NHSMUN

Background Guide | *CMS*

NHSMUN
National High School Model United Nations

Dear delegates,

My name is Gabriel Binder and I will be the CMS Director for NHSMUN's Session 1 this year! I am from Brasilia, the capital of Brazil. There, I study International Relations as a major at the University of Brasilia (UnB) and additionally intern at the Brazilian Ministry of Foreign Affairs. During my free time, I like to watch soccer, hang out with my friends and read.

More so, I have been involved in Model United Nations since I was 14 and I have developed such a passion for education through simulation. I strongly believe that this extracurricular activity carries along the power of changing lives. I now pursue a diplomatic career mainly because of MUN.

Particularly, the Convention on Migratory Species will discuss protecting migratory seals and bats this year. I know this may sound a little strange at first but reading this background guide will permit you to acknowledge how crucial these two wild animal species are to tackling climate change and guaranteeing a better future for humanity.

As always, please feel free to reach out if you have any questions and come to NHSMUN with high hopes!

Best regards,
Gabriel Binder
Director of the Convention of Migratory Species
Session I
nhsmun.cms@imuna.org

NHSMUN
National High School Model United Nations

Dear delegates,

My name is Maya Checchi, and I am pleased to welcome you to the Committee on the Convention of Migratory Species (CMS) for NHSMUN 2025! My Co-Director, Gabriel Binder, and I look forward to this exciting debate, exploring the complexities of wildlife conservation. This background guide will inspire you to protect migratory species and address the socio-economic needs of communities across these continents. Last year, I had the honor of serving as Director for the CMS committee, and I was thrilled to have the chance to return and represent this committee once again. The year before, I served as the Assistant Director of the Special Political and Decolonization Committee (SPECPOL). Before joining NHSMUN staff, I actively participated in my high school's Model UN team for three years, eventually leading the team as captain during my senior year. Attending NHSMUN was a once-in-a-lifetime experience that left a lasting impression on me, and as soon as I saw the opportunity to join the NHSMUN staff, I knew I wanted to apply!

I am currently in my third year at University College London, where I am pursuing a degree in Politics and International Relations with French. Though I now live in the UK, I was born and raised in Los Angeles, California, by Italian parents. Growing up in a multilingual household, I developed a strong love for languages and speak Italian, Spanish, and English fluently. I'm also an avid reader, with a special passion for Spanish literature. In my free time, I enjoy running through London's vibrant parks and traveling to Italy to visit my many relatives, who remain a very special part of my life.

After extensive research, we selected "Protection of Migratory Seal Species" and the "Conservation of Migratory Bat Species" as this year's topics for the Committee on the Convention on the Conservation of Migratory Species of Wild Animals (CMS). These issues highlight the urgent need to protect vulnerable species that face growing threats from climate change, habitat loss, and human activity. Migratory seals are increasingly affected by melting ice, pollution, and overfishing, while migratory bats, despite playing a vital role in ecosystems, are threatened by habitat destruction and sustainable energy development. These topics ask delegates to think about how international cooperation can protect species that cross borders, and how we can balance environmental protection with development and energy needs. We hope this committee inspires you to dive deep into global conservation challenges and think creatively about solutions.

Please do not hesitate to contact me with any questions you may have. Good luck researching, and I look forward to meeting you all in March!

Maya Checchi
Director of the Convention of Migratory Species
Session II
nhsmun.cms@imuna.org

A NOTE ON RESEARCH AND PREPARATION

Delegate research and preparation is a critical element of attending NHSMUN and enjoying the debate experience. We have provided this Background Guide to introduce the topics that will be discussed in your committee. We encourage and expect each of you to critically explore the selected topics and be able to identify and analyze their intricacies upon arrival to the conference.

The task of preparing for the conference can be challenging, but to assist delegates, we have updated our Beginner Delegate Guide, Advanced Delegate Guide, Research Guide, and Rules of Procedure Guide. In particular, these guides contain more detailed instructions on how to prepare a position paper and excellent sources that delegates can use for research. Use these resources to your advantage. They can help transform a sometimes overwhelming task into what it should be: an engaging, interesting, and rewarding experience.

To accurately represent a country, delegates must be able to articulate its policies. Accordingly, NHSMUN requires each delegation (the one or two delegates representing a country in a committee) to write a position paper for each topic on the committee's agenda. In delegations with two students, we strongly encourage each student to research each topic to ensure that they are both prepared to debate throughout the committee. More information about how to write and format position papers can be found in the Research Guide. To summarize, position papers should be structured into three sections.

I: Topic Background – This section should describe the history of the topic as it would be described by the delegate's country. Delegates do not need to give an exhaustive account of the topic. It is best to focus on the details that are most important to the delegation's policy and proposed solutions.

II: Country Policy – This section should discuss the delegation's policy regarding the topic. Each paper should state the policy in plain terms and include the relevant statements, statistics, and research that support the effectiveness of the policy. Comparisons with other global issues are also appropriate.

III. Proposed Solutions – This section should detail the delegation's proposed solutions to address the topic. Descriptions of each solution should be thorough. Each idea should clearly connect to the specific problem it aims to solve and identify potential obstacles to implementation and how they can be avoided. The solution should be a natural extension of the country's policy.

Each topic's position paper should be **no more than 10 pages** long double-spaced with standard margins and 12 point font size. This is a maximum; **3–5 pages per topic is often a suitable length**. The paper must be written from the perspective of your assigned country and should articulate the policies you will espouse at the conference.

Each delegation is responsible for submitting position papers on or before **February 20, 2026**. If a delegate wishes to receive detailed feedback from the committee's dais, a position must be submitted on or before **January 30, 2026**. The papers received by this earlier deadline will be reviewed by the dais of each committee and returned prior to your arrival at the conference. Instructions on how to submit position papers will be shared directly with faculty advisors.

Complete instructions for how to submit position papers will be sent to faculty advisers via email. If delegations are unable to submit their position papers on time, please contact us at nhsmun@imuna.org.

Delegations that do not submit position papers will be ineligible for awards.

