



Revisiting the State of Philippine Biodiversity And The Legislation on Access and Benefit Sharing

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ABSTRACT

As a megadiverse country, the Philippines is recognized with its rich biodiversity. It has the most diverse life forms on a per unit area. Its biodiversity, composed of various flora and fauna, provides resources to meet basic needs for human survival, promotes economic development and offers environmental services. However, the unsustainable use and management of the country's biodiversity may lead to its destruction. The country has been tagged as one of the world's biodiversity hotspots and a top priority in terms of conservation. Policies have been initiated to protect and conserve biodiversity in the country which cover legislations on access and benefit sharing.

INTRODUCTION

The Philippines is considered as one of the world's megadiverse countries with almost 75% of the world's biodiversity found in the country. However, in recent years, the country has faced great challenges in protecting, conserving and developing its biodiversity. In fact, there has been continued destruction of the country's resources and increase in the number of endangered plant and animal species, reaching a total of more than 700 threatened species. These include the Philippine eagle (*Pithecophaga jefferyi*), Philippine freshwater crocodile (*Crocodylus mindorensis*), tamaraw (*Bubalus mindorensis*), yakal (*Shorea astylosa*) and waling-waling (*Vanda sanderiana*), among others.

Biodiversity, however, is more than just the number of unique flora and fauna species found in a country. It refers to the variety of life on Earth, it includes all organisms, species and populations; the genetic variation among these; and their complex assemblages of communities and ecosystems (UNEP, 2010). It is described as the most complex and very vital feature of Earth (Carrington, 2018). This is because humanity relies so much on the resources and services offered by biodiversity such as food, medicines, wood products, ornamental plants and breeding stocks, among others. Moreover, the world benefits from ecosystem services such as water provision, soil protection, nutrient storage and recycling, pollution breakdown, ecotourism, carbon offset, flood prevention and fishery and crop production. Nevertheless, these resources and services may not last forever especially if their utilization and management is not sustainable. Along with the decline is the lessening of the benefits mentioned above, thus the need for biodiversity protection and conservation from threats such as overexploitation, habitat loss, climate change, pollution and invasive alien species, among others.

Policy is a key area where initiatives on protection, conservation and development of biodiversity can be in place. The Philippines has been one of the first countries to regulate the utilization of biodiversity resources. Yet, overexploitation of the biological and genetic resources is still rampant in the country. There are several reports of smuggling, abuse of traditional uses, and biopiracy.

For the purpose of understanding the country's initiatives on biodiversity conservation and development, this paper presents the status, trend and issues in the Philippine biodiversity. It also reviews the history of legislations and current initiatives on access and benefit sharing in the country.

THE PHILIPPINE BIODIVERSITY

Overview of the status, trends and issues

The Philippines is among the countries with the richest biodiversity in the world. Indeed, almost two-thirds of the earth's biodiversity is concentrated in the country. Comparing the geographical area of all the countries on earth, the Philippines is considered to have the most number of diverse life forms on a per unit area basis (Convention on Biological Biodiversity (CBD), n.d.; Aquino-Gayao et al., 2014; Biodiversity Management Bureau (BMB), 2016).

The country houses an estimated total of 53,000 described species (composed of almost 15,000 plant species and 38,000 animal species), of which more than half is considered endemic and hence, cannot be found in any other place in the world (BMB, 2016). The country actually ranks fifth in terms of the number of plant species with at least 25% of the world's plant genera endemic to the country (CBD, n.d.). It is also considered to be a center of animal diversity with an estimated total of 1,437 terrestrial wildlife, of which almost 49% is endemic (BMB, n.d.; CBD, n.d.). Based on the data of the Department of Environment and Natural Resources (DENR), the Philippines has an estimated 207 terrestrial mammals (133 are endemic), 691 birds (239 endemic), 419 reptiles (241 endemic) and 120 amphibians (98 endemic) (BMB, 2016).

