

SUSTAINABLE DEVELOPMENT YOUTH CONVENTION 2017

UNITED NATIONS

DEVELOPMENT PROGRAMME (UNDP)

TOPIC GUIDE



CONTENTS

About the Chairs	3
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Topic: Biodiversity and Development

Committee Introduction	4
Key Question	4
Introduction	5
Key Issues	5
Links to Sustainable Development	20
Past Initiatives	23
Key Stakeholders	26
Food for Thought	29
Bibliography	30



ABOUT THE CHAIRS

VERNICIA NEO HEAD CHAIR

A Year 6 student in NUS High, this is Vernicia's third (and last) time serving as the dais for SDYC. Biology is her favourite subject and she enjoys learning more about the biodiversity around us, especially through participating in intertidal walks. Hence, she is looking forward to see how the council will discuss about the balance between different aspects of development and biodiversity conservation, and propose novel solutions to tackle the environmental issues we are currently facing. She would like to extend a warm welcome to all delegates, and sincerely hopes that delegates will come in with an open mind, and give their inputs and opinions freely. Most importantly, she hopes that all delegates, regardless a first-timer or a seasoned delegate, will have a takeaway from these 3 days in UNDP, as well as SDYC.

XIE JIACHENG VICE CHAIR

Jiacheng is a Year 5 student of NUS High, and this would be his first time taking part in SDYC as part of the dais. Biology is a subject he doesn't take and doesn't like, turning to physics and history instead. Even so, he understands the importance of preserving biodiversity in the continued development across the world. He looks forward to seeing the innovative solutions delegates come up with to harmonize biodiversity conservation and development in order to create sustainable action. Finally, he hopes that at the the end of SDYC, delegates will leave with a new perspective on not just the issue at hand, but also the world at large.

ABIZER VICE CHAIR

Abizer is a Year 4 ~~prisoner~~ student of NUS High and when not attending to his many admirers, Abizer amuses himself by casually outrunning all his classmates in the NAPFA 2.4 and admiring the many bags of salt he is constantly gifted with. Despite his poor taste in memes (specifically, *high recombination frequency biology memes*), Abizer has a good fashion sense and an even wackier sense of humour. Beginning his MUN career in SDYC 2016, Abizer has attended various conferences as a delegate and will be chairing for the first time in SDYC 2017. He looks forward to debating the intricacies of preserving wildlife in the face of advent destruction and to seeing all delegates having a good time



COMMITTEE INTRODUCTION

The United Nations Development Programme (UNDP) is an executive board of the UN General Assembly. It was founded in 1965 when the Expanded Programme of Technical Assistance (EPTA) and the United Nations Special Funds were merged to become a single organization in order to avoid the clashing of their respective activities. The UNDP has worked towards improving the development status of developing nations through addressing social issues such as female genital mutilation and other global issues such as responding to climate change. It supports nations in their development, particularly in policy making, as well as providing knowledge, experience and resources. The UNDP also promotes sustainable development, which is in support with the 2030 Agenda for Sustainable Development as well as the newly established 17 Sustainable Development Goals (SDGs). Inclusive growth, environmental sustainability, good governance and security are all fundamental to achieve this aim.

The UNDP has offices and staff in more than 170 countries, and tackles development challenges outlined by five different sections: democratic governance, poverty reduction, crisis prevention and recovery, environment and energy, and HIV/AIDs. The UNDP helped countries achieve the Millennium Development Goals, and also played a vital role in crafting the new 17 Sustainable Development Goals (SDGs). In addition, the annual Human Development Report is also commissioned by the UNDP. The resolutions from the UNDP are not legally binding, and governments are expected to take ownership of their own domestic frameworks in the process of achieving the SDGs in place.

KEY QUESTION

How can development be continuously achieved while ensuring that biodiversity is not compromised?



KEY ISSUES

Effects of Development on Biodiversity

Globalisation has seen countries adopting new technologies, opening domestic markets to international trade and looking for export niches. With the increasing ease of emigration and immigration, the homogenisation of culture and tradition is common in many countries. While this has facilitated the transfer and transaction of raw materials and produced goods across international borders with ease, therein lies a tradeoff.

However, various human activities have impacted the environment, as well as the biodiversity, on Earth detrimentally. Agricultural developments have led to vast changes in the natural landscapes, as well as the addition of inorganic minerals into the ecosystem through fertilizer leech-off. Deforestation has resulted in tropical rainforests being cleared at an alarming rate, leading to habitat loss for the biodiversity that thrives in these forests. Apart from logging, the practice of slash-and-burn clearing has also been employed to clear these forests, which has led to criticism from global communities. Overfishing, as well as controversial methods employed in fishing such as trawling, have also inflicted severe damage to the marine ecosystem.

However, efforts have been made to strike a balance between development and the conservation of biodiversity. The introduction to the concepts of ecotourism, as well as renewable energy, are indeed promising solutions to the biodiversity loss that development has caused. Yet, these solutions are not perfect and potentially bring about many disadvantages as well. Hence, this council looks into the issue of balancing between different aspects of development: such as economic performance, standards of living and sustainability, while ensuring that biodiversity is conserved.

Industrialization

The onset of the Industrial Revolution can be seen as the most important event in the history of humanity since the domestication of animals and plants¹. The Revolution has seen the world progress from an agricultural-based economy to an industrialized one; the various technological developments allowed industrial labour to flourish, where many ordinary working people found increased opportunities for employment. In return, economies have grown steadily for these industrialized nations due to an increase in productivity. The United Nations World Economic Situation and Prospects

¹ McCloskey, Deirdre. 2017. "Deirdre McCloskey: Publications: Review of Floud and Johnson." Accessed June 23. <http://deirdremccloskey.org/articles/floud.php>.



(WESP) classifies all countries into one of the three broad categories: developed economies, economies in transition and developing economies². In the 21st century, more nations are opening their doors to industrialization and development and nations such as BRICS (Brazil, Russia, India, China, South Africa) are attaining growth at a faster rate than ever. However, these developments are achieved at the cost of the environment as human activities drive the rise of diverse environmental pressures³, including deforestation, affecting biodiversity.

In the past century, rates of extinction have increased to 100-1000 times faster than normal, implying a drastic change in environment factors as well as human activity. Studies show that this, put together with the worryingly high number of threatened and endangered species, could eventually lead to a mass extinction in 240-540 years.⁴ A decrease in species in ecosystems, makes it less efficient and stable. This then in turn leads to greater fluctuations in conditions as well as higher levels of unpredictability which could escalate into disastrous consequences. Most initiatives to save biodiversity begun in the early 1990s and included the creation of new parks and protected areas.⁵ It is vital that the tradeoff that arises with industrialization be dealt with properly or it could result in unintended consequences.

Usage of Renewable Energy

Renewable energy refers to energy derived from a natural source such as wind, sunlight or moving water.⁶ Conventional energy sources, such as fossil fuels, has led to global warming and pollution, be it air, water or land. Renewable energy is widely recognised as a sustainable source of energy that minimises the adverse impact on the environment even as industrialization continues to occur. Sole reliance on non-renewable energy could result in catastrophic consequences in the long run, as resources are constantly depleted in order to generate sufficient energy. Therefore, it is crucial that countries do invest both capital and time into harvesting these renewable sources of energy.

Renewable energy can be generated from both small-scale and large-scale sources. Of interest would be the generation of renewable energy on a large-scale, generating enough energy for a factory or even a small town. Hence, these large-scale energy generators are normally built in areas in which lots

² "World Economic Situation and Prospects Country Classification." 2014.

http://www.un.org/en/development/desa/policy/wesp/wesp_current/2014wesp_country_classification.pdf.

³ "Industrialization & Associated Wastes." 2017. Accessed June 23. <http://www.biodiversity.sg/biodiversity-information/view-slideshow/anthropic-impacts-and-biodiversity/industrialization-and-associated-wastes/>.

⁴ Cardinale, Bradley J. 2017. "Opinion: Biodiversity Impacts Humanity | The Scientist Magazine®." *The Scientist*. Accessed June 23. <http://www.the-scientist.com/?articles.view/articleNo/34448/title/Opinion--Biodiversity-Impacts-Humanity/>.

⁵ "What's Being Done." 2017. Accessed June 23. <http://www.biodiversitybc.org/EN/main/22.html>.

