Indonesian Journal of Conservation Volume 9 (01), Tahun 2020
Indonesian Journal of Conservation
http://journal.unnes.ac.id/nju/index.php/ijc

NEO-CONSERVATION OF BIODIVERSITY: A REVIEW OF INTERNATIONAL ENDEAVORS

Muhammad Shahzaib
University of Sargodha, Sargodha, Pakistan

author: mohammadshahzaib701@gmail.com

Info Artikel

Sejarah Artikel:
Diterima Maret 2020
Disetujui Mei 2020
Dipublikasikan
Juni 2020

Keywords:
Biodiversity conservation, Conservation strategies, International efforts,

Abstrak

As the dawn of the industrial revolution has begun since the last few decades, it has produced a huge impact on the biodiversity of organisms on our blueish-green planet. The extent of this impact is increasing day by day due to the constant progression of technology and these maneuvers are pushing the biodiversity to its edge. Although, this constant progress has also modified our techniques and methodologies that we applied previously to prevent the overlap of both environmental and technological niches. But still, the imbalances on the natural scale posed to the biodiversity by our evolution are increasing gradually. This study gives us an insight into the present range and magnitude of international efforts and the interventions needed to protect biodiversity from an unrecoverable loss.

ISSN: 2252-9195
E-ISSN: 2714-6189

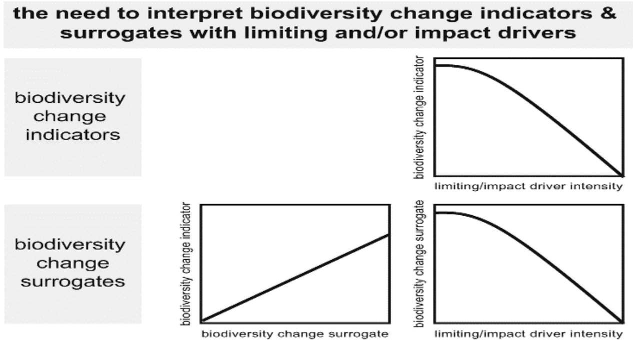
INTRODUCTION

Biodiversity is the extent of variation between the living organisms inhabiting a specific area of the environment which includes marine, aquatic, terrestrial, and all other types of ecosystems. The extent of variation that defines the biodiversity within an environment includes variation within species, between the species the ecosystem itself. The biodiversity of organisms is the most dynamic and complex feature of Earth expanding on all of its surfaces and the seas. However, this feature is also the most affected one due to the ever-increasing induction and interaction of all the advancing human activities on the planet. It possesses all of the ecosystems of the planet whether they are managed or unmanaged. The managed ones include crop populated lands, farms and natural wild plantations, etc. On the other hand, the unmanaged ones include natural wild preserves, etc. These cultivated ecosystems now comprise of more than 24% of all the terrestrial ecosystems and are largely included in anthropogenic systems.

RESULT AND DISSCUS

Biodiversity Richness Indicators

Several advanced tools, techniques, and data sources are used to classify the living organisms in biodiversity but the precise quantification of every organism is far more complex and difficult ever by using the most advanced techniques and technology available. So, the richness of organisms is only estimated as a whole using these methods. This overall estimation procedure is only useful and precise on a macro level. Furthermore, the calculation of turnover of biodiversity is crucial for the maintenance but in this scenario, the lack of data and techniques form hurdles in the way. These indication techniques are also utilized to map the possible and accurate dimensions of an environment. That's why several different kinds of indicators are used but still no single indicator has been used till now that can accurately map all of the dimensions of biodiversity in the environment.



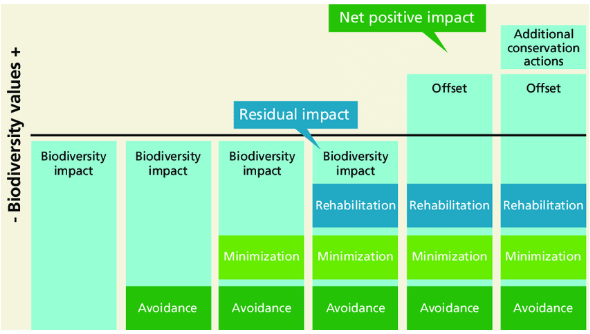
Branquinho C., et al (2019)

