Forum: SISMUN-Youth

Issue: Measures to Curb the Increasing Loss of Global Biodiversity Due to Invasive Species

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Introduction

The loss of global diversity is currently a pressing and critical issue worldwide, and the rate of its decline is profoundly alarming. According to the Living Planet Index (LPI) complied by the World Wildlife Fund (WWF), the 2022 global LPI indicates an average decline of 69% in wildlife populations under its track between 1970 and 2018. Approaches to terminate or decelerate the loss of global biodiversity have mostly been unsuccessful to this date, even with three decades of policy interventions. A primary factor behind such a drastic decline in global diversity is invasive species.

Invasive species or alien species are defined by National Geography as “an organism that is not indigenous, or native, to a particular area”, and their spread is primarily facilitated by human activities inadvertently, as they are often transported in vehicles. To provide an example, the brown tree snake, indigenous to Papua New Guinea and invasive to Guam, was accidentally transported by US military vehicles after World War II. The effects of such accidents are severe. According to research published in Frontiers in Ecology and the Environment, invasive species are “the primary cause of global extinctions in the past five centuries”, and the research determined that out of the 953 species that have become extinct since the 16th century, invasive species contributed to the extinction of approximately 300 species.

The impacts of invasive species are multidimensional and are both environmental and economic. The economic impacts of invasive species are subject to control costs, agricultural productivity, and property values. The effects thereof are mostly attributed to the disruption of the ecosystem’s balance, resulting in a total economic cost of 1.288 trillion over the past 50 years on a global scale. Furthermore, it is estimated that the expenditure on invasive species control in the United States alone is around 95.3 billion USD during the period of 1960 to 2020. This cost, however, may be unaffordable for Less Economically Developed Countries (LEDCs), as will be further elaborated in the “Previous Attempts” section. Hence, it is recommended that any resolution featuring solutions for invasive species control also encompasses support for LEDCs to address the issue.

When drafting resolutions, delegates should consider the multifaceted impacts of invasive species. Even though most invasive species are harmful, there are exceptions, where some may be economically and environmentally beneficial. For instance, some invasive plants provide ecological benefits, including the autumn olive, which provides food for bird species, especially during winter, when food resources are scarce. Therefore, it is crucial to note that the content above and the majority of the following content focuses on invasive species with negative impacts, unless stated otherwise.

Definition of Key Terms

Invasive species

Invasive species refer to non-indigenous species that invade a region or ecosystem. Often, they are accidentally introduced into a non-native environment by human activity and are viewed as a significant threat to an ecosystem. This is due to their potential to cause environmental and economic damage to their non-native environment, as well as their capability to alter ecosystem functions and balances. Click here to enter text.

Indigenous species

Indigenous species, or native species, refers to organisms naturally found in their habitat over an extensive period. This term opposes the term “invasive species”. The decline of the population of indigenous species is the most observed consequence of the introduction of invasive species.

Biodiversity

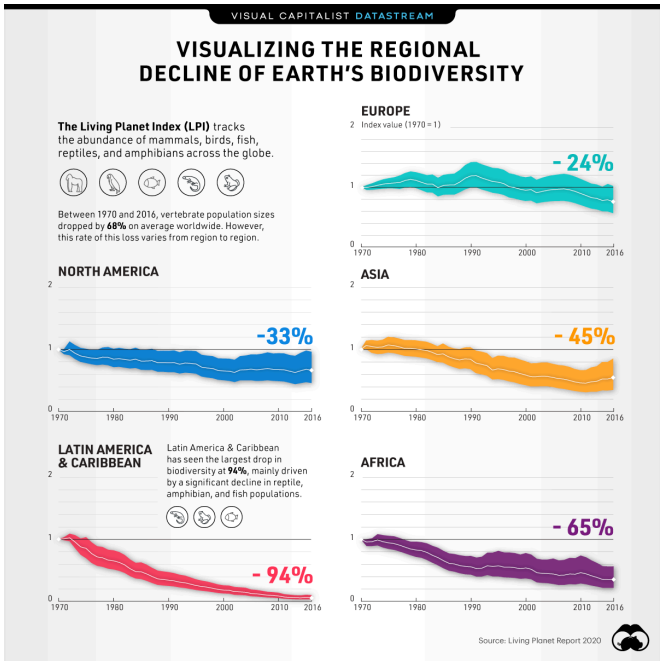
Biodiversity is the variety of species in a specific ecosystem or region. A primary method to measure biodiversity would be to measure species richness or count the number of species in an area. The decrement in biodiversity is one of the commonly observed impacts of the overabundance of invasive species in an ecosystem.