Meanwhile, the country ranks third in terms of marine biodiversity and is considered part of the Coral Triangle (World Wildlife Fund, 2010). It hosts almost 10,000 marine species which is equivalent to nearly one-fifth of the world's marine species. It has 1,700 reef species and at least 3,214 (121 are endemic) fish species (BMB, 2016; CBD, n.d.). These number, however, might be underestimated and are subject to changes since there is very high rate of species discovery in the country.

Despite the great number of new discoveries, the country is tagged as one of the world's biodiversity hotspots and a top global conservation area, together with the Caribbean, Western Ghats and Sri Lanka, Sunderland, Brazil's Atlantic Coast, coastal forest of Kenya and Tanzania, Madagascar and Indo-Burma. This implies that large number of the Philippine plant and wildlife species are experiencing alarming rate of destruction brought about by habitat loss, human activities and climate change, among others (Facts and details, 2019).

Currently, the country has more than 700 threatened plant and animal species based on the national list of DENR. This includes 42 species of terrestrial mammals, 127 birds, 24 reptiles, 14 amphibians and 76 fish species. Some of the identified critically endangered species are tamaraw (*Bubalus mindorensis*), dugong (*Dugong dugon*), Philippine eagle, Philippine pond turtle (*Siebenrockiella leytensis*) and Philippine crocodile, among others (CBD, n.d.; DENR, 2017a). On the other hand, for plants, there are 99 critically endangered, 187 endangered, 176 vulnerable and 64 other threatened species. These include yakal (*Shorea astylosa*), giant orchid (*Grammatophyllum speciosum*), waling-waling (*Vanda sanderiana*), staghorn fern (*Platynerium*), among others, which are considered critically endangered (CBD, n.d.; DENR, 2017b).

A primary threat considered is the continuous destruction of ecosystems and habitats that support and provide shelter to the country's biodiversity. The Philippines has already lost almost 93% of its original forest cover since 1990s. Similarly, the marine biodiversity and inland water biodiversity are deteriorating which is evident in the decreasing quality of water and fish in Laguna de Bay, the Philippine largest lake. Also, in the early 1900s, there was significant decrease in the country's total mangrove cover from 450,000 ha to 140,000 ha. Meanwhile, 53% of the coral reef covered was already in poor condition (CBD, n.d.; Aquino-Gayao et al., 2014).

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Habitat loss, one of the reasons for deteriorating biodiversity, can be attributed to several factors as identified in the Philippine Biodiversity Strategy and Action Plan (PBSAP). These include forest degradation, unsustainable mineral extraction and human activities and practices, among others. Rampant forest degradation is associated with the indiscriminate logging and deforestation as well as conflicting land use. Most of the Philippine protected areas and ancestral lands sit on where the country's mineral reserve such as gold, copper, nickel, chromite, marble and limestone are located. Also, the growing human population in the country induces conversion of forest areas to either residential and/or agricultural land. There seems to be a weak integration of biodiversity concerns in the landscape planning of the country (Aquino-Gayao *et al.*, 2014). Meanwhile, for the marine and inland water biodiversity, the major threats are pollution and fishing operations (CBD, n.d.).

Other identified threats to biodiversity are the introduction of invasive alien species, degradation from climate change, overexploitation, biopiracy, weak enforcement and management and under-valuation of the country's natural resources, among others (Aquino-Gayao *et al.*, 2014; BMB, n.d.).

It cannot be denied that the Philippines is benefitting a lot from its biodiversity and the provided services. The country derives water from watersheds, which also prevent soil erosion and siltation of coasts and water bodies. The coastal and marine ecosystem, on the other hand, provides for fishery production and ecotourism. It also supports the coral reef and mangrove ecosystem. Furthermore, the marine organisms found in the country have exceptional economic potential for medical use and fuel production. Aside from timber and fuelwood production, the forest ecosystem plays a vital role in water provision, carbon offset, flood prevention, and agroforestry activities, among others (CBD, n.d.; Aquino-Gayao *et al.*, 2014).