⁶ "Energy and Ecology: Does Renewable = Good?" 2017. Accessed June 23. <http://www2.hawaii.edu/~strauch/EnergyEcology/RenewableTrouble.html>.



of energy in various forms are present, primarily solar. However, constructing specific infrastructure to efficiently harvest renewable sources of energy often leads to a destruction of the habitat of exoting animals which inhabit these high-concentration areas, which in turn causes a loss in biodiversity.

The controversy lies in whether to progress to newer forms of energy harvesting considering its effect on biodiversity. The use of non renewable energy such as fossil fuels coal, oil and natural gas, leads to air pollution and even global warming. However, the infrastructure required to harness renewable energy poses threats to the environment as well as the local biodiversity.

Hydroelectric Power

This form of generating energy makes use of flowing water using a hydroelectric dam. However, the construction of dams disrupts the flow of rivers, compromising the marine wildlife. Measures are being taken to counter this problem through the demolition of the dam, such as at the Elwha River⁷ in Washington, in order to restore the native diversity. The construction of the dam in 1911 resulted in a 90% drop in the salmon population that return to the dam annually. While the dams were demolished in 2012, the marine diversity has yet to return to its original state.

Another example is the Three Gorges Dam, a hydroelectric dam that spans the Yangtze River, located in Hubei province, China. While this dam has earned the title of the world's largest power station in terms of installed capacity, the pros and cons from its construction remain highly controversial.⁸ Indeed, it provides a large amount of electricity and hence is efficient in reducing greenhouse gas emissions. In fact, the total energy generating capacity is 22,500 MW. Furthermore, it helps to lower the risk of floods downstream as well as lowers carbon emissions. However, the dam was constructed in a region famous for its unique and rich biodiversity, which includes the giant panda, snow leopard and the Yangtze finless porpoise⁹. The construction of the dam has been shown to have increased the occurrences of landslides in the region.¹⁰ In fact, in the first 4 months of 2010 alone, there were 97 significant landslides. Furthermore, erosion and sedimentation has lead to a drop in aquatic biodiversity especially on migratory fishes.¹¹ While dams provide a sustainable source of energy, they can lead to critical losses in biodiversity that could adversely impact the environment.

⁷ Ibid.

⁸ "Three Gorges Dam | International Rivers." 2017. Accessed June 23. <https://www.internationalrivers.org/campaigns/three-gorges-dam>.

⁹ "Yangtze River | Places | WWF." 2017. Accessed June 23. <https://www.worldwildlife.org/places/yangtze>.

¹⁰ Hvistendahl, Mara. 2017. "China's Three Gorges Dam: An Environmental Catastrophe?" *Scientific American*. Accessed June 23. <https://www.scientificamerican.com/article/chinas-three-gorges-dam-disaster/>.

¹¹ López-Pujol, Jordi, and Ming-Xun Ren. 2009. "Biodiversity and the Three Gorges Reservoir: A Troubled Marriage." *Journal of Natural History* 43 (43–44): 2765–86. doi:10.1080/00222930903220010.



Solar Power

In order to harvest a large amount of solar power, solar panels are normally constructed in areas with high sunlight concentration, such as deserts. However, such locations are normally the habitat to certain species that have adapted to the climate in those locations. These species have limited range and furthermore, are very sensitive to disturbances such as construction. Also, owing to the fact that most cities that utilise the power obtained from the solar panels are hundred of kilometres away, long power lines have to be built, which further affects the wildlife and biodiversity there.

One such instance of this issue is found in the Mojave Desert, located within California and Nevada. Owing to its geographical advantage of receiving twice the amount of sunlight as other regions in the country, it contains $7km^2$ of solar panels.¹² In fact, there was the world's largest solar power installation until 2013 and it has sufficient power for almost 90 000 households. Furthermore, it would also cause a significant drop in carbon emission by at least 40 kilotons. There would be various species affected as a consequence, such as the Desert Tortoise which is considered 'threatened' under the United States Federal Endangered Species Act. The power lines constructed have in addition had a serious impact on the already endangered California Condor. Furthermore, the solar power plant is notorious for its bird mortality due to the solar flux created by the solar panels as well as from collision with the heliostat mirrors. It is evident that the solar plants do have a significant negative impact on the rich biodiversity of the desert areas.

Furthermore, solar panels include photovoltaic (PV) solar cells or concentrating solar thermal plants (CSP)¹³. However, the manufacturing of these PV solar cells is infamously known to be detrimental to the environment as it employs the use of many hazardous materials such as gallium arsenide and silicon dust. Gallium arsenide is a known carcinogen in animals and causes lung irritation and inflammation; in addition, silicon dust could potentially result in chronic respiratory problems. It is evident that these harmful materials have an adverse effect on the health of animals and hence causes a significant impact on biodiversity.

Hereby lies the controversy of whether the complications that arise from the construction of these solar panels are outweighed by the advantage of production of clean renewable energy in the long run.

¹² "Concentrating Solar Power Projects - Mojave Solar Project | Concentrating Solar Power | NREL." 2017. Accessed June 23. https://www.nrel.gov/csp/solarpaces/project_detail.cfm/projectID=57.

¹³ "Environmental Impacts of Solar Power." 2017. *Union of Concerned Scientists*. Accessed June 23. http://www.ucsusa.org/clean_energy/our-energy-choices/renewable-energy/environmental-impacts-solar-power.html.



Wind Power

Wind turbines harness the energy of moving air to generate electricity. These turbines can be located either on land (onshore) or out at sea (offshore). Onshore wind is regarded as one of the most affordable forms of renewable energy as compared to solar photovoltaic panels and nuclear power¹⁴. From 2000 to 2015, cumulative global wind capacity increased from 17,000 megawatts to more than 430,000 megawatts¹⁵. In 2015, China also had surpassed the European Union (EU) in the total number of installed wind turbines¹⁶. In 2017, Dutch officials have opened one of the world's largest offshore wind farms, with 150 turbines spinning out in the North Sea¹⁷. However, these wind farms pose a hazard to wildlife. For example, offshore turbines and the cables used to connect them to the electric grid could interfere with the migration of marine animals such as the North Atlantic right whales that pass by South Carolina, Georgia and Florida¹⁸. Birds, bats and other flying creatures have slim chances of surviving when they collide with a rotating turbine blade. Studies in the United States have estimated the number of annual avian fatalities by wind turbines to be from 10,000 to 440,000¹⁹. However, the effects of both offshore and onshore wind turbines on biodiversity are not yet fully understood²⁰.

Biofuel

With growing concern about global warming caused by carbon dioxide emissions, biofuels have been gaining in popularity especially in developed nations. There are various methods to make biofuels, but the general procedure would be to use chemical reactions, fermentation and heat to break down starches and sugars in plants, before refining the crude product to produce biofuel²¹. Biofuels are deemed as a viable solution to resolve the problem of excessive emissions from cars, since the plants

¹⁴ Institute, Grantham Research. 2012. "Onshore Wind Energy: What Are the Pros and Cons?" *The Guardian*, September 25, sec. Environment. <https://www.theguardian.com/environment/2012/sep/25/climate-change-windpower>.

¹⁵ "Environmental Impacts of Solar Power." 2017. *Union of Concerned Scientists*. Accessed June 23. http://www.ucsusa.org/clean_energy/our-energy-choices/renewable-energy/environmental-impacts-solar-power.html.

¹⁶ Ibid.

¹⁷ France-Presse, Agence. 2017. "Full Tilt: Giant Offshore Wind Farm Opens in North Sea." *The Guardian*, May 9, sec. Environment. <https://www.theguardian.com/environment/2017/may/09/full-tilt-giant-offshore-wind-farm-opens-in-north-sea>.

¹⁸ Board, The Herald Editorial. 2017. "Weigh Pros and Cons of Offshore Wind Turbines." *Heraldonline*. Accessed June 23. <http://www.heraldonline.com/opinion/editorials/article35438466.html>.

¹⁹ Maehlum, Mathias A. 2017. "Wind Energy Pros and Cons." *Energy Informative*. Accessed June 23. <http://energyinformative.org/wind-energy-pros-and-cons/>.

