 1247-1254.

Maron M., Brownlie S., Bull J.W. *et al.* (2018) The many meanings of no net loss in environmental policy. *Nature Sustainability* **1**, 19-27.

Maron M., von Hase A., Quétier F., Sonter L.J., Theis S., zu Ermgassen S.O.S.E. (2025) Biodiversity offsets, their effectiveness and their role in a nature positive future. *Nature Reviews Biodiversity*.

Marshall A.J., Lacy R., Ancrenaz M. *et al.* (2009) Orangutan population biology, life history, and conservation. Perspectives from population viability analysis models. pp. 311-326 in S. Wich, S.U. Atmoko, T. Mitra Setia, C.P. van Schaik editors. *Orangutans: geographic variation in behavioral ecology and conservation*. Oxford University Press, Oxford, UK.

Meijaard E., Sheil D., Sherman J. *et al.* (2022) Restoring the orangutan in a Whole- or Half-Earth context. *Oryx*, 1-12.

Meijaard E., Sherman J., Ancrenaz M., Wich S.A., Santika T., Voigt M. (2018) Orangutan populations are certainly not increasing in the wild. *Current Biology* **28**, R1241-R1242.

Meijaard E., Unus N., Ariffin T. *et al.* (2023) Apes and Agriculture. *Frontiers in Conservation Science* **4**, 1225911.

Meijaard E., Wich S., Ancrenaz M., Marshall A.J. (2012) Not by science alone: Why orangutan conservationists must think outside the box. *Annals of the New York Academy of Sciences* **1249**, 29-44.

Narain D., Sonter L.J., Lechner A.M., Watson J.E.M., Simmonds J.S., Maron M. (2023) Global assessment of the biodiversity safeguards of development banks that finance infrastructure. *Conservation Biology* **37**, e14095.

Nature Positive Initiative. (2023) The Definition of Nature Positive. https://www.naturepositive.org/app/uploads/2024/02/The-Definition-of-Nature-Positive.pdf.

Phalan B., Hayes G., Brooks S. *et al.* (2018) Avoiding impacts on biodiversity through strengthening the first stage of the mitigation hierarchy. *Oryx* **52**, 316-324.

Pope J., Morrison-Saunders A., Bond A., Retief F. (2021) When is an Offset Not an Offset? A Framework of Necessary Conditions for Biodiversity Offsets. *Environmental Management* **67**, 424-435.

Santika T., Sherman J., Voigt M. *et al.* (2022) Effectiveness of 20 years of conservation investments in protecting orangutans. *Current Biology* **32**, 1754-1763.e1756.

Seaman D.J.I., Voigt M., Ancrenaz M. *et al.* (2024) Capacity for recovery in Bornean orangutan populations if both forest fragmentation and offtake are limited. *Ecography*.

Sherman J., Voigt M., Ancrenaz M. *et al.* (2022) Orangutan killing and trade in Indonesia: Wildlife crime, enforcement, and deterrence patterns. *Biological Conservation* **276**, 109744.

Simmonds J.S., Sonter L.J., Watson J.E.M. *et al.* (2020) Moving from biodiversity offsets to a target-based approach for ecological compensation. *Conservation Letters* **13**, e12695.

Voigt M., Kühl H.S., Ancrenaz M. *et al.* (2022) Deforestation projections imply range-wide population decline for critically endangered Bornean orangutan. *Perspectives in Ecology and Conservation* **20**, 240-248.