Based on the compilation done by Aquino-Gayao *et al.* (2014), the estimated economic value of the ecosystem services in the Philippines totaled PhP 2,309.49 billion (US\$ 52.02 billion)¹, which includes timber and fuelwood production, water provision, ecotourism, carbon offset, flood prevention, soil erosion, fishery production, crop production, coral reef, and mangrove. This does not account yet for the value of the mere existence of the endemic flora and fauna found in the country.

Because of undervaluation, many of the Filipino people might underestimate and underappreciate the importance of the country's genetic resources. This may lead to overexploitation and unsustainable use of these resources, which includes both production and consumption for trade and domestic use. Also, it somehow gives way to either legal or illegal collection of genetic resources by local or foreign companies, also known as biopiracy.

Even if a genetic resource was discovered, identified and developed by a local scientist, local community and indigenous people (IPs), some local and foreign companies and corporations patent these resource or knowledge without properly acknowledging the sources. These companies could earn a lot from commercialization of a resource and its by-product, and not be obliged to provide share to the source. Some of the resources which originated in the Philippines but were patented by foreign organizations include Philippine yew tree (*Taxus sumatrana*), ilang-ilang (*Cananga odorata*), banaba (*Lagerstroemia speciosa* L.), saluyot (*Corchorus olitorius*), sambong (*Blumea balsamifera*), lagundi (*Vitex negundo*) and takipkuhol (*Centella asiatica* L.) (Aquino-Gayao *et al.*, 2014).

Clearly, there is a problem on access and benefit sharing in the country. The current legislations in the country do not include a sustainable and effective system of tracking and monitoring the utilization of genetic resources. It also fails to regulate the innovation, pre-commercialization and commercialization stages. The country also lacks studies and investments with regard to the further identification and/or evaluation of these resources and its potentials (BMB, n.d.). Likewise, there was a low budget for biodiversity conservation for the past years. According to the BIOFIN, the annual spending for conservation from 2008 to 2013 averages to PhP 4.9 billion (US\$ 110.37 million) which is equivalent to 0.08% of the gross domestic product (GDP) and 0.31% of the national budget during that time. This implies 80% financing gap based on the required level of spending for the conservation of biodiversity (Aquino-Gayao *et al.*, 2014).

¹ Exchange rate is based on the average exchange rate in 2014 (US\$1 = PhP 44.3952) published by the Bangko Sentral ng Pilipinas

Legislations on access and benefit sharing

Despite the issues in the management and utilization of genetic resources, it is undeniable that the Philippines has long been recognizing the importance of conserving and protecting its resources. Some regulations were already in place even before 1995. Indeed, the Philippines is the first country in the world to introduce a legislation on the collection, use and development of genetic resources, also known as bioprospecting, and related activities (Swiderska, 2001; Smagadi, 2005).

The first agency to be involved in supervising bioprospecting activities is the National Museum of the Philippines which was established in the early 1900s. The responsibility was later assumed by DENR as the lead agency in conserving, managing, developing and properly using the country's environment and natural resources. A specific bureau, Protected Areas and Wildlife Bureau (PAWB), was created for this purpose in 1987. In 1990, the Philippines also had a kind of permitting system for the collection of biological samples in the form of a memorandum of agreement titled "Guidelines for the Collection of Biological Specimens in the Philippines". However, this system seemed to be ineffective mainly because of limited scope and lack of teeth to enforce the policies indicated (LEAD as cited by Smagadi, 2005).

In May 1993, the country ratified the Convention on Biological Diversity (CBD), which is an international treaty to sustain the diversity of life on Earth. It has three principal objectives - conservation of biodiversity; sustainable use of biodiversity; and fair and equitable sharing of the benefits arising from the use of genetic resources (Molinyawe 1999). CBD requires its signatories to devise legislations or policy measures that will ensure sustainable use and equitable sharing of benefits from the use of genetic resources, and knowledge and/or practices of indigenous communities (Swiderska et al., 2001).