Restoration

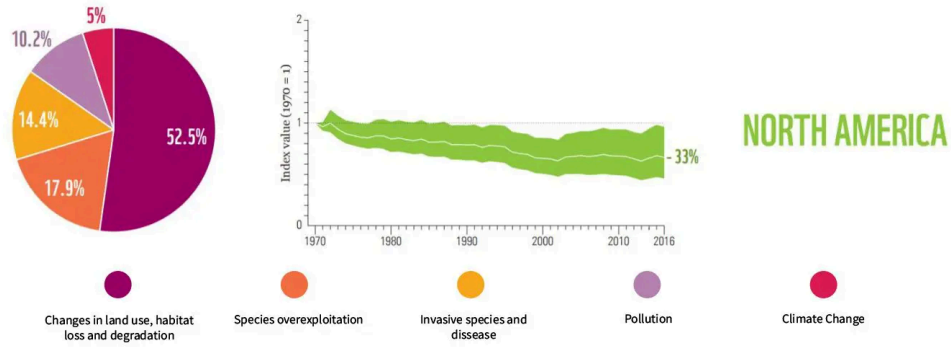
Restoration refers to the act of returning something to its former, usually better, condition. In the context of this issue, restoration is to reduce the loss of biodiversity by controlling invasive species to improve the ecological health of an ecosystem globally in the larger picture.

Background Information

The global loss of biodiversity



Caption #1: The visualization of the decline of biodiversity in 5 continents (Ang)



Caption #2: The visualization of the factors leading to the decline of biodiversity in North America (Daily Sabah)

As indicated in the graphs, derived from the WWF Living Planet Report 2020, the loss of biodiversity has been a global issue regardless of the region, with Latin America being the most impacted, where its vertebrate population has dropped by 94% compared to 1970. Additionally, in North America, 14% of the decline of the living planet index (refer to the introduction) is subject to invasive

species. Therefore, it is crucial to restore biodiversity by controlling the spread of harmful invasive species.

Overview of the importance of biodiversity

The importance of biodiversity to ecosystems

Ecosystems are composed of diverse species with distinct functions that are of vital importance to the ecosystem, which are categorized into photosynthesizers, decomposers, herbivores, and carnivores to sustain the health of an ecosystem. In each of the functions, an apparent excessive number of species for each ecological role (which is what biodiversity creates) is required as insurance for the ecosystem during the occurrence of disturbances. When a species is unable to survive due to such disturbances, an alternative species can assume its ecological role. In summary, biodiversity is critical to increasing the resilience of an ecosystem.

However, the damages dealt by invasive species are not always reversible. For instance, within an ecosystem, keystone species exist, which are species with a significant ecological role. Once impacted by any means, including invasive species, no other species can assume its ecological role and the survival of an ecosystem will be threatened. An example would be the eradication of wolves from Yellow Stone National Park. Once removed, the elk population within Yellowstone Park rocketed and the plant and the plant resources within the park depleted.

The importance of biodiversity to mankind

Biodiversity is vital to humankind. To begin with, variety in the human diet is crucial, which is guaranteed by biodiversity, including animal products, vegetables, and fruit. However, a growing trend of reliance on a limited variety of food sources or crops among humans has been observed. Nearly 60% of plant-based calories consumed by humans are obtained from three types of crops, including wheat, corn, and rice. As a result of this trend, the variety of rice grown in Asia has reduced from tens of thousands to a few dozen, which undermines the resilience of food sources as there is a lack of a substitute in case of a threat. Furthermore, virtually all contemporary medicine consists of plant ingredients, 25% of medicine is extracted from rainforest plants and 70% of cancer drugs have natural properties.