²⁰ "What Are the Advantages and Disadvantages of Offshore Wind Farms? | American Geosciences Institute." 2017. Accessed June 23. <https://www.americangeosciences.org/critical-issues/faq/what-are-advantages-and-disadvantages-offshore-wind-farms>.

²¹ "Biofuels: The Benefits and Drawbacks." 2017. *National Geographic*. February 27. <http://www.nationalgeographic.com/environment/global-warming/biofuel/>.



used in the synthesis of biofuels absorb carbon dioxide as they grow, and are also renewable resources.

However, there are drawbacks to the widespread adoption of biofuels. The process of growing crops, synthesizing fertilizers and pesticides, as well as processing the plants into fuel consumes a lot of energy, which mainly comes from coal and natural gas²². A 2007 study in Science Magazine has sparked intense debate after reporting that the clearing of rainforests, savannas and grasslands for the production of biofuels could release up to 420 times more carbon dioxide than fossil fuels²³, while also leading to habitat loss for the local biodiversity.

Human Activities

After World War II, the population growth of developing countries began to accelerate drastically, supported by an abundance of resources and a rise in living standards²⁴. However, the exponential human population growth has taken a toll on the environment and the Earth's resources, as seen through the various activities humans engage in to support ourselves.

Agriculture

To support the increasing population, the proportion of land areas used for agricultural purposes has been steadily increasing. Currently, 11 percent of the Earth's land surface is used in crop production, which includes arable land and permanent crops²⁵. Particularly in developing nations with limited access to technology-driven intensification techniques that can increase the yield in the same land area, simple expansion of agricultural land is favoured. Contrary to the popular perception that there is little arable land left to expand agriculture into, current agricultural land represents only a third of total arable land. Thus, expansion of agricultural land is projected to continue increasing for the next 10 years. Just as the land is fertile for agriculture, it is also a conducive habitat for flora and fauna. A study by the FAO showed that in two-thirds of countries with an expanding agricultural sector, forested area was also decreasing²⁶.

²² Ibid.

²³ Gattuso, Dana J. 2017. "Renewable Energy: Truth and Consequences." Accessed June 23.

<https://www.nationalcenter.org/NPA582.html>.

²⁴ "Human Population: Population Growth." 2017. Accessed June 23. <http://www.prb.org/Publications/Lesson-Plans/HumanPopulation/PopulationGrowth.aspx>.

²⁵ "World Agriculture: Towards 2015/2030 - An FAO Perspective." 2017. Accessed June 23.

<http://www.fao.org/docrep/005/y4252e/y4252e06.htm>.

²⁶ Rosengren, Linda, and Christina Seeberg-Everfeldt. n.d. "Agricultural Expansion and Deforestation."

<http://www.unclearn.org/sites/default/files/inventory/fao57.pdf>.



Urbanization, which is defined as the population shift from rural to urban areas, has led to fewer individuals remaining involved in the agriculture industry. With recent technological advancements, agricultural mechanization has reduced hard labour and improved the productivity and the use of resources in the agricultural industry²⁷. This allows for greater land usage for agricultural purposes, while minimizing the manpower needed. The use of technology or techniques to increase the yield of agricultural production for every unit input, be it labour, land or others, is called intensification²⁸.

Expansion, coupled with intensification practices, has physically changed the plant and animal habitat surrounding agricultural areas²⁹. Landscapes are altered through the clearing of forested or grassland for cultivation, leading to habitat loss for the local biodiversity. Agricultural practices such as crop rotation and grazing, coupled with residue management, irrigation, and drainage, affect the soil environment and change the range of habitats and foods for soil organisms.

The application of agrochemicals like pesticides or fertilizers, affects not just the farming area, but also the surrounding land and water through runoff. Practices like spraying by aeroplane easily spread chemicals well past their intended area. Pesticides that enter surrounding waterways poison animals that depend on these rivers or ponds for their water and food. Likewise, fertilizers entering waterways alters the nutrient system, commonly causing eutrophication, killing off aquatic life in the water body. A study done by the UN in 1993 showed that eutrophication on varying levels is common in lakes and reservoirs all over the world, with 54% in Asia Pacific having eutrophication problems, 53% in Europe, 28% in Africa, 48% in North America, and 41% in South America³⁰.

One example is the Potomac River that runs through Washington DC. Starting in the 1800s, because of increased mining and agriculture upstream, surface runoff carried nutrients in top level soil into the river, causing severe eutrophication that lasted until the 1960s. A sudden increase in algae population limits the sunlight that reaches the bottom of the water body, greatly reducing the amount of dissolved oxygen available for plants, fish and other marine animals. The growth of certain organisms like *Pfiesteri* and red tides release powerful toxins that are known to kill fish, as well as poison animals that eat the fish³¹.

²⁷ "Sustainable Agricultural Mechanization | FAO | Food and Agriculture Organization of the United Nations." 2017. Accessed June 23. <http://www.fao.org/sustainable-agricultural-mechanization/en/>.

²⁸ "Agricultural intensification." The ethics of sustainable agricultural intensification. Accessed March 17, 2017. <http://www.fao.org/docrep/007/j0902e/j0902e03.htm>.

²⁹ Ibid.

³⁰ "Facts and figures about eutrophication." Clean Water Space. Accessed June 21, 2017. http://www.cawater-info.net/all_about_water/en/?p=211.

³¹ "Facts and figures about eutrophication." Clean Water Space. Accessed June 21, 2017. http://www.cawater-info.net/all_about_water/en/?p=211.



Extreme cases of eutrophication have caused severe consequences for the ecosystem. In Lake Victoria in Africa, turbid water caused by eutrophication reduce visibility to an extent that is too low for fish to identify mates of their own species. In the Taihu and Dianchi lakes in China, almost all native water plants have been killed and fish species have almost stopped breeding due to the lack of oxygen in the water³².

Agricultural Biodiversity

Agricultural Biodiversity, also known as Agrobiodiversity, refers to the biodiversity of crops, livestock and fish, as well as other species that support the agricultural ecosystem.³³ Managing agricultural biodiversity directly impacts human food security. As the global population grows, ensuring that agriculture is diverse and sustainable is needed to maintain secure sources of food.

Food sources are currently threatened by numerous factors including climate change, pests and blights. Locusts, for example, have plagued crops since ancient times, causing famines and even forcing human mass migrations. During periods of drought, locusts swarm and move quickly and destructively, causing severe damage to crops. Even though techniques now exist to monitor and contain locust swarms, developing countries in Africa and Asia are still hard-hit by locust plagues.³⁴ The potato blight is another such example; when the bacteria that causes potato blight spread to Europe, the blight caused numerous famines across Europe. Ireland was hit the hardest, with the Great Irish Famine caused 1 million starved to death and many more to emigrate away from Europe. This was caused by Ireland largely depending on a single variety of potato, the Irish Lumper.³⁵

Currently other than research and breeding efforts, many countries are building seed banks that store seeds for crops and plants for a scenario where a plant species goes extinct. The largest such projects are the Millennium Seed Bank Partnership which now houses more than a billion seeds, and the Svalbard Global Seed Vault that stores seeds in the Arctic ice.³⁶

³² "Facts and figures about eutrophication." Clean Water Space. Accessed June 21, 2017. http://www.cawater-info.net/all_about_water/en/?p=211.

³³ Gaia. "Environment and Ecology." About Agricultural Biodiversity. Accessed June 21, 2017. <http://environment-ecology.com/biodiversity/161-about-agricultural-biodiversity.html>.

³⁴ "Locust issues in Caucasus and Central Asia (CCA)." FAO Site. Accessed June 21, 2017. <http://www.fao.org/ag/locusts-CCA/en/1010/>.

³⁵ "Great Famine potato makes a comeback after 170 years" IrishCentral. March 3, 2017. Accessed June 21, 2017. <http://www.irishcentral.com/news/great-famine-potato-makes-a-comeback-after-170-years-194635321-237569191>

³⁶ Mellgren, Doug. "'Doomsday' seed vault opens in Arctic." NBCNews.com. February 27, 2008. Accessed June 21, 2017. http://www.nbcnews.com/id/23352014/ns/technology_and_science-science/t/doomsday-seed-vault-opens-arctic/.