Committee History

The Convention on the Conservation of Migratory Species of Wild Animals (CMS), commonly known as the Bonn Convention, is a United Nations umbrella convention under the United Nations Environment Program (UNEP). It was signed in 1979 and has been in force since 1983.[1] Composed of 133 countries, CMS is the only international framework for migratory species and aims to nourish the legal protection of wild animals that migrate. Appendices I and II of the Convention list migratory species endangered or in need to be preserved through global agreements, because they are unlikely to survive without international aid. Four species of seals are listed in Appendix I: *Halichoerus grypus grypus*, *Monachus monachus*, *Phoca vitulina*, and *Pusa caspica*. Being listed means that hunting and fishing are prohibited activities towards these species by this binding treaty.[2]

The Convention works to protect a range of migratory species, such as birds, sharks, whales, insects, and reptiles, to preserve biodiversity. The decision-making body of CMS is the Conference of Parties, which meets to make decisions on CMS-related issues. Annually, climate problems linked to the scope of the committee are debated at the Conference of the Parties (COP).[3]

CMS often works with international organizations, member states' governments, and private organizations.[4] CMS is usually called upon by other organizations to assist in creating solutions that impact biodiversity and animal welfare, such as the United Nations Environment Programme.[5] The Convention collaborates frequently with BirdLife International and Wetlands International, which have worked several times with the United Nations but are not officially a part of the UN.

1 "Legal Instruments | CMS," n.d. https://www.cms.int/en/legalinstrument/cms.
2 "Appendix I & II of CMS | CMS," n.d., https://www.cms.int/en/species/appendix-i-ii-cms.
3 New Zealand Department of Conservation. "Convention on the Conservation of Migratory Species of Wild Animals (CMS)." Government of New Zealand. 2020. https://www.doc.govt.nz/about-us/international-agreements/species/migratory-species/.
4 CMS, United Nations Environment Programme, Inputs Towards Enhancing the Relationship Between the CMS Family and Civil Society, UNEP/CMS/StC45/Inf.1, November 6, 2016, https://www.cms.int/sites/default/files/document/cms_stc45_Inf.1_e.pdf.
5 CMS, UNEP, Report of the United Nations Environment Programme, UNEP/CMS/StC53/Doc.8, October 19, 2022, https://www.cms.int/sites/default/files/document/cms_stc53_doc.8_unep-report_e.pdf.

Protection of Migratory Seal Species

Photo Credit: Hans Hillewaert

Migratory seals are among the most migrating species in the animal kingdom. While most of them live in the Arctic and Antarctic waters, they can travel long distances to look for nutrition, to breed and to rest. Seals have a really important ecological role because of maintaining ocean ecosystems equilibrium. As they migrate, they carry vital nutrients with them, helping to sustain marine biodiversity. They also sense alterations in the environment and provide scientists with the correct data to continue researching remote and inaccessible areas.[1]

However, migratory seals can also spread diseases to other animals, and their health reflects the status of the environments through which they cross and stay in. When seal populations decline or their health deteriorates, it means the environments might be changed or in trouble, as they indicate when an ecosystem is unhealthy. In other words, protecting seals is not only a matter of preserving biodiversity, but also of controlling the health of the oceans.[2]

Historically, seals have not always been in danger. Their conservation status has changed across the years. In the 1980s and 1990s, hunting expeditions drove some seal species to extinction or near extinction. Driven by demand for their meat, fur, and blubber, humans severely overhunted them.[3] Nevertheless, some species have recovered and are now thriving. However, many still suffer from overhunting, while climate change and plastic pollution are now the major new threats.

Some seals depend on ice for their breeding season. Therefore, melting of glaciers and ocean acidification affect them. Furthermore, seals confuse cephalopods (squids, octopuses) and other mollusks that are part of their ordinary diet with trash or plastic. Additionally, they often become entangled in fishing gear and drown as a result.[4] They are also vulnerable to pathogens that emerge after ice melting, including viruses.[5]

Many countries have signed treaties to protect wild animals, including seals. Unfortunately these agreements are often not effectively implemented. Some states prioritize their fishing industries, while others focus on preserving indigenous peoples' cultures and supporting ecotourism activities. Other countries are concerned about global food security.
Some challenges related to seal conservation include monitoring species, improving international cooperation, regulating hunting, reducing bycatch, addressing overfishing, and taking effective climate action. To solve these problems, governments need to work together to protect seals and, as a result, help protect the world's environment.

1 Noémie Friscourt, et al. "Antarctic fur seals as bioindicators of seasonal and ocean basin scale variation in the Southern Ocean food web." *Scar.Org*. Marine Ecology Progress Series, 2024. https://scar.org/~documents/policy/commission-for-the-conservation-of-antarctic-marine-living-resources-ccamlr/scar-papers-to-the-commission-for-the-conservation-of-antarctic-living-resources-meetings/2024-ccamlr-43-and-sc-camlr-43-2/sc-camlr-43bg20-scar-antarctic-fur-seals-as-bioindicators-of-seasonal-and-ocean-basin-scale-variatio?layout=default.
2 Julia Jacobo. "How Marine Biologists Are Using Elephant Seals as Nature's 'artificial Intelligence.'" ABC News, February 14, 2025, https://abcnews.go.com/US/marine-biologists-elephant-seals-natures-artificial-intelligence/story?id=118689227.
3 World Wildlife Fund. "Seals |FACTS," n.d. https://www.worldwildlife.org/species/seals.
4 Alexandria Sletten, Anna Bryan, Katrin Iken, Justin Olnes, and Lara Horstmann. "Microplastics in spotted seal stomachs from the Bering and Chukchi seas in 2012 and 2020." Science Direct, March 1, 2025. https://www.sciencedirect.com/science/article/pii/S002532GX25002450.
5 VanWormer, E., Mazet, J.A.K., Hall, A. et al. Viral emergence in marine mammals in the North Pacific may be linked to Arctic sea ice reduction. Sci Rep 9, 15569 (2019). https://doi.org/10.1038/s41598-019-51699-4