Additionally, over half of the world's GDP, which is approximately $44 trillion is supported by nature, including the medical industry and tourism, and an annual profit of $125 trillion is derived

from ecosystems, whose healthiness is highly dependent on biodiversity. The majority of the impoverished workforce (60%) is employed by the agricultural sector. For instance, in India, profits gained from forest ecosystems sustain up to 57% of the livelihoods of rural Indian communities. Therefore, based on the information above, it is critical to preserve global biodiversity by implementing measures to curb the spread of invasive species.

Impacts of invasive species on biodiversity

Once introduced to a new environment, invasive species can pose a threat to indigenous species in various ways. Predominantly, the local ecosystem may lack a predator to control its population, leading to the excessive proliferation of the invasive species, which ultimately results in the decline in the population of indigenous species, as invasive species can outcompete or prey on indigenous species who have not evolved defense mechanisms against invasive species.
One example would be the lionfish, which is native to the Indo-Pacific region and was introduced to the east coast of Northern America. Lionfish prey on native fish species including snappers and groupers, which results in the reduction of their population. According to research, the presence of a singular lionfish in a coral reef alone can lead to the reduction of 79% of the recruitment of native fish species. These native fish species are often crucial in maintaining a balanced level of algae growth in a coral reef, which is critical to the health of reef ecosystems, and some are economically significant.

Likewise, Japanese Knotweed is an invasive plant species native to eastern Asia and was introduced to regions including Europe, North America, and Oceania as an ornament. The consequences of the establishment of Japanese Knotweed in wetlands and riparian habitats include the degradation of their quality and the reduction of the sunlight received by surrounding plants as its leaves are effective in blocking sunlight. Research has indicated that the presence of Japanese Knotweed is directly related to the drastic reduction of the population of native green frogs (Rana clamitans). As one can see from the examples, invasive species are potential causes of the decline of the population of native species once introduced to a new environment, which potentially impacts ecosystems as well.

Control methods of invasive species

Currently, there are a variety of control methods that target invasive species, which the following section aims to provide an overview of.

Cultural control

Cultural control refers to the act of raising the awareness of locals of the affected environments due to invasive species on their threats, for them to enter a habit of preventing further impacts of invasive species. To do so, locals would be advocated to directly kill or control the populations, or to select approaches to decrease the impacts brought by invasive species, such as selecting pest-resistant crops. This is one of the most effective approaches, as it is cost-effective and, hence, sustainable. An example of the utilization of cultural control in environmental conservation would be the Coastal Program, which was initiated by the US Fish and Wildlife Service, as a voluntary program. This program has cooperated with over 50,000 private landowners to restore "4.5 million acres of uplands, 1.2 million acres of wetlands, and more than 13,000 miles of stream habitat."

Biological control

Biological control refers to the manipulation or the introduction of the population of natural predators or species that are harmful to the invasive species to reduce their populations to the area they were introduced to. For instance, insects including beetles and flies were previously utilized in North America to control the population of weeds. This was extremely successful, as the insects exclusively targeted weeds, resulting in a 99% reduction in the weed population. However, before the implementation of this method, assessments on the threat of the species used to control the population of invasive species to the local environment are necessary, as some species are non-native and may tend to prey on native species or become a threat themselves.

Chemical control

Chemical control refers to the usage of chemical substances that pose lethal harm to invasive species, including the usage of “pesticides, herbicides, fungicides, and insecticides”, as quoted by the United States Department of Agriculture (USDA). Nonetheless, it should be noted that chemicals are non-selective and may potentially pose a threat to the local species and environment; therefore, the implementation of the method of chemical control must undergo heavy consideration. Additionally, the use of chemicals, including pesticides, must comply with the International Code of Conduct on Pesticide Management, which was established by the Food and Agriculture Organization of the United Nations.