Mining Stress and Conservation Science

Mining poses a very controversial range of issues based on its effects on biodiversity. Although, mining produces income for several million workers all around the world yet the effects it has on biodiversity are undeniable. The continuous stress on the environment produces a lot of challenges for conservation science but still, their co-existence is going on since the dawn of the mining industry. To combats, the damage to the environment caused by mining several diverse kinds of long term strategic assessment and pathway procedures have been established on different kinds of spatial scales. Nowadays, policymakers must make strategies that can combat ever-increasing demand for metallic ores while rendering the biodiversity loss at a still state. The Bingham Canyon Mine is the best example of biodiversity loss in the present-day world. Only a handful of the area is protected due to the poor action of mining policies. *(Sonter, L. J., et al. 2018).*

International Nature Conservation Mitigation Hierarchy

The combating strategy to conserve the natural environment always comprises of a web network of National-Level Plans, Common Goals, and Interventions. If we look at present-day strategies, the overall observation concludes that all of these are failing in biodiversity conservation. In these cases, Mitigation Hierarchy is the best strategy the can be deployed to slow up the irreversible effects of human actions on the ecosystem. This hierarchy helps to prioritize the crucial measures that are in progress in conservation and the overall international goals. One major key point includes ecosystem study on dynamics scales that shall eventually make it feasible for the conservation strategy to be applied successfully. As a result, the research priorities then can be arranged in a manner so that the solution to immediate problems become easy for every nation to apply. Furthermore, these interventions are highly crucial and necessary to achieve the desired outcomes. *(Arlidge, W., et al. 2018).*



Temple., et al. (2012)

Conservation of Mammalian Diversity

Global understandings and priorities toward the conservation of major animal biodiversity i.e., mammalian biodiversity are itself high diverse that are mostly based on their evolutionary importance as well as only their functional roles. These types of under-represented conservation strategies often are a major cause of biodiversity itself. For the proper priorities to be established, crucial estimation and consideration of multiple diverse dimensions of biodiversity become a major key in conservation.

Speaking of mammalian conservation specifically, several factors like taxonomy and phylogenetic traits prioritization is always considered important based on the priority region estimation. Across these dimensions, mammals generally have the lowest overlap probability as seen in the recent studies of biodiversity-related to mammals. All of these factors form the foundation of the basic biological for future conservation strategies and efforts. *(Brum, F. T., et al. 2017).* For example, the World Conservation Union (IUCN) is one of the most noticeable organizations that is making progress in efforts related to the conservation of both animals and plants' biodiversity. Renowned researchers and scientists from around the globe are permanent members of the organization and this the reason for constant progress in advanced conservational strategies. *(Rahman M., 2008).*

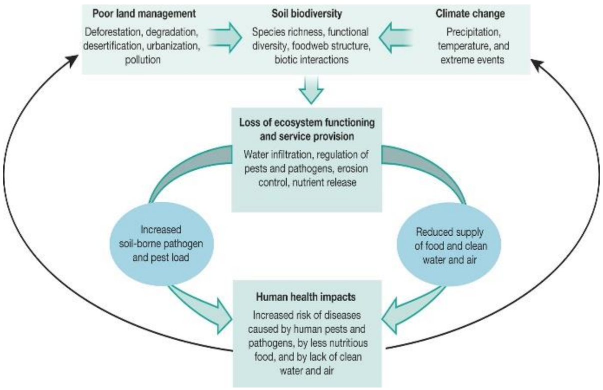
All of the mentioned researches have been supported by experimental evidence that emerged as a result of several experimental studies on biodiversity. For example, the case studies related to the conservation of biodiversity performed in Vietnam. The *Pu Luong Cuc Phuong* terrestrial area is a very important ecosystem. It is situated between Limestone landscapes that are inhabited by several diverse communities of locals. The major scientific knowledge transfer model based on *Research-Integration-Utilization* (RIU) has become the foundation of these studies. These studies prove the loopholes in poor and low-quality research on which international strategies based upon. *(Do Thi, H., et al. 2018).*

Human Demands and Biodiversity Conservation

The up-to-date ecosystem safeguarding services are a very important piece of the puzzle in the prevention of biodiversity loss. Human demands have remained way under the radar in case of biophysical conservation of the ecosystem's biodiversity. But there is always a major graph fall toward the human-dominated areas that support very less biodiversity. So, in-fact the demand always affects the extent of conservation of biodiversity of the ecosystem yet properly maintained and balanced strategies play an important role. This proves the statistical direct relationship between human demand in quantifying the conservational resources of the ecosystem. *(Watson, K. B., et al. 2019).*

World Conservation Monitoring Center (WCMC) is situated in the United Nations. WCMC monitors the balance between international human demands and the need for biodiversity conservation per the specific geographical area.