In accordance with the CBD, the Philippines drafted the Executive Order No. 247 or the law Prescribing Guidelines and Establishing a Regulatory Framework for the Prospecting of Biological and Genetic Purposes, and for other Purposes, which was signed by former President Fidel V. Ramos in 1995. Its implementing rules and regulations (IRR) was issued in 1996 through the DENR Administrative Order (AO) No. 96-20 (Molinyawe, 1999).

EO 247 is considered the first law on access and benefit sharing (ABS) in the world. It specifically aims to regulate the research, collection and use of biological and genetic resources so that such resources are conserved, used sustainably and benefit the national interest and promote the development of local capability in science and technology (Swiderska, 2001). EO 247 covers all biological and genetic resources in the public domain and natural-growing plants to be used by either foreign or national individuals, entities, or government or private organizations for pharmaceutical development, agricultural and commercial applications (Swiderska, 2001; LEAD as cited by Smagadi, 2005).

Moreover, EO 247 has the following basic elements in regulating bioprospecting and other related activities, as cited in Molinyawe, 1999:

- A system of mandatory research agreements between collectors and the government with minimum terms on providing information and samples, technology cooperation and benefit sharing;
- An Inter-Agency Committee to consider, grant, monitor, and enforce compliance with research agreements and to coordinate further institutional, policy and technology development;
- A requirement of and minimum process standards for prior informed consent (PIC) from local and indigenous communities where collecting materials is carried out; and
- Minimum requirements to conform to environmental protection laws and regulations.

Research agreement is the primary legal instrument used under EO 247 to authorize bioprospecting in the country. There are two types of research agreement – academic and commercial. Academic research agreement is issued to academic, research and other recognized institutions for academic and scientific purposes while the commercial is issued to private individuals or corporations for direct or indirect commercial uses (Molinyawe, 1999).

Unsurprisingly, as the first ABS legislation, the implementation of EO 247 is not flawless. Several difficulties were encountered with regard to the scope and coverage, processing of PIC and research agreements and fair and equitable benefit sharing. As pointed by Molinyawe (1999), the EO's definition of bioprospecting is broad such that it also involves the conservation activities of academic and scientific institutions and the government entities. Some

even asserted that it regulates bioprospecting to a much higher degree than required by the CBD (Smagadi, 2005). Another issue is the processing of research agreements and PIC, described as time-consuming and tedious. This is seen as barrier to the growth of R&D in the country. On the other hand, some scientists argued that the conditions for fair and equitable benefit sharing are too demanding and adversely affect the confidentiality of their work (Molinyawe, 1999).

Particularly, in relation to the issues on scope and coverage, EO 247 does not explicitly regulate use of traditional knowledge of indigenous cultural communities (ICCs) and local communities. In further recognition of the need to protect and preserve traditional knowledge, the Indigenous Peoples Rights Act (IPRA) was enacted in 1997. IPRA aims to recognize, protect and promote the rights of ICCs and IPs over their traditional knowledge. It states that ICCs/IPs must have the full ownership and control and protection of their cultural and intellectual rights. In particular, they can control, develop and protect their science, technologies and cultural manifestations, seeds, traditional medicines and health practices, vital medicinal plants, animal and minerals, indigenous knowledge systems and practices, knowledge of properties of fauna and flora, oral traditions, literature, designs and visual and performing arts. The use of these resources and indigenous knowledge shall be granted to the third party if and only if a PIC is secured from the ICCs and IPs. This PIC has provisions and conditions to ensure that benefits from the use of traditional knowledge are shared to the concerned ICCs and IPs (LEAD as cited by Smagadi, 2005; Molinyawe, 1999; Swiderska, 2001).

In July 2001, the Wildlife Resources Conservation and Protection Act was introduced to address the problems on the broad scope of EO 247 and other issues related to the procedures for securing PIC. It was followed by the issuance of the IRR through the joint AO 20 of DENR and the Philippine Council for Sustainable Development (PCSD) in May 2004. These laws repealed all conflicting provisions with EO 247 (Medaglia, 2014; LEAD).