Deforestation

Deforestation is the permanent destruction of forests in order to make the land available for other uses, such as housing and urbanization. An estimated 18 million acres of forest are lost each year, and half of the trees illegally logged are used as fuel.³⁷

The most concentrated deforestation occurs in tropical rainforests, with about half of the world's tropical forests have been cleared.³⁸ Yet tropical rainforests, covering 7% of the Earth's surface, are home to about 50% of the world's species.³⁹ As the rainforests are cleared, these species that once called the rainforests their homes, are ousted of their natural habitats and forced to adapt in new ecosystems or co-exist with man on artificial landscapes, such as farms. Deforestation in the world's largest tropical rainforest, the Amazon rainforest, is particularly rampant near more populated areas, roads and rivers, but even remote areas have been encroached upon when valuable mahogany, gold and oil are discovered.⁴⁰

In light of the recent South East Asian transboundary haze, the practice of slash-and-burn has been receiving global attention. However, this practice has been in use for thousands of years in Central America and Mexico.⁴¹ Slash-and-burn is an agricultural procedure employed to clear patches of land for plantation, where farmers cut down part of the vegetation on the land before setting fire to the remainder.⁴² As global demand for palm oil is increasing rapidly, plantations are spreading across Asia, Africa and Latin America, which contain some of the greatest biodiversity on Earth, including many endangered species.⁴³ The biggest impact of unsustainable palm oil production is the loss of critical habitat for these endangered species, leading to greater human-wildlife conflict. Indonesia and Malaysia are the key stakeholders involved in the palm oil industry, producing 86 percent of the world's palm oil.⁴⁴ It is of grave concern that these countries engage in such unsustainable agricultural

³⁷ Bradford, Alina. "Deforestation: Facts, Causes & Effects." LiveScience. March 04, 2015. Accessed June 21, 2017. <http://www.livescience.com/27692-deforestation.html>.

³⁸ "State of the World's Forests: the first ten issues" FAO Accessed 21 June, 2017. <http://www.fao.org/docrep/016/i3010e/i3010e01.pdf>

³⁹ George Kling. The Global Change Project. "The Tropical Rainforest." Global Change. Accessed June 21, 2017. <http://www.globalchange.umich.edu/globalchange1/current/lectures/kling/rainforest/rainforest.html>.

⁴⁰ "Deforestation." WWF. Accessed June 21, 2017. <https://www.worldwildlife.org/threats/deforestation>.

⁴¹ "Slash and Burn Agriculture." EcoLogic Development Fund. Accessed June 21, 2017. <http://www.ecologic.org/actions-issues/challenges/slash-burn-agriculture/>.

⁴² "South East Asia haze: What is slash-and-burn?" BBC News. June 24, 2013. Accessed June 21, 2017. <http://www.bbc.com/news/business-23026219>.

⁴³ "Palm oil." WWF - Palm oil - WWF-Australia. Accessed June 21, 2017. <http://www.wwf.org.au/what-we-do/food/palm-oil#gs.QxxQp3w>.

⁴⁴ "Palm oil." WWF - Palm oil - WWF-Australia. Accessed June 21, 2017. <http://www.wwf.org.au/what-we-do/food/palm-oil#gs.QxxQp3w>.



practices, yet possess tropical rainforests that support a range of biodiversity endemic to these regions, such as tigers and orangutans.

Without sufficient reforestation, habitat and hence biodiversity loss can be severe. Deforested regions are more exposed to the natural elements and are prone to adverse soil erosion, which washes away top level arable soil, degrading the region into a wasteland. However, forests are still being removed at a rate 10 times higher than any possible level of regrowth⁴⁵, which is a concern that requires immediate attention.

Desertification

Desertification is the persistent degradation of dryland ecosystems by variations in climate and human activities. It occurs on all continents except Antarctica, and the situation is most severe in Africa, where 66% of the total land area is arid or semi-arid.⁴⁶ According to a UNESCO report in 2012, one-third of the world's land surface is threatened by desertification.⁴⁷ Populations affected by desertification are those that live in the dryland, which are usually in developing countries. In addition, dryland populations are often marginalized both socially and politically due to their impoverishment and remoteness⁴⁸, hence are unable to be involved in the crafting of policies that affect them and their livelihood.

The two main causes of desertification are climatic variations and human activities. Increasing global temperatures and climate change have led to more droughts, as well as changes to precipitation patterns. The lack of precipitation, coupled with hot, dry weather that promotes evaporation, lowers the water table depth and hence leading to a drought. However, the major cause of desertification worldwide is overgrazing. When livestock feed on plants down to the roots, the plants grow short roots which provides minimal anchorage to the ground. Eventually, plants stop growing, and these large open areas with no vegetation exposes the soil to the natural elements.⁴⁹ Deforestation, agricultural activities and the exploitation of natural vegetation cover for domestic use such as obtaining fuel wood, are also the main causes of soil degradation in susceptible drylands and other areas.⁵⁰

⁴⁵ "Impact of habitat loss on species." WWF. Accessed June 21, 2017.

http://wwf.panda.org/about_our_earth/species/problems/habitat_loss_degradation/.

⁴⁶ "Desertification: Its Effects on People and Land" World Ecology Report Accessed 21 June, 2017.

http://worldinfo.org/wp-content/uploads/library/wer/english/2009_Spring_Vol_XXI_no_1.pdf

⁴⁷ "Desertification, Drought Affect One Third of Planet, World's Poorest People, Second Committee Told as It Continues Debate on Sustainable Development | Meetings Coverage and Press Releases." United Nations. Accessed June 21, 2017. <https://www.un.org/press/en/2012/gaef3352.doc.htm>.

⁴⁸ "Desertification." Desertification: 3. Who is affected by desertification? Accessed June 21, 2017.

<https://www.greenfacts.org/en/desertification/l-2/3-impacts-desertification.htm#2>.

⁴⁹ "How does overgrazing cause desertification?" Population Education. May 05, 2017. Accessed June 21, 2017.

<https://www.populationeducation.org/content/how-does-overgrazing-cause-desertification>.

⁵⁰ "What are the Major Causes of Desertification?" Japan Ministry of Environment Accessed 21 June, 2017.

<https://www.env.go.jp/en/nature/desert/download/p2.pdf>



Desertification reduces soil fertility, particularly base cation content, organic matter content, pore space and water-retention capacity. This leads to a decline in vegetative productivity, which affects agricultural and livestock yields. The loss of the productive potential of the land also leads to the growth of invasive weeds, such as the knapweeds in the northern region of the Salmon-Challis National Forest.⁵¹ Desertification has led to major droughts such as the 1969 to 1973 drought in the African Sahel, which led to the death of 250, 000 people and millions of livestock.⁵² Desertification has also caused the conversion of perennial grasslands to savannas dominated by annual grasses. An example would be the Kalahari Gemsbok National Park in South Africa, where satellite imagery showed increases in exposed soil surfaces, which are usually irreversible.⁵³

Overfishing

Large-scale fishing activities are arguably effective in allowing the commercial fishing industry to be able to keep up with increasing demand. However, careless fishing for the largest catch possible has led to overfishing, where the remaining fish population is unable to replace the number of fish removed from the water body in time. As a result, according to the FAO, 25% of the world's fish stocks are overexploited, or have already been depleted.⁵⁴ This overexploitation not only threatens the supply of fish as a food source, but threatens the biodiversity of the oceans and lakes. Overfishing of common fish like the cod and tuna depletes the food supply for greater sea species like whales and dolphins, creating large ecological dead zones.⁵⁵ Direct overfishing of species higher in the food chain creates a shift in the ecosystem towards smaller fish, upsetting the balance of the ecosystem.⁵⁶

The Atlantic Cod, for example, came into high demand starting in the 1950s. At the same time large factory trawlers were introduced to the Canadian fishing industry. Eventually, in 1992 the cod fisheries

⁵¹ "Salmon-Challis National Forest (N.F.), Noxious Weed Management Program: Environmental Impact Statement" United States Forest Service Accessed 21 June, 2017.

<https://books.google.com.sg/books?id=w6I2AQAAMAAJ&pg=SA4-PA5&lpg=SA4-PA5&dq=desertification+weeds+and+invasive+species&source=bl&ots=vr-TW92INO&sig=VNYA7BaPicue5OGIEsEBAcR-PmA&hl=en&sa=X&ved=0ahUKEwis7grqnUAhWDwl8KHasVA3cQ6AEIQzAG#v=onepage&q=desertification%20weeds%20and%20invasive%20species&f=false>

⁵² "Desertification of Arid Lands." Center for International Earth Science Information Network. Accessed June 21, 2017.