Similarly, The World Resources Institute (WRI) established on June 3, 1982, is responsible for the proper check of conserved ecosystem resources globally. When these balances get out of ranges, specific strategies are applied to force the extent of conservation of ecosystem resources within these boundaries. *(Rahman M., 2008).*



Wall, D., et al. 2015 (2015)

Biodiversity Conservation and Climate Change

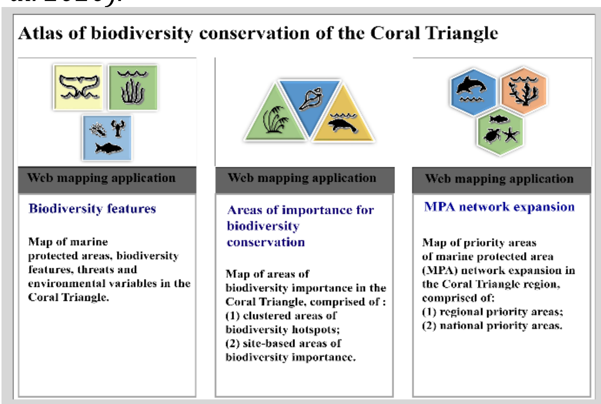
Biodiversity rich area of Myanmar is the perfect case of those geographical regions that are most affected by gradual climate change all over the Earth. Furthermore, poor political and low investment policymaking regarding the conservation of biodiversity has led to the disaster of the ecosystem's biodiversity of Myanmar. The only option to save this crucial piece of nature is to balance the overall investment that the government deploys regarding conservation. Climate change poses a major threat to this ecosystem because of its vulnerability. The management can be done by extensively assessing the direct climatological impact upon the ecosystem. (Rao M., et al. 2013). This topic is one of the top topics of peer-reviewed and independent *Global Biodiversity Assessment Journal* (GBA). *(Rahman M., 2008).*

Antarctica is a whole biome and its oceans cover about 10% of total Earth's geographical area. Antarctica may seem less dense than other ecosystems like that of the Amazon rainforest but it has far more complex life as compared to others. So, we can say that the biodiversity point of view is mostly comparable to the rest of the planet's ecosystem. Climate change is one of the major causes of biodiversity loss in these kinds of the ecosystem yet there are a promising number of remedies and procedures that can be used for preservation. One major key point to conservation is the very less terrestrial influence that makes this region a good candidate for conservation overall.

Marine Biodiversity Conservation

Marine ecosystems are one of the most complex ecosystems on Earth due to its extensive and complex variety of organisms. However, the more the ecosystem complex is the more is the threat available for it out there. The major evidence of disturbance in the marine ecosystems is the gradually increasing decline of the population of several marine species over several years. The endemism measurement is the most efficient tool to estimate specie richness in marine ecosystems. This calculated spatial information is then compared to the human impact on ecosystems to estimate the damage and to consider any possible as well as necessary future intervention. In a recent study, the analysis of 12,500 different marine species of the famous *Coral Triangle* to the Antarctic Oceans revealed that climate change, as well as the fishing activity, pushes the environmental stress to the maximum. *(Selig, E. R., et al. 2014).*

On the other hand, freshwater holds very little spatial extent yet its extent of biodiversity is remarkably fine. Freshwater ecosystems all over the Earth hold one-third of all the vertebrates. The diversity loss in the freshwater ecosystem is thrice as compared to the terrestrial ones. The population graph is decreasing at twice the rate as compared to marine ecosystems. By managing the extensive use of freshwater resources we can preserve most of the freshwater biodiversity in a couple of years yet proper policies regarding freshwater biodiversity and interventions are way out of the league and there are no signs of improvements in policies so far. *(Tickner, D., et al. 2020).*

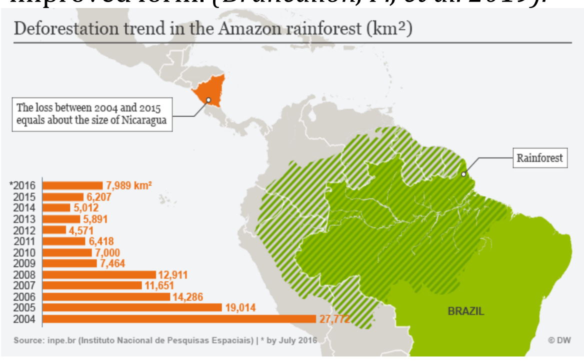


Asaad., et al. (2018)

Industrialization and Biodiversity

The oil industry is one of the most widely spread industry and the major victim of these unchecked large expansions is the biggest and most diverse rain forest in the world i.e., Amazon Rainforest. Recently, the systematic conservational planning regarding the Amazonian region has been taken seriously yet the damage caused by the previous oil industry expansion has taken things too far.