TOPIC BACKGROUND

Ecological Role of Migratory Seals

Seals have been important for the ecosystems for many years.[6] Migratory seals, or those that seasonally rotate to preferable climates, hold a unique role in ecosystems, compared to non-migratory seals.[7] The non-static nature of migratory species as a whole allows them to link distant and unrelated ecosystems. This is important for global connectivity of ocean species, and also can serve as a general indicator for threats across oceans.[8] Unlike animals that stay in one place their whole lives, seals travel across large parts of the ocean and hunt in many different areas. Because they pass through so many ecosystems, their ability to survive and complete their journeys shows how strong and balanced ocean environments are.[9]

If ecosystems across the ocean are struggling, the migratory seals will not be able to hunt adequately, and their population will suffer. Meanwhile, if the ocean is strong and healthy, their population will stay steady or grow, indicating easy access to food sources.[10] Species that are used as an indication of the overall health of an environment or ecosystem are known as "bioindicators."[11] As a result of climate change, the melting of polar ice caps, and the overall warming of ocean water, species of migratory seals have faced an overall decline in population.[12] Not only is this an indicator of the current risk to seal populations, but it is also a sign that the conditions in oceans are not conducive to broader species growth across marine ecosystems.

Migratory seals bring important nutrients to different areas, which is a big benefit.[13] When the ocean environment is damaged, important nutrients drop, which harms the whole food web. Tiny organisms called phytoplankton, which are the base of marine life, need these nutrients to grow. If they do not have enough, the entire food chain suffers. Migratory seals help with this problem as they travel. By eating prey in nutrient-rich areas and releasing waste in nutrient-poor areas, they help spread nutrients, which supports phytoplankton and strengthens ecosystems along their journey.[14]

Without proper protection of migratory seals, nutrient transfer would drop, and the whole food chain would be affected too. Marine food webs exist in a delicate balance.[15] Seals are prey to species like orcas, polar bears, and sharks.[16]At the same time they eat different fish, squid, etc. As a result, any change in their population can upset the balance of the whole food system. With less seals or without their migration, animals higher in the food chain would struggle more

6 "Seals: Diet, Habitat, Behaviour, and Conservation," International Fund for Animal Welfare, accessed July 11, 2025, https://www.ifaw.org/animals/seals
7 "Fur Seal Migrations," National Oceanic and Atmospheric Administration Fisheries Video Gallery, accessed July 11, 2025, https://videos.fisheries.noaa.gov/detail/videos/seals-sea-lions/video/886001378001/fur-seal-migrations.
8 Daniel C. Dunn et al., "The Importance of Migratory Connectivity for Global Ocean Policy," Proceedings of the Royal Society B: Biological Sciences 286, no. 1911 (September 25, 2019): 20191472, https://doi.org/10.1098/rspb.2019.1472.
9 Shahida Anusha Siddiqui et al., "Investigating the Sustainability, Utilisation, Consumption and Conservation of Sea Mammals – a Systematic Review," Sustainable Production and Consumption 46 (May 2024): 400–417, https://doi.org/10.1016/j.spc.2024.03.003.
10 Robyn S Hetem et al., "Responses of Large Mammals to Climate Change," Temperature 1, no. 2 (July 21, 2014): 115–27, https://doi.org/10.4161/temp.29651.
11 Trishala K. Parmar, Deepak Rawtani, and Y. K. Agrawal, "Bioindicators: The Natural Indicator of Environmental Pollution," Frontiers in Life Science 9, no. 2 (April 2, 2016): 110–18, https://doi.org/10.1080/21553769.2016.1162753.
12 "Condition of Seals Declined during Rapid Warming in Alaska," National Oceanic and Atmospheric Administration, January 27, 2021, https://www.fisheries.noaa.gov/feature-story/condition-seals-declined-during-rapid-warming-alaska.
13 Lola Gilbert et al., "Predator-Mediated Nutrient Transfers and Recycling in Ecosystems."
14 Dominique Fayad, "Food Insecurity and Climate Shocks in Madagascar," Selected Issues Papers 2023, no. 037 (June 2023): 1, https://doi.org/10.5089/9798400242601.018.
15 Blanche Saint-Béat, Frédéric Maps, and Marcel Babin, "Unraveling the Intricate Dynamics of Planktonic Arctic Marine Food Webs. A Sensitivity Analysis of a Well-Documented Food Web Model," Progress in Oceanography 160 (January 2018): 167–85, https://doi.org/10.1016/j.pocean.2018.01.003.
16 "Seals," International Fund for Animal Welfare, accessed July 13, 2025, https://www.ifaw.org/explore/animals/seals.

to find food.[17] Meanwhile, those below them could see population growth as a key predator began to decrease, triggering even more issues like food scarcity of their prey, overpopulation, resource depletion, and more.[18] Moreover, a key part of migration for seals is their ability to reproduce. Often, migratory seals travel to one area during mating season and when having pups (baby seals), and travel to another for hunting. If they are not able to migrate, it threatens all future generations of seals, holding the potential for generational threat and elimination.

The ecological impact of migratory seals is not only felt by other wildlife. Human fishing and ocean ecosystems are closely linked to seals.[19] Migratory seals are an important part of marine ecosystems and that cannot be ignored. Any threat to migratory seals can upset the food web and cause ripple effects. For many countries and fishing industries, seals are important as predators, bioindicators, and nutrient circulators. Losing them would cause unusual catches, later declines, and wider chaos. The importance of migratory seals, and protecting them, cannot be overstated.[20]

Direct Threats to Migratory Seals

Now, more than ever, migratory seals are under threat. There are a few key reasons for this. The first is the accidental fishing of seals. Bycatch and entanglement continue to be a large, unmitigated threat to migratory seals.[21] In some regions such as the North Atlantic and parts of the Pacific Northwest, thousands of seals are killed every year as a result of bycatch.[22] Nets are a common tool of industrial fisheries with the intention of catching large quantities of commercial fish such as tuna, cod, salmon, etc.[23] However, nets do not discriminate. This is to say that when a net is deployed, it will catch all marine life in its path. As a result, seals, especially young seals that are unaware of danger or slower, can easily get caught and trapped.[24] Nets can remain underwater for over 48 hours depending on the variety.[25] Seals, however, can typically spend only up to 45 minutes underwater before needing to resurface.[26] As a result, the potential for oxygen deprivation (and thus, drowning) for seals caught by nets is very high.