<http://www.ciesin.org/docs/002-193/002-193.html>.

⁵³ "Impacts on Desertification." IPCC - Intergovernmental Panel on Climate Change. Accessed June 21, 2017.

<http://www.ipcc.ch/ipccreports/tar/wg2/index.php?idp=404>.

⁵⁴ "General situation of world fish stocks" FAO Accessed 21 June, 2017.

<http://www.fao.org/newsroom/common/ecg/1000505/en/stocks.pdf>

⁵⁵ "Overfishing infographic" Overfishing.org Accessed 21 June, 2017.

http://overfishing.org/pages/images/overfishing_infographic_v1.1.png

⁵⁶ "Shark Declines Threaten Shellfish Stocks, Study Says." National Geographic. Accessed June 21, 2017.

<http://news.nationalgeographic.com/news/2007/03/070329-sharks-shellfish.html>.



of Canada and America collapsed. In 1995 it was estimated that the entire cod biomass had declined to around 1,700 tonnes from an annual yearly catch in the mid 50's of 250,000 tonnes.⁵⁷ The cod population has never recovered since. As apex predators, the collapse of the cod population caused a trophic cascade that drastically increased the population of smaller fish, upsetting the ecosystem.

Fishing methods themselves also have great impact on the habitat for marine biodiversity. Trawling, a controversial form of commercial fishing, involves dragging large nets through the water. Especially so for bottom trawlers, where heavy fishing gear is dragged across the seabed, trawling nets destroy coral reefs and entire seabed ecosystems by overturning the seabed. Bottom-trawling stirs up the sea-bed's surface, loading suspended solids into the water column. These turbidity plumes can even be seen following trawlers on satellite images.⁵⁸

Ecotourism

With the advancements in transportations and technologies, people able to travel to places that were rendered inaccessible in the past. With the increasing appreciation of nature, the concept of ecotourism has emerged. Ecotourism is regarded as an environmentally responsible travel to natural areas, in order to enjoy and appreciate nature and its accompanying cultural features.⁵⁹

Ecotourism is an avenue to promote conservation of local biodiversity and cultures, as well as to educate both locals and travelers about the importance of conserving biodiversity. It also serves as an alternative source of income for local communities, who generally have few other income-generating options.⁶⁰ Ecotourism has prompted developers to have more consideration for the natural environment, preserving more natural habitat and hence conserving biodiversity.

However, increased tourism to natural areas without the appropriate planning and management can threaten the integrity of ecosystems and local cultures. It is inevitable that some form of damage will be inflicted on the environment by humans, be it consciously or unconsciously. For instance, in the building of boardwalks in forested areas, forested regions have to be cleared to make way for the construction. The sound and dust generated by these constructions pollutes the local environment, and can impact the biodiversity detrimentally in the affected regions. In the African safari business,

⁵⁷ "Cod Collapse" Canada History. Accessed June 21, 2017.

http://www.canadahistory.com/sections/eras/pcsinpower/cod_collapse.htm.

⁵⁸ "Louisiana trawling landsat cropped" Accessed 21 June, 2017.

https://commons.wikimedia.org/wiki/File:Louisiana_trawling_landsat_cropped.jpg

⁵⁹ "Eco-Trips and Travel." What Is Ecotourism? | The Nature Conservancy. Accessed June 21, 2017.

<https://www.nature.org/greenliving/what-is-ecotourism.xml?redirect=https-301>.

⁶⁰ "Eco-Trips and Travel." What Is Ecotourism? | The Nature Conservancy. Accessed June 21, 2017.

<https://www.nature.org/greenliving/what-is-ecotourism.xml?redirect=https-301>.



where tour jeeps are used to bring tourists around the savannas, the jeeps scare off the animals that the lions prey on due to their loud noises and large movements. As a result, lions are forced to hunt during the hottest parts of the day, when no tour jeeps are around, which can take a toll on their health.⁶¹ In addition, ecotourism does not serve as an incentive to prevent people from pursuing activities that are detrimental to the environment. Illegal logging is still prominent in the Amazon rainforests⁶² despite the introduction of ecotourism to the region, which includes activities like watching pink river dolphins and hiking.

Ecotourism is labelled by some as an eco-facade, and the benefits of ecotourism over sustainability are exaggerated via marketing tactics. The establishment of resorts in nature reserves in the name of ecotourism has altered natural landscapes, wiping out the habitats and ecosystems. The ecotourism monoculture has replaced many local economic activities, but not necessarily improving their incomes. Locals are often left with low-paying service jobs such as tour guides and souvenir vendors, and they are not assured of year-round employment. It is undeniable that airline companies, tourism operators and developers make most of the profit derived from ecotourism, just as in conventional tourism.⁶³

Carbon Credits

As with every issue that affects the environment but can lead to a source of money, there is a conflict of interest. While the government wants to preserve biodiversity, industries and companies in the private sectors disregard the issue of the environment, with only the goal of maximising profits in mind. Examples include major companies such as ExxonMobil and Gazprom⁶⁴, who have some of the world's most carbon emissions.

Governments have been introducing various fiscal policies to overcome the negative externality that arises when there is significant harm done to the environment. An example, is the adoption of the carbon tax system. Utilising this system, a certain levy has to be paid depending on the amount of greenhouse gases produced. Another system put into place, is the carbon credit system. This system is formalized in the Kyoto Protocol⁶⁵ which is an international treaty that extends the United Nation Framework Convention on Climate Change (UNFCCC). This agreement was ratified by 156 member

⁶¹ "Pros and Cons of Eco-tourism." World Tourism Forum. Accessed June 20, 2017.

<http://worldtourismforum.org/global/pros-and-cons-of-eco-tourism/>.

⁶² "Pros and Cons of Eco-tourism." World Tourism Forum. Accessed June 20, 2017.

<http://worldtourismforum.org/global/pros-and-cons-of-eco-tourism/>.

⁶³ ECO-TOURISM OR ECO-TERRORISM? Accessed June 20, 2017. <https://www.gdrc.org/uem/eco-tour/negative.html>.

⁶⁴ "5 Energy Companies That Are Destroying the Planet and Don't Seem to Care." One Green Planet. Accessed June 20, 2017. <http://www.onegreenplanet.org/animalsandnature/energy-companies-that-are-destroying-the-planet-and-dont-seem-to-care/>.

⁶⁵ Administrator. "What is the Kyoto Protocol?" Carbon trade watch. Accessed June 20, 2017.

<http://www.carbontradewatch.org/carbon-connection/what-is-the-kyoto-protocol.html>.



states but was then notoriously rejected by the USA and Australia, both of which are major greenhouse gas producers. According to this treaty, the government gives each industry a certain of credit to produce that amount of greenhouse gases and they are not allowed to produce more than that. In the case whereby a company does not require all the credits, these credits can be sold to other companies that are producing more greenhouse gases than what their current amount of credits permit them to produce. This system rewards companies that produce less greenhouse gases, providing an alternative source of income through selling their carbon credits to other companies, while discouraging companies from producing more greenhouse gases. By treating carbon emissions as a market commodity, it further leads to better prices for carbon credits as it is solely controlled by free market forces. Furthermore, this system ensures that the amount of greenhouse gases emitted will be consistent.

On the other hand, there arises the complication of regulation. It is simply not feasible to bring each company, that exceeds its allowed carbon production, to task. Furthermore, it is also improbable to be able to ensure that its company does indeed stay under its assigned limit. This complication further escalates with the existence of corruption, especially in LEDCs such as India and Nigeria.

Also, there is the dilemma of certain companies benefitting from the production of carbon as well as climate change.⁶⁶ For example, oil companies can now utilise the area exposed by the melting of ice in the Arctic, as resources in those areas were previously untapped on. Furthermore, certain insurance companies will benefit as the general population will be scared of a higher chance of a disaster occurring due to climate change and will hence buy insurance. As seen, due to this, most companies make the unethical decision to forgo the environment for the sake of profits. As a result, even if they have to pay more to buy carbon credits, they will not mind in doing so as in the long run they earn more profits due to the consequences of climate change.⁶⁷

Overall however, it is important to note the adverse effects on biodiversity that can arise with climate change as well as a higher level of carbon in the atmosphere. First and foremost, the direct impact of an escalating concentration of carbon in the environment has a dire impact on the metabolic activity of plants. As this causes a drop in the number of plants, by virtue of the domino effect, most animals in the food chain are also affected and hence, a impact on biodiversity is observed. In addition, increasing

⁶⁶ Böhm, Steffen. "Why are carbon markets failing?" The Guardian. April 12, 2013. Accessed June 20, 2017. <https://www.theguardian.com/sustainable-business/blog/why-are-carbon-markets-failing>.