It has been estimated through different advanced ecological models that 68% of Ecuadorian Amazon is covered by expanded oil blocks that make it more vulnerable to severe biodiversity-related losses. The only way to preserve the biodiversity of Amazon is to completely cover its Southern area that'll decrease the oil block coverage by 33%. Furthermore, a balance must be maintained between the exploitation of Amazon resources and biodiversity conservation. *(Lessmann, J., et al. 2016).* These tropical rainforests have restoration point called as restoration hotspots. Amazon rainforest has about 10% restoration hotspots in over conservation area of extent 88%. There is a major challenge ahead if the restoration process goes on then it may be completed near 2030. Although restoration hotspots cover a very small amount of area yet these are the key area through which the overall conservation and restoration feasibility process take place As a result, a better human well-being environment comes into a new and improved form. *(Brancalion, P., et al. 2019).*



Irene Banos Ruiz., (2017)

We can't deny the fact that recent industrial and technological revolution has caused far more damage to the environment than we could have imagined yet as the wheel of technology continues to evolve, several conservation strategies and techniques also evolve along-with the pathway. Urbanization is a process that is also highly evolved and has certain macro-drivers in nature like ideation, fertility, and poverty alleviation. The ecological, demographic as a well sociological analysis of populations can give us insight in modernizing our old ways of resurrections of biodiversity. When all of these environmental bottlenecks get removed from the way then the breakthrough happens as we continue to move in the same way without any diversion. *(Sanderson, E. W., et al. 2018).*

On the other hand, while considering the conservation over a large geographical area, there are several barriers in the way overall like geographical location, wealth and language, etc. Overcoming these barriers is one of the major tasks while dealing with the conservation process on a global scale. *(Amano, T., et al. 2013).*

Contradiction Policies and Biodiversity

National contradiction policies often pose a threat to the conservation process of biodiversity mostly in those countries which have the largest and the most distinguished ecosystems. One of the best case here we can discuss is of China. China has one of the most biodiverse ecosystems in the world. But in recent decades, China gained very high biodiversity loss due to its modern socio-economic policies as well as its huge population. There is also very limited local participation that paves the way to the biodiversity loss easier. *(Zheng, H., et al. 2015).*

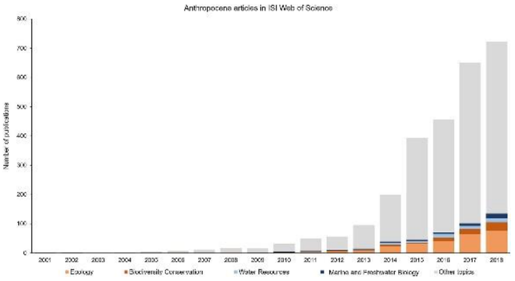
In China, deforestation is the major cause of greenhouse gas emission that eventually ends up in climate change and as a result, causes biodiversity loss. Interventions must be made thereto prevent the species-rich areas from biodiversity loss by providing a major framework based upon balanced resources checking procedures as well as proper local participation. *(Paoli, G. D., et al. 2010).*

The assessment of these large eco-systems in another major challenge. The old techniques we use for assessing ecosystem biodiversity are based upon assessing the diversity and complexity of species there. As humans evolve, these techniques also evolve and nowadays modern methods utilize major principles of biotechnology as well as demography and bioinformatics to asses biodiversity that is far more easy and efficient as compared to the old methods. These advancements are one of the main reasons that now we can easily analyze the complexity of huge ecosystems. *(Chiarucci, A., et al. 2011).* China has 2729 reserved of varying complexity and these all reserves cover about 14.84% of the country's surface. All of these metrics of data have been obtained using these modern and advanced analysis techniques. *(Turkington, R., et al, 2016).*

PREDICTS Database

PREDICTS (Projecting Responses of Ecological Diversity In Changing Terrestrial Systems) Database is a collection of large sets of data of a comparable sample of biodiversity-related data per the extent of human impacts on the terrestrial area. Researchers use all of this data in the development of extensively useful statistical models that account for how native biodiversity reacts to these measures. It represents over 47,000 species related biodiversity data from over 26,000 locations all over the world. It is one of the most taxonomically representative data on the planet and provides the researcher with solutions to complex problems in the way of solving conservation-related measures. *(Hudson, L. N., et al. 2016).* For example, a case was made on the complex diversity of species present in western Himalayan mountain ranges and its surrounding area. The overall unbiased classification of plant species present in these ranges was made possible by comparing the data with the database provides data and finally making robust and complex ethnobotanical statistical models that show he unbiasedness of the classification as a whole. *(Khan, S. M., et al. 2013)*.