Physical control

Physical control refers to the manual control of invasive species using a variety of physical methods, including the eradication of invasive animals or the destruction of their nests and eggs, harvesting and disposal, shading, and constructing barriers to block invasive plants. However, despite being the most traditional way to prevent the spread of invasive species, physical control is not the most cost-effective or sustainable approach. In some cases, this method will only result in the temporary removal of the invasive species”

Challenges

Recently, despite control efforts in MEDCs (More Economically Developed Countries) observed (refer to the “previous attempts to resolve the issue” section), LEDCs struggle to successfully address the issue of invasive species, for instance, African countries. According to Scopus and Web of Science Databases, 35 African countries are impacted by invasive species out of 48 samples, and African countries are currently short of funds to allow for the successful control of invasive species. For instance, in South Africa, 7.1 billion South African Rands were spent in the period 1998 to 2020, and according to a study that was recently published in a science journal named Biological Conservation, three to seven times more funding is required to achieve significant success in conservation efforts in South Africa.

Major Countries and Organizations Involved

United States (US)

The United States is heavily impacted due to the presence of invasive species. According to the United States Geological Survey, the US mainland has 8657 records of invasive species, and examples of the most dominant ones include the Feral Swine, Domestic Cats, Nutria, Burmese Pythons, and European Starlings, resulting in a huge level of ecological impact. Furthermore, the US has implemented a sophisticated and robust framework to address the issue of invasive species.

Australia

Similar to the United States, Australia is also heavily impacted by thousands of invasive species. It is mostly threatened by 267 invasive species, and the ecological impacts of invasive species in Australia are exceptionally severe due to its unique geographical position, as it is located on a separate

continent. Species that have inflicted the most damage include cats, rabbits, and annual ryegrass, and have a profound impact on the biodiversity of native species.

China

The high level of biogeography in China provides opportunities for invasive species, therefore, China is among the impacted nations. According to statistics from 2022, 660 distinct invasive species have been identified in China, and 71 species within the count pose a direct or potential threat to the ecosystems of China. The most dominant invasive species include the Fushou snail and the Solidago Canadensis.

South Africa

According to estimates, 7 invasive species are introduced to South Africa each year. A total of 775 invasive species have been identified in South Africa, and 107 species have been recognized for causing significant ecological and social impacts. Additionally, efforts to address the issue of invasive species are facing obstacles, including funding issues and the lack of specialists.

Timeline of Events

Date	Description of event
19th Century	During this period, an overall increment in the population of invasive species in taxonomic groups has been observed. This was primarily due to the deliberate introduction of species that were supposedly beneficial during the European colonial expansion.
1982	The Convention on Biological Diversity (CBD), which aims to facilitate international action on the preservation of biodiversity, was signed by 196 nations.
1995	The World Trade Organization (WTO) Agreement on the Application of Sanitary and Phytosanitary (SPS) Measures was implemented, which aims to facilitate the quarantine of pests during transportation and the prevention of the spread of animal diseases.

1996	The peak of the introduction of invasive species was reached in 1996 when 585 new non-native species were introduced.
1998	The International Civil Aviation Organization (ICAO) Assembly Resolution was implemented in 1998, which advocates for its members to help curb the spread of invasive species via planes.
2004	The Ballast Water Management Convention (BWM), which was initiated by the International Maritime Organization (IMO), is adopted. The convention aims to curb the spread of invasive species to marine ecosystems due to shipping. It is achieved by regulating and controlling the ballast water of ships, which may contain and release non-native species to a pristine environment.