Entanglement refers to the general threat to seals fishing gear holds for seals.[27] Things like ropes, broken nets, packing material, and wires can all remain underwater. Ropes and wires can cut deep into blubber and muscles of seals, trap seals, and cause broader injury.[28] Because migratory seals travel thousands of kilometers, they are at unique risk because they pass through many fishing areas, and different

17 "The Impact of Melting Arctic Sea Ice on Wildlife," Arctic Ice Project, October 24, 2023, https://www.arcticiceproject.org/the-impact-of-melting-arctic-sea-ice-on-wildlife/.
18 Hilary Costa et al., "Food Web," National Geographic, accessed July 13, 2025, https://education.nationalgeographic.org/resource/food-web/.
19 David Costalago et al., "The Necessity of a Holistic Approach When Managing Marine Mammal–Fisheries Interactions: Environment and Fisheries Impact Are Stronger than Seal Predation," Ambio 48, no. 6 (December 8, 2018): 552–64, https://doi.org/10.1007/s13280-018-1131-y.
20 Ralph Osterwoldt, "Implementation and Enforcement Issues in the Protection of Migratory Species: Two Case Studies: Waterfowl in North America, Seals in Europe," *Natural Resources Journal* 29, no. 4 (1989): 1017–49, http://www.jstor.org/stable/24883422.
21 Cian Luck et al., "Estimating Protected Species Bycatch from Limited Observer Coverage: A Case Study of Seal Bycatch in Static Net Fisheries," Global Ecology and Conservation 24 (December 2020), https://doi.org/10.1016/j.gecco.2020.e01213.
22 "Bycatch Reduction Engineering Program 2019 Report to Congress," National Oceanic and Atmospheric Administration, November 9, 2022, https://www.fisheries.noaa.gov/bycatch/bycatch-reduction-engineering-program-2019-report-congress.
23 "Gillnets and Trammel Nets," Marine Stewardship Council International, accessed July 14, 2025, https://www.msc.org/what-we-are-doing/our-approach/fishing-methods-and-gear-types/gillnets
24 Jonathan Lambert, "Why Don't Diving Seals Drown? Scientists Finally Have an Answer," NPR, March 26, 2025, https://www.npr.org/2025/03/26/g-s1-55440/why-dont-diving-seals-drown-answer-in-their-blood-scientists.
25 Sarah Holcomb, "The Net Consequence," Oceana, April 19, 2024, https://oceana.org/blog/the-net-consequence/.
26 "Harbor Seal Facts," The SeaDoc Society, Accessed July 14, 2025, https://www.seadocsociety.org/harbor-seal-facts
27 "Entanglement Prevention," Florida Fish and Wildlife Conservation Commission, Accessed July 14, 2025, https://myfwc.com/conservation/special-initiatives/cwci/entanglement/
28 Roger W. Byard and Aaron Machado, "Characteristic 'Neck Collar' Injuries in Australian Sea Lions (Neophoca Cinerea) Caused by Marine Debris," Forensic Science, Medicine and Pathology 15, no. 4 (December 5, 2018): 631–34, https://doi.org/10.1007/s12024-018-0060-1.

territorial waters with various (and often poor) regulation of fishing gear.[29]

Human activity underwater, unfortunately, is not the only threat to migratory seals. Shipping and ship traffic directly impact migratory seals.[30] Seals, which spend much time above water, can be hit by ships.[31] Not only does this apply to large, cargo ships, but also to small, recreational boats. Migratory seals often surface rapidly and without warning, especially when diving during hunts, or during long distance travel.[32] As such, ships often do not have the time or ability to divert course. Collisions are very harmful to migratory seals, causing blunt-force trauma, broken bones, or even death.[33] The rapid nature of seal-surfacing and travel leaves no clear option to avoid this. As the need for ships and oceanic travel increases, so too will the threat to migratory seals.

Direct trauma is not the only consequence of ships. Shipping lanes and ports can often overlap with migratory paths.[34] The physical presence of these ships can directly contribute to habitat degradation, pushing seals away from optimal habitats. A specific way this is achieved is through the destruction of ice. Ice is used for general habitation, but also for reproducing. Mother seals often leave their pups on patches of ice while they hunt. The destruction of these ice floats not only eliminates a crucial resting place, but it can also separate mothers and their pups.[35]

Climate change continues to hold a multitude of threats for migratory seals. Rising temperatures melt sea ice earlier in the season, if not in totality.[36] Not only does this interrupt and impede current migratory timelines for seals, but it has also led to a net decrease in the total amount of ice, as well as the thickness and safety of ice. Seal pups that are born on thin or unstable ice are at risk of drowning.[37] Additionally, crucial food webs are directly implicated and threatened by climate change. Certain food sources for migratory seals only reside in cold water.[38] Warm-water fish hold different nutritional value.[39] As water temperatures continue to rise, migratory seals face difficulty in locating crucial food sources, and risk malnutrition. Additionally, the survival rate of pups decreases because mother seals are unable to build sufficient fat reserves when pregnant, compounded by overall pup mortality from malnutrition.

Climate change has also been directly tied to an increase in storms and turbulent water.[40] Storms can flood ice platforms, drown pups, and destroy breeding grounds. Furthermore, unsafe coastal conditions interrupt seal migration patterns, leading to broader chaos and disruption.[41] Climate change does not harm migratory seals in one, distinct way. Rather, it has a