⁶⁷ Hyde, Rachael. "Industries That Will Benefit From Global Warming (MON, RDS-A)." Investopedia. September 22, 2015. Accessed June 20, 2017. <http://www.investopedia.com/articles/investing/092215/industries-will-benefit-global-warming.asp>.



temperatures and frequent extreme weather caused by climate change leads to changing pattern of rainfall and drought which also will have adverse consequences on biodiversity.

Biodiversity Offsetting

Biodiversity offsetting is a policy approach that seeks to minimize the environmental impacts of a development project by ensuring that any damage in a certain place is compensated for somewhere else⁶⁸. These changes in biodiversity are usually assessed through biodiversity tracking. Biodiversity tracking also forecasts the future impact of pressures caused by human activities especially in response to the conversion of land for agriculture and urbanisation.

However, biodiversity offsetting has its limitations and shortfalls as well. Studies have shown that in the United States, the implementing body almost never takes action when offsets are found not to be in compliance with the agreed standards. Furthermore, test cases in the European Union has also shown that biodiversity offsetting may increase levels of biodiversity destruction instead of preventing damage.⁶⁹ Most biodiversity offsets do not take into consideration the social impact of development and land-use change. This is especially crucial in developing countries where people depend heavily on natural resources, such as households having reduced agricultural land if the area was designated as an offset.⁷⁰

It is also important to note that reliable indicators for deforestation that can be monitored remotely have not been developed nor agreed on. National biodiversity monitoring programmes differ widely across various nations, and most data sets are inconsistent or not shared openly with the global community.⁷¹ In addition, the quantification of biodiversity is tricky and challenging as it involves the details of the interaction of energy with living organisms, instead of definite physical units.

Nevertheless, biodiversity offsets can be used to achieve environmental outcomes through the negotiations between the government and landholders and developers. The Department of Environment and Conservation New South Wales (DEC) has been involved in various cases in which negotiations between stakeholders were carried out in order to avoid, minimise or offset biodiversity losses. The construction of the Karuah bypass required the removal of 47 hectares of vegetation, 16 of

⁶⁸ "Biodiversity Offsetting in the UK: A Beginner's Guide" Department of Geography, University of Cambridge. Accessed June 20, 2017. <http://www.geog.cam.ac.uk/research/projects/biodiversityeconomy/policybrief1.pdf>.

⁶⁹ "Critical review of Biodiversity Offset track record" Fern. Accessed June 20, 2017. <http://www.fern.org/sites/fern.org/files/Critical%20review%20of%20biodiversity%20offsets.pdf>.

⁷⁰ Cécile. "Social impacts of biodiversity offset projects" Bangor University. Accessed June 20, 2017. <http://www.esee2015.org/wp-content/uploads/2015/10/0154.pdf>.

⁷¹ "Environmental science: Agree on biodiversity metrics to track from space." Nature News. Accessed June 20, 2017. <http://www.nature.com/news/environmental-science-agree-on-biodiversity-metrics-to-track-from-space-1.18009>.



which were from the Karuah Nature Reserve. An 89 hectares block of privately owned land, which contained similar vegetation and many threatened species as to that affected by the road upgrade, was purchased by the government and then incorporated into the adjacent Karuah Nature Reserve. In addition, a contribution of \$15,000 towards initial management costs was made by the government to control the growth of weeds and conduct active rehabilitation for the new plot of land.⁷²

Recently, satellite remote sensing has drawn the attention of conservationists for long-term global coverage of the biodiversity globally. Satellite remote sensing can rapidly reveal areas to reverse the loss of biodiversity on a wide range of scales in a consistent, borderless and repeatable manner.⁷³ However, researchers have been unable to define a standard set of biodiversity variables to monitor from satellites. This is due to the inadequate access to satellite data, where data was restricted for security or commercial reasons, and the spatial and temporal limitations of satellite imagery. Furthermore, there is a lack of communication between the ecology and remote-sensing communities.⁷⁴

LINKS TO SUSTAINABLE DEVELOPMENT

In 2015, the sustainable development goals (SDGs) were launched by the United Nations that followed and expanded on the millennium development goals (MDGs). The SDGs are a new, universal set of goals, targets and indicators that United Nations member states will be expected to use to frame their agendas and political policies over the next 15 years.⁷⁵ Many of these SDGs have an impact, either directly or indirectly, on biodiversity.

Goal 6: Ensure access to water and sanitation for all⁷⁶

One of the targets of Goal 6 includes to improve water quality by reducing pollution, eliminating dumping and minimizing release of hazardous chemicals and materials, halving the proportion of untreated wastewater and substantially increasing recycling and safe reuse globally. One example of

⁷² Heritage, CorporateName=Office Of Environment and. "Avoiding and offsetting biodiversity loss - case studies." NSW Environment & Heritage. April 27, 2016. Accessed June 20, 2017.

<http://www.environment.nsw.gov.au/biobanking/biodivcasestudies.htm>.

⁷³ Turner, Woody. "Sensing biodiversity." Science. October 17, 2014. Accessed June 20, 2017.

<http://science.sciencemag.org/content/346/6207/301>.

⁷⁴ "Environmental science: Agree on biodiversity metrics to track from space." Nature News. Accessed June 20, 2017.

<http://www.nature.com/news/environmental-science-agree-on-biodiversity-metrics-to-track-from-space-1.18009>.

⁷⁵ Ford, Liz. "Sustainable development goals: all you need to know." The Guardian. January 19, 2015. Accessed June 20, 2017. <https://www.theguardian.com/global-development/2015/jan/19/sustainable-development-goals-united-nations>.

⁷⁶ "Water and Sanitation - United Nations Sustainable Development." United Nations. Accessed June 20, 2017.

<http://www.un.org/sustainabledevelopment/water-and-sanitation/>.



water pollution would be DuPont's egregious disposal practices since the 1950s. Toxic waste, such as Perfluorooctanoic (PFOA) acid, were buried in drums along the banks of the Ohio River. Barrels of toxic wastes were also dropped into the open ocean and buried in local 'non-hazardous' landfills, which might potentially seep into aquifers and groundwater reserves.⁷⁷ PFOA is an extremely stable chemical and does not biodegrade, but bioaccumulates in the bodies of organisms. PFOA has been found in the blood of seals, eagles and dolphins around the world, including in animals living in a remote wildlife refuge in the middle of the North Pacific.⁷⁸ It is evident that water pollution has an adverse effect on living organisms, including humans, either directly or indirectly.

It is acknowledged by the United Nations that hydropower is the most important and widely-used renewable source of energy. As of 2011, hydropower represented 16 per cent of total electricity produced worldwide and this is expected to increase as costs for harnessing hydropower decrease. However, as mentioned in earlier paragraphs, the constructions of dams for harnessing hydropower have caused significant impacts on the biodiversity in the regions. Hence, a balance between harnessing hydropower and biodiversity conservation needs to be achieved.

Goal 12: Ensure sustainable consumption and production patterns⁷⁹

The targets of Goal 12 also include encouraging companies to adopt sustainable practices and to integrate sustainability information into their reporting cycle, as well as developing and implementing tools to monitor sustainable development impacts for sustainable tourism that creates jobs and promotes local culture and products. This is in line with the various issues brought up, such as the slash-and-burn practice in the palm oil industry and ecotourism, which need to be resolved.

Goal 15: Sustainably manage forests, combat desertification, halt and reverse land degradation⁸⁰

Thirteen million hectares of forests are being lost every year while the persistent degradation of drylands has led to the desertification of 3.6 billion hectares. Of the 8,300 animal breeds known, 8 per cent are extinct and 22 per cent are at risk of extinction.