Relevant UN Treaties and Events

- Nature knows no borders: transboundary cooperation - a key factor for biodiversity conservation, restoration, and sustainable use, 20 Apr 2021 **(A/RES/75/271)**
- Stressing Need to Address Causes of Biodiversity Loss, Control Invasive Alien Species, Secretary-General Urges All to Protect Life on Earth, 11 May 2009 **(SG/SM/12236-ENV/DEV/1047-OBV/784)**
- Convention on Biological Diversity, 2 Mar 1998 **(A/RES/52/201)**

Previous Attempts to Solve the Issue

Invasive species regulations

Globally, numerous regulations to control invasive species were adopted by various countries and organizations, and examples of the most significant ones are incorporated in the following sections. However, it should be noted that comprehensive laws and regulations on the control of invasive species may be lacking in some countries or regions. For instance, the US has in short comprehensive laws on

the control of invasive species, and its existing laws are instead a patchwork of laws, and some are only narrowed to specific species and their impacts. Furthermore, a single law that facilitates interdepartmental collaboration for the extensive number of federal agencies involved in invasive species control is required.

Convention on Biological Diversity (CBD)

The CBD, a UN-affiliated organization, was signed by 196 nations and is recognized as the first international convention that encompasses a variety of aspects on the conservation of biodiversity and aims to encourage preservation efforts, and its role is crucial in terms of combating invasive species. “Article 8(h) of the CBD states that, ‘Each contracting Party shall, as far as possible and as appropriate, prevent the introduction of, control or eradicate those alien species which threaten ecosystems, habitats or species’”. Additionally, the CBD has established global guidelines and priorities for combating invasive species on a global scale. However, although this convention established an overall direction for combating invasive species, it does not take any direct action nor provide any support.

Ballast Water Management Convention (BWM)

The BWM convention, another UN-affiliated organization, was implemented in 2004. The BWM convention was adopted by the International Maritime Organization (IMO), to cease the accidental introduction of invasive species or pathogens due to the release of ballast water. From 2017 on, it is compulsory for ships to address any harm in their ballast water. This was effective, as this has effectively addressed the issue of the introduction of invasive species due to ballast water, which was a significant cause for the introduction of invasive species in a marine ecosystem on a global scale.

Invasive Species Regulation (IAS)

Implemented in 2014 in the European Union (EU), the IAS incorporates approaches to control invasive species with aims to prevent its spread and mitigate its economic and social impacts. Additionally, with the implementation of this regulation, a list of Invasive Alien Species of Union Concern (Union List) was established and targeted, and actions relevant to raising, purchasing, selling, breeding, growing, and releasing of species in the Union List are prohibited. The EU aims to mitigate 50% of the impacts of invasive species on the Red List of Threatened Species by

2030. This was effective, as this regulation requested for direct actions to be taken in the EU, and its results were significant (refer to the next section).

National Invasive Species Act of 1996

The National Invasive Species Act of 1996 was implemented in the US and was an amendment to the Nonindigenous Aquatic Nuisance Prevention and Control Act of 1990. It focuses on the prevention of the introduction of invasive species into the Great Lakes due to ballast water by establishing relevant regulations. Furthermore, a task force to implement a water management program that utilizes technologies was also established. The act also authorizes technical, and financial assistance and education to ensure the implementation of the laws and encourages international cooperation to prevent the spread of invasive species. This was also effective, as direct support and actions were implemented to address this issue. However, similar to the IAS, this regulation was regional and did not initiate a global impact.

Actions

Although the issue of invasive species remains a significant threat to biodiversity on a large scale, several successes in the control efforts can be observed. Some instances are listed in the following section:

IAS

Since the implementation of the IAS (see above), an early detection system was established, where member states are obliged to report the presence of invasive species. Among the 135 cases of invasive species detected by EU member states, 57 were confirmed to have been eradicated promptly, while efforts were still underway for 42 species. Currently, there are only 5 species that remain to be brought under control. Additionally, member states of the EU implemented 634 management approaches for 41 out of the 43 invasive species of union control. Out of the management approaches, 6% eradicated invasive species, 21% resulted in the decline of the population of invasive species, 14% resulted in no change, 17% resulted in the increment of the population of invasive species, and the outcomes for 42% of the approaches were unclear.