29 Mervi Kunnasranta et al., "Sealed in a Lake — Biology and Conservation of the Endangered Saimaa Ringed Seal: A Review," Biological Conservation 253 (January 2021): 108908, https://doi.org/10.1016/j.biocon.2020.108908.
30 John K. Jansen et al., "Reaction of Harbor Seals to Cruise Ships," Journal of Wildlife Management 74, no. 6 (August 2010): 1186–94, https://doi.org/10.2193/2008-192.
31 "Understanding Vessel Strikes," National Oceanic and Atmospheric Administration
32 Michael McGowen, "Seals, Sea Lions, and Walruses," Smithsonian Ocean, January 2021, https://ocean.si.edu/ocean-life/marine-mammals/seals-sea-lions-and-walruses.
33 Renée P. Schoeman, Claire Patterson-Abrolat, and Stephanie Plön, "A Global Review of Vessel Collisions with Marine Animals," Frontiers in Marine Science 7 (May 19, 2020), https://doi.org/10.3389/fmars.2020.00292.
34 Andrei Ionescu, "Ship Routes Overlap with 92% of Whale Habitats ," Earth.com, accessed July 19, 2025, https://www.earth.com/news/ship-routes-overlap-with-92-of-whale-habitats/.
35 Tracy D'Augustino, "Exploring Our World: Ice Protecting Life," Michigan State University, February 18, 2016, https://www.canr.msu.edu/news/exploring_our_world_ice_protecting_life.
36 Rebecca Lindsey and Michon Scott, "Climate Change: Arctic Sea Ice Summer Minimum," National Oceanic and Atmospheric Administration, October 18, 2022, https://www.climate.gov/news-features/understanding-climate/climate-change-arctic-sea-ice-summer-minimum.
37 Jennifer Hayes, "Meet the Harp Seal-One Face of the Climate Crisis," National Geographic, February 2024, https://www.nationalgeographic.com/animals/article/harp-seal-survival-climate-change.
38 T. Gjedrem, "Genetic Improvement of Cold-Water Fish Species," Aquaculture Research 31, no. 1 (January 2000): 25–33, https://doi.org/10.1046/j.1365-2109.2000.00389.x.
39 Ahtisham Ali et al., "Research Progress on Nutritional Value, Preservation and Processing of Fish—a Review," Foods 11, no. 22 (November 16, 2022): 3669, https://doi.org/10.3390/foods11223669.
40 "Extreme Weather," National Aeronautics and Space Administration, October 23, 2024, https://science.nasa.gov/climate-change/extreme-weather/.
41 Robert B Gangosian, "Abrupt Climate Change: Should We Be Worried?," Woods Hole Oceanographic Institution, February 10, 2003, https://www.whoi.edu/ocean-learning-hub/ocean-topics/climate-weather/abrupt-climate-change/abrupt-climate-change-should-we-be-worried/.

wide range of consequences and effects that will continue to drive migratory seals towards extinction.

Similarly, pollution is a large threat to migratory seals.[42] Migratory seals are especially impacted by polluted water. The water is polluted where the migration paths pass through. General plastic pollution holds a great threat to seals.[43] Plastic can harm seals on the outside, and eating it can cause serious internal damage. Also, pollution can include toxins like mercury.[44] Seals are also poisoned when hunting the lower animals of the food chain that have been exposed to toxins.[45] The ingestion of toxins can cause a wide variety of negative impacts including immune system damage and reproductive disruption. It can also cause organ damage to the liver, kidneys, and nervous system.[46]

Moreover, oil spills, an unfortunate, but semi-common occurrence, are uniquely threatening to seals. Seals rely on their fur and blubber for insulation, especially in the freezing waters and temperatures they normally experience. However, oil coating on fur breaks down the insulation, and harms their ability to stay warm.[47] Furthermore, seals groom themselves by licking their fur, and thus can ingest oil and contaminated liquids, leading to intestinal distress and damage. The Exxon Valdez oil spill of 1989 is a good example.[48] This spill, which occurred in Alaska, killed over 300 seals directly. and has yielded long-term issues for harbor seals.

Injured and Stranded Harbour Seals (Credit: Andreas Trepte)

decreased fertility and reproductive rates, as well as weaker immune systems and internal damage.[49]

The final direct threat to migratory seals, and one of the most preventable, is poaching and illegal hunting of migratory seals.[50] International treaties, national laws, and conservation efforts have all been levied to combat the poaching of seals and other marine life. However, loopholes, regulatory gaps and black-market demand

42 Roger C. Helm et al., "Overview of Effects of Oil Spills on Marine Mammals," Handbook of Oil Spill Science and Technology, November 14, 2014, 455–75, https://doi.org/10.1002/9781118989982.ch18.
43 "How Plastic Pollution Is Affecting Seals and Other Marine Life," World Animal Protection, November 17, 2017, https://www.worldanimalprotection.org/latest/news/how-plastic-pollution-affecting-seals-and-other-marine-life/.
44 "Mercury and Toxics in Nature," National Parks Service, accessed July 19, 2025, https://www.nps.gov/subjects/air/nature-toxics.htm
45 "Toxics in the Food Web," Environmental Protection Agency, June 20, 2025, https://www.epa.gov/salish-sea/toxics-food-web.
46 Monisha Jaishankar et al., "Toxicity, Mechanism and Health Effects of Some Heavy Metals," Interdisciplinary Toxicology 7, no. 2 (June 1, 2014): 60–72, https://doi.org/10.2478/intox-2014-0009.
47 Oil in the Sea III: Inputs, Fates, and Effects (Washington, D.C: National Academies Press, 2003).
48 "Harbor Seals," Exxon Valdez Oil Spill Trustee Council, accessed July 19, 2025, https://evostc.state.ak.us/status-of-restoration/harbor-seals/.
49 Victoria D. Balise et al., "Systematic Review of the Association between Oil and Natural Gas Extraction Processes and Human Reproduction," Fertility and Sterility 106, no. 4 (September 2016): 795–819, https://doi.org/10.1016/j.fertnstert.2016.07.1099.
50 "Ending the Commercial Seal Hunt," International Fund for Animal Welfare, accessed July 19, 2025, https://www.ifaw.org/international/projects/ending-the-commercial-seal-hunt-canada.

all incentivize the continuation of illegal seal hunting.[51] Migratory seals are hunted for several reasons. Their soft fur, especially from pups, is considered valuable in some cultures. People also use seal oil and blubber, which were once important fuels, and seal meat is still eaten in some Indigenous and commercial communities.[52] There are legal methods and quotas for hunting. However, when down beyond these quotas, it is considered illegal hunting. Finally, some hunters and poachers solely kill migratory seals for the thrill of the hunt.[53]