⁷⁷ Sharon Kelly / Earth Island Journal. "For More Than 50 Years, DuPont Concealed the Cancer-Causing Properties of Teflon." Alternet. Accessed June 20, 2017. <http://www.alternet.org/personal-health/duPont-duplicity-chemical-giant-hid-cancer-causing-properties-teflon>.

⁷⁸ Sharon Kelly / Earth Island Journal. "For More Than 50 Years, DuPont Concealed the Cancer-Causing Properties of Teflon." Alternet. Accessed June 20, 2017. <http://www.alternet.org/personal-health/duPont-duplicity-chemical-giant-hid-cancer-causing-properties-teflon>.

⁷⁹ "Sustainable consumption and production." United Nations. Accessed June 20, 2017. <http://www.un.org/sustainabledevelopment/sustainable-consumption-production/>.

⁸⁰ "Forests, desertification and biodiversity - United Nations Sustainable Development." United Nations. Accessed June 20, 2017. <http://www.un.org/sustainabledevelopment/biodiversity/>.



The targets of Goal 15 encompass the aspects of sustainable management of forests through the conservation and restoration of ecosystems, while also reducing and preventing the degradation of natural habitats. It also aims to mobilize and significantly increase resources to conserve and sustainably use biodiversity and ecosystems. It also hopes to integrate ecosystem and biodiversity values into national and local planning, development processes, poverty reduction strategies and accounts by 2020.

In 2010, Australia released the Australia's Biodiversity Conservation Strategy 2010-2030, which is the guiding framework for governments to recognise the importance of conservation of the national biodiversity, and putting conservation into action. This is especially significant as Australia is a megadiversity nation with a high number of endemic species, including having the most number of endemic mammals and non-fish vertebrates than any country on Earth.⁸¹ However, it is important to note that Australia is the only megadiversity nation on Earth which is a developed nation with a low population density, hence has a high level of economic ability for biodiversity protection. The other megadiversity nations are developing nations which face population pressures, hence competing with biodiversity protection for land use. While similar frameworks can also be adopted in the other megadiversity nations, the countries' economic ability and demographic need to be taken into account.

⁸¹ "Australia's Biodiversity - A Summary." The Wilderness Society. December 10, 2015. Accessed June 20, 2017. <https://www.wilderness.org.au/articles/australias-biodiversity-summary>.



PAST INITIATIVES

Africa Adaptation Programme (2008 - 2012)⁸²

The Africa Adaptation Programme (AAP) was launched in 2008 by UNDP in partnership with the United Nations Industrial Development Organization (UNIDO), the United Nations Children's Fund (UNICEF), the World Food Programme (WFP) and US\$92.1 million support from the Government of Japan. It aims to integrate climate resilience in the national development plans of African countries to allow them to adjust and cope with climate change.

The AAP has instituted transformational changes in the 20 African countries in the areas of:

- I. Long-term planning
- II. Leadership and institutional capacity
- III. Climate-resilient policies and measures
- IV. Innovative finance
- V. Knowledge generation and sharing

After the end of the AAP, reviews of findings have led to the suggestion of the following key advice and recommendations.⁸³ Firstly, more emphasis can be placed on research capacity development where more organisational and institutional capacities can be build. However, these projects would require both long time commitment and funding for a minimum of ten years. In addition, a future programme on knowledge sharing can be established to enhance productivity of such future programmes in similar regions in future.

Biodiversity Finance Initiative (BIOFIN) (2012)⁸⁴

In October 2012, UNDP launched the Biodiversity Finance Initiative (BIOFIN) as a new global partnership across 30 countries. It aims to address the biodiversity finance challenge in a comprehensive manner through increased investment in the management of ecosystems and biodiversity. The BIOFIN methodology provides an innovative, stepwise and adaptable approach that enables countries to analyse the policy and institutional context for biodiversity finance. It also allows countries to measure the current biodiversity expenditures by the public sector, private sector, donors,

⁸² "Africa Adaptation Programme." UNDP. Accessed June 20, 2017.

http://www.undp.org/content/undp/en/home/ourwork/environmentandenergy/projects_and_initiatives/aap/.

⁸³ "Final Evaluation of the IDRC/DFID Climate Change Adaptation in Africa Programme" May 17, 2012. Accessed June 20, 2017. http://www.agrhymet.ne/portailCC/images/pdf/Report_final_project_CRDI_AGRHYMET_2011.pdf.

⁸⁴ "The Biodiversity Finance Initiative." UNDP. Accessed June 20, 2017.

<http://www.undp.org/content/undp/en/home/ourwork/sustainable-development/natural-capital-and-the-environment/biodiversity-and-ecosystems-management/biodiversity-finance-initiative/>.



NGOs and other civil society actors, such that they can assess future financial needs needed to achieve national and sub-national biodiversity targets. Therefore, countries can identify and mobilize the resources and policies required to successfully implement the most suitable finance solutions to achieve national biodiversity plans and targets.

BIOFIN also recognises four types of finance results countries can pursue, which includes delivering better through enhancing efficiency and synergies, preventing or reducing expenditures, mobilising financial resources and re-aligning existing financial flows and resources.

Global Policy Centre on Resilient Ecosystems and Desertification⁸⁵

Global Policy Centre on Resilient Ecosystems and Desertification (GC-RED) is one of UNDP's six Global Policy Centres. Building on the work of the former Drylands Development Centre (DDC), GC-RED is responsible for advancing global thinking and knowledge sharing on inclusive and sustainable development in drylands and other fragile ecosystems. It works to explore solutions in two major areas:

1. Sustainable management of renewable natural capital for optimal livelihoods support and jobs creation, with a particular focus on the poorest and most vulnerable communities; and
2. Social and ecological resilience in drylands and other fragile ecosystems.

In order to achieve those goals, many initiatives have been implemented such as the Sustainable Land Management and Restoration programme which aims to help ecosystem restoration efforts. Another programme is the Integrated Drylands Development Programme which, as its name suggests, is an initiative targeted at supporting sustainable development in drylands.

United Nations Collaborative Programme on Reducing Emissions from Deforestation and Forest Degradation in Developing Countries (UN-REDD Programme) (2008)⁸⁶

The UN-REDD Programme was established in 2008 to assist developing nations in meeting the forest conservation objectives in the 2005 United Nations Framework Convention on Climate Change (UNFCCC). The UNFCCC adopts the REDD+ approach, which aims to mitigate climate change through the reduction of net emissions of greenhouse gases by ensuring the conservation of forests. Thus the UN-REDD Programme supports nations in REDD+ processes by providing funding and technical support.

⁸⁵ "Global Policy Centre on Resilient Ecosystems and Desertification." UNDP. Accessed June 20, 2017. http://www.undp.org/content/undp/en/home/ourwork/global-policy-centres/sustainable_landmanagement.html.

⁸⁶ "UN-REDD Programme." UN-REDD Programme. Accessed June 20, 2017. <http://www.un-redd.org/>.



The UN-REDD Programme also employs sustainable practices and strives to contribute to national sustainable development. The UN-REDD Programme now covers 64 countries in Asia, Latin America and Africa.

A recent community project⁸⁷ in Kalimantan, Indonesia helped study and build peat dams in canals to reduce the risk of fire used in land clearing from unintentionally spreading to peatlands. Peatland ecosystems are not just the most efficient carbon sink available, but is also vital to biodiversity in the area.

⁸⁷ UN-REDD Programme. Accessed June 20, 2017. <http://www.un-redd.org/single-post/2017/04/01/Community-based-options-for-water-and-fire-management-in-Barito-Selatan-Central-Kalimantan>.



