Economics, finance and biodiversity decline

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Biodiversity decline

Occurring at the level of ecosystems, species and genes, biodiversity is in severe decline. The Millennium Ecosystem Assessment (2005)[1] states that all ecosystems have been transformed by human actions, with the loss of 35 per cent of mangroves, 20 per cent of coral reefs and around half of tropical forests. Loss of tropical forest remains a cause for concern having been around 0.8 per cent per year during 1981 and 199014, and is estimated to continue at 2 per cent per year.

While fossil records indicate that the diversity of species on the planet has never been stable, the worrisome fact is that the estimated rate of species loss is nearly 1,000 times greater than historical rates[2]. Overexploitation of biodiversity resources for food, sport, building materials, medicine and cultural purposes contribute to declines in population of species and integrity of supporting ecosystems. This is worsened by policy failures representing conflict of interest between the public and private sector and inability to understand and account for market failures.

Approximately 24% (1130) of the world's mammals and 12% (1183) of the world's bird species are regarded on the basis of IUCN criteria as globally threatened while 87 species of mammals and 131 species of birds are now extinct. At the species level, Bar-on, Phillips, and Milo (2018)[3] reports that humans have caused the annihilation of 83% of all wild mammals and half of all plants. Of the birds left in the world, 70% are poultry chickens and other farmed birds. And of the mammals left in the world, 60% are livestock, 36% are pigs, and a mere 4% are wild.

Daniel Pauly described the situation for global fisheries in paper entitled "Aquacalypse Now"[4]. The article likens the prevailing exploitation in the fisheries sector to a Ponzi-scheme where capital is continuously being forked out to catch smaller and uglier fish. Over the past 50 years, populations of large commercial fish, such as bluefin tuna, cod, and other favorites, have been reduced by a staggering 90 percent and one study, published in the prestigious journal Science, forecast that, by 2048, all commercial fish stocks will have "collapsed," meaning that they will be generating 10 percent or less of their peak catches.

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[1] *http://www.millenniumassessment.org/en/index.html*
[2] *https://sciencing.com/reason-decline-biodiversity-22141.html*
[3] *Yinon M. Bar-On, Rob Phillips, and Ron Milo. 2018. The biomass distribution on Earth. PNAS June 19, 2018 115 (25) 6506-6511; published ahead of print May 21, 2018 https://doi.org/10.1073/pnas.1711842115*
[4] *Pauly, D. Aquacalypse Now. The End of Fish. The New Republic. Sept 28, 2009.*

Genetic diversity provides the raw material of evolution allows for species to be flexible in the face of environmental change. Genetic diversity is also critically important for the continuing ability of human societies to derive economic and social benefits from biodiversity. Among the BIOFIN countries, there is interest in enhancing wealth generation from biodiversity resources and /or reducing leakages due to bio-piracy and ensuring economic benefits redound to the purveyors of traditional knowledge.

Economics of biodiversity

Biodiversity assets possess value which can either be used directly or indirectly, or as use options for future generations. Biodiversity resources can generate wealth for present and future generations. Surveys from the Faculty of Pharmacies of Thailand's Mahidol University had listed 1,459 species of medicinal plants used in Thai Traditional Medicine. In 2011, the Department for Development of Thai Traditional and Alternative Medicine, Ministry of Public Health estimated the market value of Thai medicine and herbs to equal to 354.8 billion US$ for medicine, 5,483.8 billion US$ for cosmetics and 2,580.6 billion US$ as dietary supplement. In addition, value from spa therapy and traditional Thai massage roughly about 413.3 billion US$ might be added into the value of traditional medicine. Using more than 200 reports, IUCN Sri Lanka estimated the value of ecosystem services for various ecosystems such as forests, protected areas, home gardens, wetlands, and wildlife, to name a few. The compendium provides estimates of specific use / non-use values for these ecosystems which can inform decision making.

At the global level, the value of ecosystem services was estimated to average $33 trillion/yr in 1995 $US ($46 trillion/yr in 2007 $US) (Costanza et al 1997)[1]. Revised estimates for the total global ecosystem services in 2011 is $125 trillion/yr (assuming updated unit values and changes to biome areas) and $145 trillion/yr (assuming only unit values changed), both in 2007 $US with the loss of eco-services from 1997 to 2011 due to land use change at $4.3–20.2 trillion/yr[2].

Imputing numbers and introducing values allow for better appreciation of biodiversity by policy makers. By doing such, biodiversity as expressed in dollar values are easily compared to number of students (education sector) or number of vaccines (health). Comparing the value of biodiversity resources with current

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[1] *Costanza, R., dArge, R., de Groot, R., Farber, S., Grasso, M., Hannon, B., Limburg, K., Naeem, S., Oneill, R.V., Paruelo, J., Raskin, R.G., Sutton, P., van den Belt, M., 1997. The value of the world's ecosystem services and natural capital. Nature 387, 253–260.*

[2] *Costanza, R., R. de Groot, P. Sutton, S. van der Ploeg, S. J. Anderson, I. Kubiszewski, S. Farber, and R. Kerry Turner. 2014. Changes in the global value of ecosystem services. Global Environmental Change 26 (2014) 152–158.*

expenditures, for example, contributes to a better understanding of the discrepancies, if any.

Understanding finance for biodiversity

At least US$52 billion is spent on biodiversity per year globally against an estimated annual financing need of between US$150 and US$440 billion[1]. The current spending proves to be a pittance when compared to the US$44 trillion value of biodiversity assets. Among the 23 countries in BIOFIN who have completed their expenditure reviews, the average biodiversity spending is 0.37% of GDP and 1.07% of the budget. Sri Lanka's result is lower than the average at 0.06% and 0.27%, respectively.

One assertion regarding finance is the lack of funding for biodiversity. When examining the reasons for continued decline in biodiversity, one observes that the perennial issues can be traced to funding: lack of trained personnel, lack of equipment, lack of operating expenses, lack of enforcement. In many documented cases of protected area finance, for example, the recommended funding is almost always lower than the actual. Governments provide the bulk of funding for biodiversity – and as public goods, this is expected. Within government bureaucracy, funding for biodiversity is a challenge especially when pitted when other expenditure needs like education and health. Also, because the topic itself does not lend to palpable results, decision makers show disinterest.

Enhancing resource mobilization is thus one of the thrusts of BIOFIN and the focus has included not only public sector but also private sector sources. For the latter, the "business case" can be made by pointing out dependencies between business operations and biodiversity. Aside from increasing government financing through traditional means like taxes and fees, other innovations have been identified including payments for ecosystem services, green bonds, green banking, and the like. BIOFIN finance solutions have also expanded beyond purely resource mobilization and included cost avoidance, delivering better, and realignment of expenditures. This approach resonates well amongst decision makers who promote better use of financing and more efficient delivery of targets. Put simply, resource mobilization efforts cannot go on *ad infinitum* if the costs keep increasing. For example, habitat protection for coastal ecosystems like coral reefs and mangroves prove to be more cost-efficient compared to restoration efforts. Finding sources of finance would be in vain if harmful subsidies are not eradicated. The paper by Daniel Pauly alleges that governments provide nearly $30 billion in subsidies each year--about one-third of the value of the global catch.

A suitable mix of finance solutions is recommended for each BIOFIN country noting the varied implementation time frames for developing each and the urgency of meeting biodiversity targets.

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[1] *The Biodiversity Finance Initiative Workbook. 2016. United Nations Development Programme. 2016*