Molecular-based surveillance technologies

The US has implemented Molecular-based surveillance technologies to detect and monitor invasive species, for instance, Asian carp in the Chicago Area Waterway System. Additionally, the US Fish and Wildlife Service has established Invasive Species Strike Teams to eradicate identified invasive species promptly, costing around one-third of the cost if the species were not rapidly controlled. The team's efforts to control invasive species include the inspection of 2,500 acres of land at the National Elk Refuge to identify invasive plants in the region and control 87 invaders. Furthermore, the team has worked on the elimination of nutria, whose consumption practices have destructed marshlands on the Delmarva Peninsula.

Possible Solutions

First and foremost, as mentioned in the introductory paragraph, it is important to consider the fact that some invasive species are beneficial, and they must be excluded from eradication efforts. To do so, it is advisable for eradication efforts to focus on a list of invasive species known to have a detrimental impact, for instance, the Global Invasive Species Database, which was developed and updated by CBD and the International Union for the Conservation of Nature.

Fostering international collaboration

A possible means to resolve this issue on a global scale would be to foster international collaboration in this field by establishing or expanding relevant international organizations or conferences to facilitate direct actions or support on an international scale to combat invasive species. Currently, such levels of collaboration are lacking, as the only measures implemented by the majority of international organizations, including WTO, IMO, and CBD are the establishment of conventions and regulations (refer to the timeline section for more details) rather than direct actions on facilitating cooperation between nations and support to LEDCs. Although this solution may not be recognized as being "creative", it is in drastic need and a unified effort will accelerate efforts to address the issue. Furthermore, fostering international collaboration allows affected countries to prevent the spread of invasive species from the source, which is vital, since the majority of countries tend to focus on controlling established invasive species, and is considered to be an inefficient method. To do so, facilitating international cooperation is critical, as typically, the origin of invasive species is in a different country than its non-native environment.

Constructing a Real-Time Warning System

Additionally, the construction of a real-time invasive species database, which requires countries to report cases of identified invasive species into the database to alert others of its existence would be necessary, since most existing databases lack information or are geographically limited. This allows for the increase of the efficiency of identifying possible invasive species-related threats, which decreases their impacts, as this allows for early eradication. This system can be compared to a method currently used by WHO, which requires nations to report cases of SARS to allow a unified international response more rapidly.

Promoting Cultural Control

Furthermore, as mentioned in the background information section, cultural control is recognized as a cost-efficient, effective, and sustainable approach to solving the issue. Therefore, further promotion and implementation of this method are recommended, especially in impacted LEDCs, where the impacts brought by the introduction of invasive species are severe and programs to raise awareness amongst the locals are lacking. However, it should be noted that initiating people's efforts in invasive species control is a potential obstacle to the implementation of this method, as individuals may not choose to spend the effort to pursue collective benefits. Thus, if this solution were to be featured, it must encompass measures including but not limited to educating or funding the locals for locals to actively engage in conservation efforts.

Ensuring the enforcement of invasive species laws and regulations

Finally, although the majority of countries today have border control laws and laws that target invasive species, such laws are lacking, or their implementation is limited in some LEDCs. For instance, some African countries lack laws related to the control of invasive species. Furthermore, in these countries, legal cases regarding invasive species are unclear, due to factors including cultural or personal interest. This increases the difficulty of the implementation of laws and actions relevant to invasive species. A specific case of this would be that dissatisfaction amongst the locals was caused when South Africa decided to control the population of the Himalayan Tahr, which was established on Table Mountain. During the process, a group named "Friends of the Tahr" was formulated to challenge the decision. The group believes that hunting the tahrs by shooting darts consisting of succinylcholine to paralyze their muscles is inhumane, as this results in suffocation. Hence, as suggested above, it is important to settle conflicts and dissatisfaction amongst locals to ensure the smooth establishment and implementation of laws. Additionally, as mentioned in the preceding section, it is evident that MEDCs are lacking inclusive regulations that target harmful invasive species as a whole, therefore, MEDCS should reevaluate the completeness of their laws.

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Appendix or Appendices

I. The UN Digital Library, which contains resolutions: https://digitallibrary.un.org/?ln=en

II. Convention on Biological Diversity: https://www.cbd.int/convention/text/

III. Further reading on solutions: https://academic.oup.com/bioscience/article/61/12/1005/388995