The Wildlife Resources Conservation and Protection Act, also known as the Wildlife Act, primarily aims to conserve and ensure the sustainability of all wildlife resources and habitats in the country. It limits the definition of bioprospecting to research, collection and utilization of biological and genetic resources for purposes of applying the knowledge derived there solely for commercial purposes (as cited by Medaglia, 2014). It has provided a more specific and uniform procedure for granting access to biological and genetic resources and evaluating bioprospecting activities.

Through this act, a bioprospecting activity/project will be allowed only if the interested party/proponent will enter into a Bioprospecting Undertaking (BU) and declare its willingness to comply with the terms and conditions set by the Secretary of DENR and/or the Secretary of the Department of Agriculture (DA). BU still requires the proponent to secure a PIC from IPs, protected area management boards (PAMBs) and local government units (LGUs) or other private or public agencies having special jurisdiction over specific areas.

The Wildlife Act, however, has introduced some changes in the course of applying for PIC. The proponent should write a letter of intent to inform the concerned agency or the affected community of their intention to conduct bioprospecting activities. They should also provide summary or outline of research proposal, written in a language or dialect that can be understood by the affected community. Nonetheless, the Act has simplified the processing of PIC such that it provides a uniform format for requesting and submitting PIC. It has also shortened the number of days given to a concerned agency/ affected community to issue a PIC certificate. Moreover, during the process, the concerned agency or the affected community can negotiate the benefit-sharing terms such that the details like mandatory bioprospecting fee, royalty payments, up-front payments and other non-monetary benefits are already specified.

Strengthening the national policy on access and benefit sharing

As discussed earlier, overexploitation of the biological and genetic resources is still rampant in the Philippines. There are several reports of smuggling, abuse of traditional uses and biopiracy. This can be attributed to lack of an effective monitoring mechanism, holistic management system and support to R&D with regard to the utilization and protection of its biodiversity (Aquino-Gayao, 2014).

That being said, initiatives have been made to improve and strengthen the country's ABS legislation. In 2016, House Bill (HB) 2163, also known as the "Philippine Genetic Resources and Access and Benefit Sharing (PGRABS)

Bill” authored by Cong. Josephine Ramirez-Sato has been filed. The bill generally aims to institute reforms in the existing policy to address the issue of unequal sharing of benefits derived from the use of genetic resources and traditional knowledge in the country. The bill has the following key provisions, as enumerated by BIOFIN:

- Strengthen the country’s rules and regulations on access to Philippine genetic resources and the indigenous knowledge systems and practices;
- Generate funds for the attainment of Aichi Biodiversity Targets and Sustainable Development Goals;
- Enable the country to avail the benefits of the Nagoya Protocol; and
- Take into account customary laws and community protocols of ICCs and IPs in the discussion on ABS.

Along with the bill, an EO version, titled “Strengthening the National Policy on Wealth Generation from Access and Benefit Sharing and from Utilization of Philippine Genetic Resources” was drafted through the efforts of BIOFIN, DENR and Cong. Sato. A recent version of the EO states that the order shall cover, not just the genetic resources found in the country, but also the imported resources brought to the country for development and utilization. It primarily provides for the creation of an Inter-Agency Committee on Genetic Resources and Traditional Knowledge, which is tasked to coordinate national efforts to harmonize, integrate, enhance, implement and monitor compliance with treaty, statutory and regulatory provisions on ABS and utilization of Philippine genetic sources. The Inter-Agency Committee will be composed of DENR, Department of Agriculture (DA), Department of Science and Technology (DOST), Department of Health (DOH), Department of Foreign Affairs (DFA), Department of Justice (DOJ), Department of the Interior and Local Government (DILG), National Commission on Indigenous People (NCIP), Intellectual Property Office of the Philippines (IPOPHL), National Museum and the UP System. The committee has the power to craft rules and guidelines on ABS and related activities. Both of these proposed legislations are yet to be enacted and still subject for reviews and consultations.