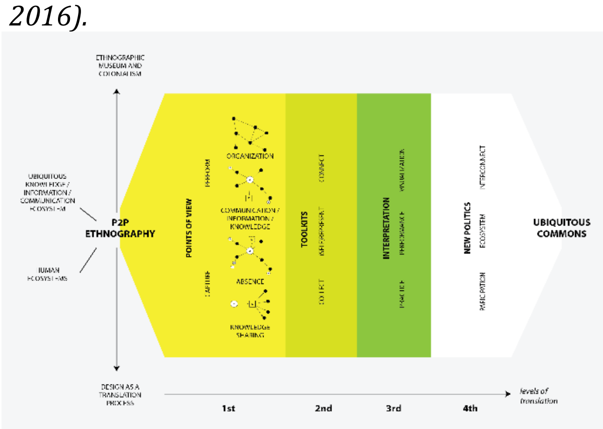
Similarly, these types of databases can also be used for classifying the biodiversity-related data for species present in marine as well as freshwater. No doubt, the freshwater ecosystems are a victim of less international attention yet some of the researchers are making progress in quantifying the statistical data related to freshwater Megafauna species present in these environments. For example, the over freshwater 132 Megafauna species always in occurrence with 93% overall freshwater mapped ecosystem. *(Carrizo, S. F., et al. 2017).*



S. Sundar., et al. (2020)

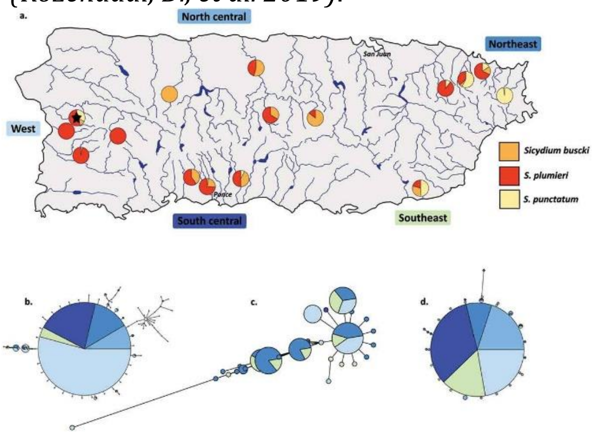
Ethnographical Analysis

These types of analyses are based upon the mutual understandings of rituals, customs, and prejudicial habits of people following the scientific approach. For example, those who are interested in biodiversity conservation know about the biology of plants and animals in the area. However, these practices are highly diverse and different from each other based on the area of their native origination. Furthermore, these types of mutual understandings based research often pave the way toward a better and balanced framework of action. This can be challenging but are crucial to address these problems effectively is the only way forward. *(Setchell, J. M., et al. 2017).* For analysis of a huge region of biological diversity, the Bootstrapping analysis is one of the best techniques. In this technique, we divide the major region into smaller regions and then iterate them with a slight addition of deformity. The final results show the overall robustness of the region added as the overall sum of smaller sub-regions. *(Brooks, T. M., et al. 2016).*



Artisopensource. (2014)

These modern and advanced methods were utilized in the conservation of several plant species in Australia. 21,000 different types of species were analyzed that were native to the continent and arise as a result of 50 million years of independent evolution. In all the present species, around 84% of them are in the endemism range of ecosystems present there. Despite several interventions made in the past, the overall species diversity is declining rapidly. *(Broadhurst, L., et al. 2017).* Under these types of circumstances, the extent of being intact is measured after applying necessary interventions. The centralized ecosystem analysis shows it is covered by about 44% wilderness and only 3% of the total area is covered by people. This shows a better opportunity to assess the hotspots of biodiversity wild staying in the overall geographical limit. *(Mittermeier, R. A., et al. 2003)*. Similar interventions can be made in the assessment of the Neotropical forest that came into modern existence just a couple of decades ago. Due to their primitive species abundance, the quantification process can be exhausting. These are generally formed on pre-existing ecosystems by the recovery process and this overall process can take decades based on the pre-existing content of ecosystems. These are also termed as specie rich secondary forests. *(Rozendaal, D., et al. 2019)*.