Indirect Threats to Migratory Seals

There are also numerous indirect threats that are just as dangerous. Ocean acidification resulting from climate change has created an unsafe environment for migratory species including seals. The atmosphere becomes more polluted as emissions of carbon dioxide increase.[54] Since the Industrial Revolution in 1760, oceans have absorbed 30 to 40 percent of human carbon dioxide emissions.[55] When carbon dioxide mixes with seawater, it forms carbonic acid, which makes the ocean more acidic (lowers the pH). While seals themselves are not directly harmed by this, the tiny organisms at the bottom of the food chain, like phytoplankton and zooplankton, are affected, which can impact the entire food web.[56] Moreover, prey of migratory seals like shellfish and crustaceans, have shells. Acidity also weakens these shells, causing them to die or grow poorly. Studies have shown that water that is more acidic weakens fish development, reducing survival rates in general.[57] Migratory seals lose sources of food and have to adjust migration patterns. This change makes them use more energy and increases their risk of mortality.[58]

The number of fish species that are overfished has tripled in the past 50 years.[59] Overfishing means catching fish at a rate faster than their reproduction rate. Basically catching more fish than are being born.[60] Industrial fishing techniques have become much more effective and efficient in recent years.[61] Sonar and GPS technologies have made it far easier for industrial fishers to locate schools of fish and catch them, greatly increasing their yields.[62] The North Atlantic, Southern Ocean, and sub-Artic waters have been heavily impacted by overfishing.[63] Now, these seals have to compete with industrial fishing boats for food, and are more than likely to lose the battle.[64] Hungry seals are less likely to have successful pregnancies or succeed in raising pups, creating a timely

51 "Legal Loopholes in Wildlife Trade Are Driving Indian Star Tortoises towards Extinction," World Animal Protection, November 10, 2015, https://www.worldanimalprotection.org.in/latest/news/legal-loopholes-wildlife-trade-are-driving-indian-star-tortoises-towards-extinction/.
52 Aaju Peter, et al., "The Seal: An Integral Part of Our Culture." Études/Inuit/Studies 26, no. 1 (2002): 167–74. http://www.jstor.org/stable/42870162.
53 Mikołaj Koss et al., "Whaling, Seal Hunting and the Effect of Fisheries on Marine Mammals," Marine Mammals, 2023, 33–47, https://doi.org/10.1007/978-3-031-06836-2_3.
54 Scott C. Doney et al., "Ocean Acidification: The Other CO2 Problem," Annual Review of Marine Science 1, no. 1 (January 1, 2009): 169–92, https://doi.org/10.1146/annurev.marine.010908.163834.
55 Michele Aresta and Angela Dibenedetto, The Carbon Dioxide Revolution: Challenges and Perspectives for a Global Society (Cham, Cham: Springer International Publishing Springer, 2021).
56 Kunshan Gao, David A. Hutchins, and E. W. Helbling, "Responses of Marine Primary Producers to Interactions between Ocean Acidification, Solar Radiation, and Warming," Marine Ecology Progress Series, n.d., https://doi.org/10.3354/meps.
57 C.M. Wood, "The Physiological Problems of Fish in Acid Waters," Acid Toxicity and Aquatic Animals, March 16, 1989, 125–52, https://doi.org/10.1017/cbo9780511983344.010.
58 Elizabeth A McHuron et al., "Factors Affecting Energy Expenditure in a Declining Fur Seal Population," Conservation Physiology 7, no. 1 (January 1, 2019), https://doi.org/10.1093/conphys/coz103.
59 Stephanie Bradley, Alison Cross, and Vishwanie Maharaj, "What Is Overfishing? Facts, Effects and Overfishing Solutions," World Wildlife Fund, accessed July 20, 2025, https://www.worldwildlife.org/threats/overfishing.
60 Clovis Hountcheme and Ahouansou Montcho Simon, "Understanding Overfishing: A Literature Review," Asian Journal of Fisheries and Aquatic Research 26, no. 1 (January 26, 2024): 61–71, https://ssrn.com/abstract=4707384
61 Vicky Bond, "The Industrial Fishing Industry Is Destroying Vital Marine Ecosystems.," CounterPunch, 2024, https://openurl.ebsco.com/EPDB%3Agcd%3A15%3A3844479/detailv2?sid=ebsco%3Aplink%3Ascholar&id=ebsco%3Agcd%3A182088175&crl=c&link_origin=none.
62 Steven J Cooke et al., "Emerging Live Sonar Technologies in Freshwater Recreational Fisheries: Issues and Opportunities," Fisheries 50, no. 2 (January 23, 2025): 66–74, https://doi.org/10.1093/fshmag/vuae003.
63 Hsiao-Hang Tao, Chun-Wei Chang, and Chih-hao Hsieh, "Exploring Mechanisms of Spatial Segregation between Body Size Groups within Fish Populations under Environmental Change," Ecography 2024, no. 3 (December 2023), https://doi.org/10.1111/ecog.06730.
64 Debra Corbett and Diane Hanson, "The Living Environment," Culture and Archaeology of the Ancestral Unangax̂/Aleut of the Aleutian Islands, Alaska, 2023, 63–118, https://doi.org/10.1007/978-3-031-44294-0_3.

and pressing issue. This is also compounded by the general risk ships hold for seals.

Noise pollution is a serious danger to migratory seals.[65] Many ocean animals, including seals, rely on natural underwater sounds to navigate, hunt, and communicate. But human activities disrupt this balance. Ship engines create constant noise, sonar blasts interfere with animal communication, and oil drilling adds even more loud sounds.[66] Sound travels more quickly and further underwater. This means that even distant interruptions can be felt.[67] Seal migration paths often cross by shipping routes. This causes seals to face unavoidable noise pollution, which confuses seals and makes it harder for them to navigate.[68]

Ecotourism has both benefits and drawbacks.[69] Ecotourism is helpful to raise awareness about marine conservation and helps stop activities like poaching. It does this by monitoring seal populations and giving people an economic reason to keep seals healthy and strong.[70] However, ecotourism also harms migratory seals. During breeding and pupping season, seals are sensitive to any outside presence.[71] Pups may die if mothers leave them when they sense danger.[72] Additionally, seals feel stress. Seeing tourists too often can raise cortisol, the hormone linked to stress.[73] Migratory seals are especially vulnerable because their migration paths cross multiple countries, making it harder to enforce protections. Since they do not stay in one place, they can also be chased for photos or human interaction, adding to the stress and danger they face.[74]