Current achievements and progress in biodiversity conservation

In the recent years, Philippines have reported several accomplishments as it strives to bring its best effort in biodiversity conservation and protection, along with its legislative initiatives on access and benefit sharing. DENR provided update on the state of the Philippine environment, particularly the achievements in 2010 to 2015. This includes efforts in reforestation, stopping illegal logging, fighting illegal wildlife trade, protecting endangered species, promoting protected areas, assessing hazards, and delineating boundaries, among others.

The National Greening Program (NGP), the government’s reforestation program that aims to plant 1.5 billion trees in 1.5 million hectares by 2016, have so far planted a total of 1.807 billion trees in 2.141 million hectares as of December 2019. With the increase in the forest stock of the country brought by NGP, it is expected that the capacity to absorb carbon dioxide will also increase (Cervantes, 2019). There was also reduction in the rate of illegal logging in the country as the number of illegal logging hotspots decreased from 197 in 2011 to 23 in 2015. In relation to this, 211 cases were filed against illegal logging operations, which also led to the increase in the number of convicted persons to 197 in 2015. Moreover, the number of forested lands overtook the number of denuded areas in 2015 – 8.14 million hectares of forested lands versus 7.66 million hectares of denuded areas. On the other hand, the recorded number of illegally-traded wildlife confiscations also reached 144 in 2010 to 2014. Another good news was the increase in the number of some endangered species - 10 more sightings of the critically endangered Philippine Eagle, and increase in the number of Philippine tamaraw from 274 to 382. Nesting sites for the Pawikan sea turtles also increased from 14,035 to 17,593. Furthermore, just recently, Davao’s Mt Hamiguitan joined the list of UNESCO World Heritage site. Mt. Hamiguitan is described as by UNESCO World Heritage as a property showcasing and inhabiting “terrestrial and aquatic habitats at different elevations, and threatened and endemic flora and fauna species, 8 of which are found only at Mt. Hamiguitan” (Ranada, 2015).

CONCLUSION AND WAYS FORWARD

The Philippine biodiversity, one of the world's most diverse and unique, since many can only be found in the country. This rich biodiversity has provided millions of Filipinos resources and services for food, medicines, wood and plant products, as well as breeding stocks, among others. It has also given significant ecosystem services such as water provision, soil protection, pollution breakdown ecotourism, flood control and prevention and crop and fisheries production. Despite the recognized importance of protecting and conserving biodiversity in the country, issues on overexploitation of the biological and genetic resources are still rampant.

Policies or regulations to protect and conserve biodiversity of the country have been in placed as early as 1900s. Agencies to regulate and manage the use and access of the country's biodiversity have been established. During the 17th Congress, both the Lower and Upper Houses, filed the bill to manage the utilization of genetic resources in the country. To date, the 18th Congress, has filed similar bills in the Lower House authored by Hon. Cong. Josephine Ramirez-Sato. HB 260 or the "Act An Act Strengthening The National Policy On Access, And Benefit-Sharing From The Utilization Of Philippine Genetic Resources" provides for the policy to ensure the fair and equitable share of benefits from genetic resources in the country. In addition, Cong. Sato also authored HB 268 or the "Act Providing for the Collection, Characterization, Conservation, Protection, Sustainable Use of and Access to and Benefit Sharing of Plant Genetic Resources for Food and Agriculture, Appropriating Funds Therefor and for Other Purposes," better known as the "Plant Genetic Resources Sustainable Use and Protection Act." While these legislations serve as recognition of the importance of biodiversity in the country, its enactment should be ensured and that its provisions be strongly implemented and monitored.