(Augustin C. Engman, et al. 2019)

This neo-typical type of biodiversity can also be found in marine environments such as on all the Pacific and Atlantic coasts and over the shore. The overall assessment score of the marine ecosystem ranges from 43-95 on a scale of 1-100. It shows that as the overall richness score rises, the more the complexity of a marine environment. No marine ecosystem on the can have an average ideal score of 100 due to factors like human demand and impact on the ecosystem etc. *(Selig, E. R., 2013).* Previously studied land management and mapping on the Australian coast clearly shows the endangered indigenous species ready to be resurrected from the biodiversity loss. On an average lap of the central ecosystem, 45% of the species are considered threatened on the overall 53% indigenous land. Overall predominant hotspots have been located on the coastal shoreline of northern Australia. *(Renwick, A. R., et al. 2017).*

CONCLUSIONS

The variety of life on our planet is constantly decreasing at an unprecedented rate. The only option to stop the loss at this rate is to conserve the resources at a sustainable and equitable rate. This will ultimately decrease the exhaustion process of resources in a biodiverse ecosystem and will sooner or later contribute to the flourishing of the pre-existing ecosystem environment. Furthermore, if all the countries try to work together and cooperate for the sake of preservation of our natural biodiversity then it may had a huge positive impact on all the pre-existing efforts that are in progress.

Conflicts of Interest

Since I'm the only writer of this review article. So, there are no conflicts of interest to declare.

REFERENCES

Amano, T., & Sutherland, W. J. (2013). Four barriers to the global understanding of biodiversity conservation: wealth, language, geographical location and security. *Proceedings. Biological sciences*, *280*(1756), 20122649. https://doi.org/10.1098/rspb.2012.2649

Arlidge, W., Bull, J. W., Addison, P., Burgass, M. J., Gianuca, D., Gorham, T. M., Jacob, C., Shumway, N., Sinclair, S. P., Watson, J., Wilcox, C., & Milner-Gulland, E. J. (2018). A Global Mitigation Hierarchy for Nature Conservation. *Bioscience*, *68*(5), 336–347. https://doi.org/10.1093/biosci/biy029

Asaad, Irawan & Lundquist, Carolyn & Erdmann, Mark & Costello, Mark. (2018). Digital map of the Coral Triangle: An online atlas for marine biodiversity conservation. Earth System

Science Data Discussions. 1-19. 10.5194/essd-2018-80.

Augustin C. Engman, Gabriela M. Hogue, Wayne C. Starnes, Morgan E. Raley & Thomas J. Kwak (2019) Puerto Rico Sicydium goby diversity: species-specific insights on population structures and distributions, Neotropical Biodiversity, 5:1, 22-29, DOI: 10.1080/23766808.2019.1606669

Bingham Canyon copper mine, UT, USA: Rio Tinto, Kennecott Utah Copper Corp. Source: Spencer Musick (self).

Brancalion, P., Niamir, A., Broadbent, E., Crouzeilles, R., Barros, F., Almeyda Zambrano, A. M., Baccini, A., Aronson, J., Goetz, S., Reid, J. L., Strassburg, B., Wilson, S., & Chazdon, R. L. (2019). Global restoration opportunities in tropical rainforest landscapes. *Science advances*, *5*(7), eaav3223. https://doi.org/10.1126/sciadv.aav3223

Branquinho C., Serrano H.C., Nunes A., Pinho P., Matos P. (2019) Essential Biodiversity Change Indicators for Evaluating the Effects of Anthropocene in Ecosystems at a Global Scale. In: Casetta E., Marques da Silva J., Vecchi D. (eds) From Assessing to Conserving Biodiversity. History, Philosophy and Theory of the Life Sciences, vol 24. Springer, Cham

Broadhurst, L., & Coates, D. (2017). Plant conservation in Australia: Current directions and future challenges. *Plant diversity*, *39*(6), 348–356. https://doi.org/10.1016/j.pld.2017.09.005

Brooks, T. M., Akçakaya, H. R., Burgess, N. D., Butchart, S. H., Hilton-Taylor, C., Hoffmann, M., Juffe-Bignoli, D., Kingston, N., MacSharry, B., Parr, M., Perianin, L., Regan, E. C., Rodrigues, A. S., Rondinini, C., Shennan-Farpon, Y., & Young, B. E. (2016). Analysing biodiversity and conservation knowledge products to support regional environmental assessments. *Scientific data*, *3*, 160007. https://doi.org/10.1038/sdata.2016.7

Brum, F. T., Graham, C. H., Costa, G. C., Hedges, S. B., Penone, C., Radeloff, V. C., Rondinini, C., Loyola, R., & Davidson, A. D. (2017). Global priorities for conservation across multiple dimensions of mammalian diversity. *Proceedings of the National Academy of Sciences of the United States of America*, *114*(29), 7641–7646. https://doi.org/10.1073/pnas.1706461114