Overfishing (Credit: Allen Shimada, NOAA NMFS OST)

Moreover, invasive species are animals that are not native to an area, often brought in by human activity.[75] In marine ecosystems, invasive species are normally

65 Mathilde Gigot et al., "Noise Pollution Causes Parental Stress on Marine Invertebrates, the Giant Scallop Example," Marine Pollution Bulletin 203 (June 2024): 116454, https://doi.org/10.1016/j.marpolbul.2024.116454.
66 Christine Erbe et al., "Sources of Underwater Noise," Marine Mammal Acoustics in a Noisy Ocean, 2025, 85–178, https://doi.org/10.1007/978-3-031-77022-7_2.
67 Luca Possenti et al., "The Present and Future Contribution of Ships to the Underwater Soundscape," Frontiers in Marine Science 11 (March 8, 2024), https://doi.org/10.3389/fmars.2024.1252901.
68 Stuart T. Johnston and Kevin J. Painter, "Avoidance, Confusion or Solitude? Modelling How Noise Pollution Affects Whale Migration," Movement Ecology 12, no. 1 (February 19, 2024), https://doi.org/10.1186/s40462-024-00458-w.
69 Madiyorbek Egamberdiyev, "Ecotourism and Environmental Conservation: Challenges and Opportunities," Models and Methods in Modern Science 4 (July 2, 2025), https://doi.org/10.5281/zenodo.15787946.
70 Erkan Akgöz and Gamze Temizel, "Evaluating Ecotourism Opportunities for a Sustainable Environment: The Case of Lake Beysehir (Türkiye)," International Journal of Contemporary Tourism Research, June 29, 2024, https://doi.org/10.30625/ijctr.1477745.
71 Luca Possenti et al., "The Present and Future Contribution of Ships to the Underwater Soundscape."
72 Keely Saville et al., "Vulnerability of Grey Seal Pups (Halichoerus Grypus) to Storm Disturbances in the Context of Climate Change: A British Isles Case Study," Oceans 6, no. 2 (April 8, 2025): 19, https://doi.org/10.3390/oceans6020019.
73 Courtney Pace et al., "Seasonal Variation of Blood Analytes Associated with Skin Health in Alaskan Ice Seals," Journal of Zoo and Wildlife Medicine 55, no. 4 (December 16, 2024), https://doi.org/10.1638/2024-0046.
74 Sandra Black, Creating a Health Index for Narwhal (Monodon monoceros) in the Canadian Arctic (PhD diss., University of Calgary, 2025), https://ucalgary.scholaris.ca/items/fb361bcd-8f65-4397-961f-6b0df4a71bfb
75 M Jake Vander Zanden et al., "Nine Lessons about Aquatic Invasive Species from the North Temperate Lakes Long-Term Ecological Research (NTL-LTER) Program," BioScience 74, no. 8 (August 2024): 509–23, https://doi.org/10.1093/biosci/biae062.

spread by ships, the seafood trade, or plastic debris.[76] The main way that invasive species pose a threat is that they compete with species of fish and crustaceans for food.[77] Seals rely on certain species as their main source of food. When those species disappear, it becomes much harder for seals to find enough to eat, especially while migrating. Invasive species make this worse by disrupting the food chain and spreading diseases. This can be especially dangerous for young seal pups, whose immune systems are not as strong.[78] Finally, invasive species can contribute to habitat destruction. Seal habitats and the ecosystems they interact with during migration are extremely delicate and vulnerable. Thus, any intrusion by invasive species poses a large, potential, threat.[79]

International Conservation of Migratory Seals

While legal frameworks have existed since the 1800s, it was not until the 1900s that they considered the protection of marine mammals.[80] Prior to this, seals and other similar species were viewed as resources for human benefit. Because of this perspective, laws included collaborative hunting and distribution of seal furs and other resources.

The Fur Seal Treaty of 1911 was one of the first international agreements to protect seal populations, which were shrinking at the time. It was signed by Japan, the United States, Russia, and the United Kingdom. The treaty banned large-scale seal hunting in certain areas of the Pacific Ocean but allowed exemptions for Indigenous communities. It was enforced for 15 years and helped seal numbers recover. The treaty is often seen as an early example of how countries can work together to protect wildlife and set the stage for future conservation agreements.[81]

Following this, the 1979 signing of the Convention on the Conservation of Migratory Species of Wild Animals (CMS) set a modern precedent for conservation of migratory animals.[82] The 1991 Wadden Sea Seals Agreement was the first agreement concluded under the CMS.[83] This agreement focused in particular on the Wadden Sea harbour seal and the grey seal, located in Germany, Denmark, and the Netherlands. Under this agreement fell a hunting ban across the three countries involved. Through the research supported, key pollutants and diseases which limited reproduction were identified. Additionally, the Wadden Sea has also been named a United Nations Educational, Scientific, and Cultural Organization (UNESCO) world heritage site, meaning it has outstanding universal value to humanity.[84] This has attracted further attention to the area, strengthening conservation efforts and impacts. Over a thirty-year span, the harbour seal population was able to return to healthy, pre-hunting levels.[85] From 2012 to 2021, the pup count of these seals has had an average annual growth of 5 percent.[86] The Wadden Sea Seals Management plan is also regularly amended to better fit the needs of these populations. Today, this plan