KEY STAKEHOLDERS

Australia

Australia is the only megadiversity nation that spans an entire continent. As mentioned previously, Australia is home to many endemic species, as well as endangered species. The Australia's Biodiversity Conservation Strategy 2010 - 2030 was established to put biodiversity conservation into action, and it was followed by a review in 2015. Australia has also seen success in the recovery of threatened species such as the helmeted honeyeater, red-tailed black cockatoo, western swamp tortoise and the pigmy bluetongue lizard.⁸⁸

Bangladesh

While over-exploitation, deforestation, habitat change and pollution are considered as the most important current drivers of biodiversity loss in Bangladesh, climate change is expected to become increasingly important. According to the Intergovernmental Panel on Climate Change (IPCC), at least one third of the forests will be adversely affected by climate change. Due to the increased rainfall in the monsoon season, water runoff rate on the forest floor has increased too, leading to rapid soil erosion in the region, destroying the ecosystems.⁸⁹ More than 50 species are critically endangered in Bangladesh, of which 23 species are already declared as endangered in the Red Data Book of IUCN (International Union for Conservation of Nature). Bangladesh still holds the world's most diverse and abundant inland fisheries, however unplanned constructions in the floodplains have led to a decline or even disappearance of many popular local species.⁹⁰

Brazil

Brazil contains one of the largest tropical rainforests in the world, containing two thirds of the Amazon rainforest. It has more species of trees than any other forests and is home to over 40,000 kinds of plants. However, Brazil also has one of the highest rates of deforestation in the world. From 1980 to 1990, more than one fifth of all tropical forests globally were lost as a result.⁹¹ However, Brazil recently

⁸⁸ "Learning from conservation success." TSR Hub. Accessed June 20, 2017.

<http://www.nespthreatenedspecies.edu.au/news/learning-from-conservation-success>.

⁸⁹ "Climate Change and Biodiversity & Forests in Bangladesh" Ministry of Environment and Forests, Government of the People's Republic of Bangladesh. Accessed June 20, 2017. <http://cmsdata.iucn.org/downloads/bio.pdf>.

⁹⁰ Rahman, Md. Redwanur. "Causes of Biodiversity Depletion in Bangladesh and Their Consequences on Ecosystem Services." American Journal of Environmental Protection. September 05, 2015. Accessed June 20, 2017. <http://article.sciencepublishinggroup.com/html/10.11648.j.ajep.20150405.13.html>.

⁹¹ Benjamin, Rowland. "Forests/Brazil." Forests/Brazil - Conservation, biodiversity sustainability environment issues, automated lobbying database at. June 20, 2017. Accessed June 20, 2017.

http://www.informaction.org/mp3/index.php?main=forbra_intro&subject=Forests%2FBrazil.



started a consultation process to define public policies capable of implementing large-scale sustainable practices, one of which is to create and consolidate protection areas in the country,⁹² in an attempt to encourage the conservation of natural environments.

People's Republic of China

China's population pressure, coupled with the conversion of forests to farmlands and hydroelectric projects, have led to the remaining forests in China at risk of being cleared. In addition, about one-quarter of the country's total land surface has been under desertification. Closely related to the issues of deforestation and desertification, habitat loss and hence a decrease in biodiversity is also rampant in China. However, the issue with species loss extends far beyond the borders of China. Elephants are slaughtered for ivory, rhinos are killed for their horns and tigers are culled for their bones, just to satisfy the insatiable Chinese market.⁹³ Over the years, conservation efforts have been made by the international community, which finally paid off in 2016, when the giant panda has been downgraded from 'Endangered' to 'Vulnerable' on the global list of species at risk of extinction.⁹⁴

India

India is one of the richest countries in terms of biodiversity. She hosts about 8 per cent of all the documented species in the world and harbours 4 of the 34 global biodiversity hotspots. However, it is estimated that after independence, India has lost 4,696 million hectares of forest land due to various causes such as illegal encroachment, cultivation, industries, roads and transmission lines. In recent years, an increasing number of species found in India are identified as threatened, due to changing land use patterns and diversion of forest lands for agricultural uses. In addition, natural calamities are also responsible for the depletion of biodiversity. During the monsoon season in 1998, the Kaziranga National Park was heavily flooded, resulting in the death of many plants and animals, such as rhinos, bears and elephants.⁹⁵ However, in 2017, India announced a conservation plan, spending R. 100 crores over a duration of 5 years to bring 4 species back from the brink of extinction. The endangered animals are the Gangetic Dolphin, the Great Indian Bustard (GIB), the Manipur Deer and the Dugong. Notably, the GIB and Manipur Deer are species endemic to India.⁹⁶

⁹² Biodiversity in Brazil | United Nations Educational, Scientific and Cultural Organization. Accessed June 20, 2017. <http://www.unesco.org/new/en/brasil/natural-sciences/environment/biodiversity/>.

⁹³ Lallanilla, Marc. "China's Top 6 Environmental Concerns." LiveScience. March 15, 2013. Accessed June 20, 2017. <https://www.livescience.com/27862-china-environmental-problems.html>.

⁹⁴ "Giant panda no longer Endangered." WWF. September 04, 2016. Accessed June 20, 2017. <https://www.worldwildlife.org/stories/giant-panda-no-longer-endangered>.

⁹⁵ "7 Causes of Biodiversity Loss in India – Explained!" Biology Discussion. August 27, 2015. Accessed June 20, 2017. <http://www.biologydiscussion.com/biodiversity/7-causes-of-biodiversity-loss-in-india-explained/4497>.

⁹⁶ Vyawahare, Malavika. "India is spending 100 cr to save 4 critically endangered species." <http://www.hindustantimes.com/>. May 22, 2017. Accessed June 20, 2017. <http://www.hindustantimes.com/health/india-is-spending-100-cr-to-save-4-critically-endangered-species/story-EnsoGIqu841L9KraeGWMgM.html>.



Indonesia

An archipelago made up of about 17,000 islands, Indonesia is home to many unique ecosystems and is one of the world's richest nations in terms of its biodiversity. Indonesia possesses 10 per cent of the world's flowering species (25,000 flowering plants) and 12 per cent of the world's mammals, placing it second after Brazil.⁹⁷ According to a study published in *Nature Climate Change* in June 2014, Indonesia has the highest rate of deforestation in the world. This can be attributed to the rising global demand for wood pulp and palm oil, which the latter is a major source of income for Indonesia. Another cause of deforestation stems from the demand for timber, where 80 per cent of timber production is considered to stem from illegal logging.⁹⁸ Overexploitation of marine resources and destructive fishing practices such as cyanide and blast fishing on coral reefs have also affected the ecosystems, pushing fish populations even closer to depletion.

United States of America

2016 saw the United States formally entering the Paris climate change agreement, along with more than 190 countries. This was seen as a huge step forward, considering the United States previously refused to ratify the Kyoto Protocol on global warming in 2001. However, just in June 2017, USA President Donald Trump announced that he will withdraw the United States from the Paris climate accord, to 'put American workers first'.⁹⁹ In March 2017, Trump's budget blueprint for the year saw a 31 per cent slash for the funding for the Environmental Protection Agency (EPA).¹⁰⁰ This would affect many of the climate change initiatives under EPA, such as the Energy Star program for energy-efficient electrical appliances, and the SmartWay program, which helps trucking companies fit their trucks with aerodynamic flaps and low resistance tires that save fuel and reduce emissions.¹⁰¹

⁹⁷ "The Rich Biodiversity in Indonesia." Biodiversity Conservation in Indonesia. Accessed June 20, 2017. https://blogs.ntu.edu.sg/hp331-2014-03/?page_id=27.

⁹⁸ "Deforestation." Biodiversity Conservation in Indonesia. Accessed June 20, 2017. https://blogs.ntu.edu.sg/hp331-2014-03/?page_id=104.

⁹⁹ Crilly, Rob. "Donald Trump pulls US out of Paris climate accord to 'put American workers first'" *The Telegraph*. June 01, 2017. Accessed June 20, 2017. <http://www.telegraph.co.uk/news/2017/06/01/trump-pull-paris-accord-see-better-deal/>.

¹⁰⁰ Thrush, Glenn, and Coral Davenport. "Donald Trump Budget Slashes Funds for E.P.A. and State Department." *The New York Times*. March 15, 2017. Accessed June 20, 2017. https://www.nytimes.com/2017/03/15/us/politics/budget-epa-state-department-cuts.html?_r=1.

¹⁰¹ <https://www.nytimes.com/2017/04/10/climate/trump-epa-budget-cuts.html>



FOOD FOR THOUGHT

1. Should developing nations be allowed to cause the same biodiversity damage past developed nations caused in the past?
2. Protecting biodiversity is often seen to come at a cost of economic development. How can the UNDP help developing nations attain both?
3. How can technology effectively assist developing nations with preserving their biodiversity?
4. Are there ways preserving biodiversity can contribute to a nation's economy or wealth?
5. Does biodiversity offsetting justify the destruction of existing biodiversity?



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