REFERENCES

- Aquino-Gayao, G., et al. (2014). The Biodiversity Finance Initiative – BIOFIN Philippines: Policy and Institutional Review.
- Biodiversity Management Bureau (BMB) (n.d.). Concept Note on Access and Benefit Sharing (ABS). Retrieved from: <https://info.undp.org/docs/pdc/Documents/PHL/93474%20Concept%20Note%20on%20Access%20and%20Benefit%20Sharing.pdf>.
- Biodiversity Management Bureau (BMB) (2016). "Status of the Philippine Biodiversity." BMB Official Website. Retrieved from: <http://bmb.gov.ph/388-protection-and-conservation-of-wildlife/facts-and-figures/786-status-of-the-philippine-biodiversity>.
- Cervantes, F. (2019). "Recto to DENR: Show us actual greenery of tree program." Philippine New Agency. Retrieved from: <https://www.pna.gov.ph/articles/1086035>.
- Department of Environment and Natural Resources (DENR) (2017a). "List of Threatened Species." DENR Administrative Order (DAO) No. 2004-15 and Cites as of 2017.
- DENR (2017b). "Updated National List of Threatened Philippine Plants and their Categories." DAO No. 2017-11.
- Draft Executive Order (EO) on Strengthening the National Policy on Wealth Generation from Access, Benefit-Sharing and Utilization of Philippine Genetic Resources.
- Convention on Biological Biodiversity (CBD) (n.d.). "Philippines – Country Profile." Convention on Biological Diversity. Retrieved from: <https://www.cbd.int/countries/profile/default.shtml?country=ph#facts>.
- Carrington, D. (2018). "What is biodiversity and why does it matter to us?" The Guardian. Retrieved from: <https://www.theguardian.com/news/2018/mar/12/what-is-biodiversity-and-why-does-it-matter-to-us>.

- Dirzo, R. and E. Mendoza (2008). "Biodiversity." *Encyclopedia of Ecology*. Elsevier. Retrieved from: <https://www.sciencedirect.com/science/article/pii/B9780080454054004602>.
- Medaglia, J., F. Perron-Welch and F. Phillips (2014). Overview of national and regional measures on access to genetic resources and benefit-sharing: challenges and opportunities in implementing the Nagoya Protocol. Montreal: Montreal Center for International Sustainable Development Law.
- Molinyawe, N. (1999). The Philippines' approach to access and benefit sharing for genetic resources and indigenous knowledge. Retrieved from: <http://www.biodiversityasia.org/books/abs/Chapter%2012.pdf>.
- Hays, J. (2015). "Biodiversity, Rainforests and Rare Animals in the Philippines." Facts and Details. Retrieved from: http://factsanddetails.com/southeast-asia/Philippines/sub5_6h/entry-3926.html.
- House of Representatives. "An Act Instituting Reforms in the Existing Policy on Access and Benefit-Sharing from the Utilization of Philippine Genetic Resources and for Other Purposes." House Bill No. 2163.
- House of Representatives. "An Act Strengthening The National Policy On Access, And Benefit-Sharing From The Utilization Of Philippine Genetic Resources." House Bill 260. Retrieved from http://www.congress.gov.ph/legisdocs/basic_18/HB00260.pdf
- House of Representatives. "An Act Providing for the Collection, Characterization, Conservation, Protection, Sustainable Use of and Access to and Benefit Sharing of Plant Genetic Resources for Food and Agriculture, Appropriating Funds Therefor and for Other Purposes." House Bill 268. Retrieved from http://www.congress.gov.ph/legisdocs/basic_18/HB00268.pdf
- Ranada, P. (2015). "State of PH environment: Good conservation efforts, bad air quality." *Rappler*. Retrieved from: <https://www.rappler.com/science-nature/environment/90645-state-philippine-environment-2015>.
- Smagadi, A. (2005). "National Measures on Access to Genetic Resources and Benefit Sharing-The Case of the Philippines." *Law Environment and Development Journal* Vol. 1/1.
- Swiderska, K., E. Daño and O. Dubois (2001). Developing the Philippines' Executive Order No. 247 on Access to Genetic Resources. International Institute for Environment and Development (IIED) 3, Endsleigh Street, London, WC1H 0DD, UK. Retrieved from: <https://www.cbd.int/doc/case-studies/abs/cs-abs-order-ph-en.pdf>.
- World Wildlife Fund. 2010. A Biodiversity Hotspot in the Philippines. Retrieved from <https://www.worldwildlife.org/blogs/good-nature-travel/posts/a-biodiversity-hotspot-in-the-philippines>