Carrizo, S. F., Jähnig, S. C., Bremerich, V., Freyhof, J., Harrison, I., He, F., Langhans, S. D., Tockner, K., Zarfl, C., & Darwall, W. (2017). Freshwater Megafauna: Flagships for Freshwater Biodiversity under Threat. *Bioscience*, *67*(10), 919–927. https://doi.org/10.1093/biosci/bix099

Chiarucci, A., Bacaro, G., & Scheiner, S. M. (2011). Old and new challenges in using species diversity for assessing biodiversity. *Philosophical transactions of the Royal Society of London. Series B, Biological sciences*, *366*(1576), 2426–2437. https://doi.org/10.1098/rstb.2011.0065

Chown, S. L., Brooks, C. M., Terauds, A., Le Bohec, C., van Klaveren-Impagliazzo, C., Whittington, J. D., Butchart, S. H., Coetzee, B. W., Collen, B., Convey, P., Gaston, K. J., Gilbert, N., Gill, M., Höft, R., Johnston, S., Kennicutt, M. C., 2nd, Kriesell, H. J., Le Maho, Y., Lynch, H. J., Palomares, M., … McGeoch, M. A. (2017). Antarctica and the strategic plan for biodiversity. *PLoS biology*, *15*(3), e2001656. https://doi.org/10.1371/journal.pbio.2001656

Do Thi, H., Krott, M., Böcher, M., & Juerges, N. (2018). Toward successful implementation of conservation research: A case study from Vietnam. *Ambio*, *47*(5), 608–621. https://doi.org/10.1007/s13280-017-0999-2

https://www.artisopensource.net/2014/07/30/communication-knowledge-and-information-in-the-human-ecosystem-p2p-ethnography/

Hudson, L. N., Newbold, T., Contu, S., Hill, S. L., Lysenko, I., De Palma, A., Phillips, H. R., Alhusseini, T. I., Bedford, F. E., Bennett, D. J., Booth, H., Burton, V. J., Chng, C. W., Choimes, A., Correia, D. L., Day, J., Echeverría-Londoño, S., Emerson, S. R., Gao, D., Garon, M., … Purvis, A. (2016). The database of the PREDICTS (Projecting Responses of Ecological Diversity In Changing Terrestrial Systems) project. *Ecology and evolution*, *7*(1), 145–188. https://doi.org/10.1002/ece3.2579

Irene Banos Ruiz., Drought, Forest Loss cause Vicious Circle in Amazon (2017). https://p.dw.com/p/2Ywrr

Khan, S. M., Page, S. E., Ahmad, H., & Harper, D. M. (2013). Sustainable utilization and conservation of plant biodiversity in montane ecosystems: the western Himalayas as a case study. *Annals of botany*, *112*(3), 479–501. https://doi.org/10.1093/aob/mct125

Lessmann, J., Fajardo, J., Muñoz, J., & Bonaccorso, E. (2016). Large expansion of oil industry in the Ecuadorian Amazon: biodiversity vulnerability and conservation alternatives. *Ecology and evolution*, *6*(14), 4997–5012. https://doi.org/10.1002/ece3.2099

Mittermeier, R. A., Mittermeier, C. G., Brooks, T. M., Pilgrim, J. D., Konstant, W. R., da Fonseca, G. A., & Kormos, C. (2003). Wilderness and biodiversity conservation. *Proceedings of the National Academy of Sciences of the United States of America*, *100*(18), 10309–10313. https://doi.org/10.1073/pnas.1732458100

Paoli, G. D., Wells, P. L., Meijaard, E., Struebig, M. J., Marshall, A. J., Obidzinski, K., Tan, A., Rafiastanto, A., Yaap, B., Ferry Slik, J., Morel, A., Perumal, B., Wielaard, N., Husson, S., & D'Arcy, L. (2010). Biodiversity Conservation in the REDD. *Carbon balance and management*, *5*, 7. https://doi.org/10.1186/1750-0680-5-7

Rahman M., (2008) Conservation Biodiversity: International efforts. https://www.thedailystar.net/news-detail-23395

Rao, M., Saw Htun, Platt, S. G., Tizard, R., Poole, C., Than Myint, & Watson, J. E. (2013). Biodiversity conservation in a changing climate: a review of threats and implications for conservation planning in Myanmar. *Ambio*, *42*(7), 789–804. https://doi.org/10.1007/s13280-013-0423-5

Renwick, A. R., Robinson, C. J., Garnett, S. T., Leiper, I., Possingham, H. P., & Carwardine, J. (2017). Mapping Indigenous land management for threatened species conservation: An Australian case-study. *PloS one*, *12*(3), e0173876. https://doi.org/10.1371/journal.pone.0173876

Rozendaal, D., Bongers, F., Aide, T. M., Alvarez-Dávila, E., Ascarrunz, N., Balvanera, P., Becknell, J. M., Bentos, T. V., Brancalion, P., Cabral, G., Calvo-Rodriguez, S., Chave, J., César, R. G., Chazdon, R. L., Condit, R., Dallinga, J. S., de Almeida-Cortez, J. S., de Jong, B., de Oliveira, A., Denslow, J. S., … Poorter, L. (2019). Biodiversity recovery of Neotropical secondary forests. *Science advances*, *5*(3), eaau3114. https://doi.org/10.1126/sciadv.aau3114

S. Sundar, Jani Heino, Fabio de Oliveira Roque, John P. Simaika, Adriano S. Melo, Jonathan D. Tonkin, Davidson Gomes Nogueira and Daniel Paiva Silva, Conservation of freshwater macroinvertebrate biodiversity in tropical regions, *Aquatic Conservation: Marine and Freshwater Ecosystems*, , (2020). https://doi.org/10.1002/aqc.3187

Sanderson, E. W., Walston, J., & Robinson, J. G. (2018). From Bottleneck to Breakthrough: Urbanization and the Future of Biodiversity Conservation. *Bioscience*, *68*(6), 412–426. https://doi.org/10.1093/biosci/biy039

Selig, E. R., Longo, C., Halpern, B. S., Best, B. D., Hardy, D., Elfes, C. T., Scarborough, C., Kleisner, K. M., & Katona, S. K. (2013). Assessing global marine biodiversity status within a coupled socio-ecological perspective. *PloS one*, *8*(4), e60284. https://doi.org/10.1371/journal.pone.0060284

Selig, E. R., Turner, W. R., Troëng, S., Wallace, B. P., Halpern, B. S., Kaschner, K., Lascelles, B. G., Carpenter, K. E., & Mittermeier, R. A. (2014). Global priorities for marine biodiversity conservation. *PloS one*, *9*(1), e82898. https://doi.org/10.1371/journal.pone.0082898

Setchell, J. M., Fairet, E., Shutt, K., Waters, S., & Bell, S. (2017). Biosocial Conservation: Integrating Biological and Ethnographic Methods to Study Human-Primate Interactions. *International journal of primatology*, *38*(2), 401–426. https://doi.org/10.1007/s10764-016-9938-5

Sonter, L. J., Ali, S. H., & Watson, J. (2018). Mining and biodiversity: key issues and research needs in conservation science. *Proceedings. Biological sciences*, *285*(1892), 20181926. https://doi.org/10.1098/rspb.2018.1926

Temple, Helen & Ekstrom, J & Pilgrim, John & Rabenantoandro, Johny & Ramanamanjato, Jean & Randriatafika, Faly & Vincelette, M. (2012). Forecasting the Path Towards a Net Positive Impact on Biodiversity for Rio Tinto QMM.

Tickner, D., Opperman, J. J., Abell, R., Acreman, M., Arthington, A. H., Bunn, S. E., Cooke, S. J., Dalton, J., Darwall, W., Edwards, G., Harrison, I., Hughes, K., Jones, T., Leclère, D., Lynch, A. J., Leonard, P., McClain, M. E., Muruven, D., Olden, J. D., Ormerod, S. J., … Young, L. (2020). Bending the Curve of Global Freshwater Biodiversity Loss: An Emergency Recovery Plan. *Bioscience*, *70*(4), 330–342. https://doi.org/10.1093/biosci/biaa002

Turkington, R., & Harrower, W. L. (2016). An experimental approach to addressing ecological questions related to the conservation of plant biodiversity in China. *Plant diversity*, *38*(1), 2–9. https://doi.org/10.1016/j.pld.2015.12.001

Wall, D., Nielsen, U. & Six, J. Soil biodiversity and human health. *Nature* **528,** 69–76 (2015). https://doi.org/10.1038/nature15744

Watson, K. B., Galford, G. L., Sonter, L. J., Koh, I., & Ricketts, T. H. (2019). Effects of human demand on conservation planning for biodiversity and ecosystem services. *Conservation biology : the journal of the Society for Conservation Biology*, *33*(4), 942–952. https://doi.org/10.1111/cobi.13276

Zheng, H., & Cao, S. (2015). Threats to China's Biodiversity by Contradictions Policy. *Ambio*, *44*(1), 23–33. https://doi.org/10.1007/s13280-014-0526-7