76 Albert Calbet, "The Consequences of Invasive Species," The Ocean of Today, the Legacy of Tomorrow, 2025, 97–114, https://doi.org/10.1007/978-3-031-88271-5_9.
77 Christopher W. Haley and R. John Morrison, "Marine Pollution Issues Relating to Shipping, Ports, and Use of Marine Coatings," Coastal and Marine Pollution, March 20, 2025, 45–66, https://doi.org/10.1002/9781394237029.ch3.
78 Henry Madsen and Jay Richard Stauffer, "Aquaculture of Animal Species: Their Eukaryotic Parasites and the Control of Parasitic Infections," Biology 13, no. 1 (January 11, 2024): 41, https://doi.org/10.3390/biology13010041.
79 Kaili M. Gregory et al., "Effects of Drought, Invasive Species, and Habitat Loss on Future Extinction Risk of Two Species of Imperiled Freshwater Turtle," Climate Change Ecology 7 (July 2024): 100078, https://doi.org/10.1016/j.ecochg.2023.100078.
80 Nicholas Sellheim, "The International Legal Framework for Seals," International Marine Mammal Law, (January 29 2020), https://doi.org/10.1007/978-3-030-35268-4_6.
81 https://upload.wikimedia.org/wikipedia/commons/b/bc/THE_FUR_SEAL_TREATY_OF_1911.pdf
82 United Nations Educational, Scientific, and Cultural Organisation,"Convention on the Conservation of Migratory Species of Wild Animals," accessed July 15, 2025, https://www.waddensea-worldheritage.org/convention-conservation-migratory-species-wild-animals.
83 United Nations Educational, Scientific, and Cultural Organisation, " A Conservation Success Story: 30 Years of the Wadden Sea Seal Agreement," last modified Januart 10, 2021, https://www.waddensea-worldheritage.org/news/conservation-success-story-30-years-wadden-sea-seal-agreement.
84 "What is World Heritage?" UNESCO, accessed September 17, 2025, https://whc.unesco.org/en/faq/19.
85 United Nations Educational, Scientific, and Cultural Organisation, " A Conservation Success Story: 30 Years of the Wadden Sea Seal Agreement,"
86 *Wadden Sea Seal Management Program 2023-2027,* (Germany; Common Wadden Sea Secretariat, 2022), https://www.cms.int/sites/default/files/document/Wadden%20Sea%20Seal%20Management%20Plan%202023-2027.pdf

is targeted from the years 2023-2025.[87] The details included in this framework are vital in ensuring thorough solutions when protecting seal populations.

Another key body in the conservation of many species is the International Union for Conservation of Nature (IUCN). This union includes governments, civil society, and over 1,400 members, representing approximately 160 countries.[88] Its goals combine the interests of animal species, ecosystem rehabilitation, and human wellbeing. In 2021, the IUCN began a project targeted at monk seals in the Eastern Mediterranean. Under this project, populations are monitored closely to identify and reduce threats. In addition, capacity building and project coordination are being built to allow long-term implementation in this region.[89] These international bodies are exemplary in collaboration and aid for the conservation of migratory seal species.

In many instances, country-specific work is also being done. For example, the seal conservation society in the United Kingdom (UK) is a volunteer-run organization that focuses on research and welfare.[90] It also assists efforts by other NGOs for lobbying for improved seal conservation law across the UK and Ireland. Notable projects completed by this society include research in and out of captivity, as well as rehabilitation and educational projects.

It is through such international and domestic initiatives that global conservation efforts can be improved. Similar frameworks and projects can be built upon looking towards the future for migratory seals.

Current Status

The Role of Seals as Bioindicators Amidst Ice Melting and Climate Change

The Antarctic and the Arctic perform as sensors for the Earth's climate system and play a fundamental role in climate regulation, influencing the climate in all the rest of the globe.[91] The ocean in these regions helps control the planet's temperature, acting as a kind of "air conditioner" for the Earth. The ice makes the air colder and the sea absorbs heat and carbon dioxide. This also mitigates greenhouse gas effects in the atmosphere while reallocating the amount of C02 to the "store" of the ocean.[92] This happens especially in Antarctica, which is responsible for a large part of the global absorption of CO2 by the sea.[93]

The Arctic has changed a lot in the past decade because of rising temperatures. Sea ice is melting quickly, which affects global food production, sea levels, and ocean conditions. These changes also impact marine animals, including seals. The 2021 report from the United Nations' Intergovernmental Panel on Climate Change (IPCC) explains that melting ice contributes to global warming, more marine heatwaves (periods of unusually warm ocean water), and increased ocean acidification.[94]

87 *Wadden Sea Seal Management Program 2023-2027.*
88 International Union for Conservation of Nature, "Monk Seal Protection at Eastern Mediterranian," last modified July 2023, https://iucn.org/our-work/projects/monk-seal-protection-eastern-mediterranean.
89 Monk Seal Alliance, "Monk Seal Protection at Eastern Mediterranean," accessed July 16, 2025, https://www.monksealalliance.org/en/projets/monk-seal-protection-in-the-eastern-mediterranean-00556.
90 "Welcome to the Seal Conservation Society Website!," The Seal Conservation Society, accessed July 16, 2025, https://www.pinnipeds.org/.
91 "Global Climate Change," n.d. https://npolar.no/en/themes/global-climate-change/.
92 United Nations. "The Ocean – the World's Greatest Ally Against Climate Change | United Nations," n.d. https://www.un.org/en/climatechange/science/climate-issues/ocean.
93 "Global Climate Change," n.d., https://npolar.no/en/themes/global-climate-change/.
94 Antonietta Capotondi et al., "A Global Overview of Marine Heatwaves in a Changing Climate," *Communications Earth & Environment* 5, no. 1 (November 20, 2024), https://doi.org/10.1038/s43247-024-01806-9.

According to the IPCC, the Arctic is warming almost twice as fast as the rest of the world. By 2050, the region is expected to see much higher temperatures, especially on colder days, which will cause more melting of permafrost, land ice, and sea ice.[95] Permafrost is frozen ground that stays below 0°C for at least two years. When it thaws, it releases carbon dioxide and methane (greenhouse gases) that make global warming worse. This process cannot be reversed once it begins.[96] The IPCC also warns that if greenhouse gas emissions remain at current levels, the Arctic could be completely ice-free at least once in September by 2050.[97]

On the other hand, Antarctica holds 90 percent of the world's ice and 80 percent of its fresh water. However, temperatures in the region have been rising significantly over the past few years. In February 2020, the continent recorded its highest temperature ever.[98] Pollution adds greenhouse gases to the atmosphere, which causes global warming. In Antarctica, scientists say that while more pollution could make Antarctic ice melt faster, it would take levels much higher than what is currently predicted. The Southern Ocean around Antarctica plays an important role in absorbing carbon dioxide, but this ability may decrease as the water warms, since warmer water holds less CO2. Scientists are still uncertain about how much the Antarctic Ocean will contribute to the carbon cycle in the future because data is limited.[99]

The Marine Mammals Exploring the Oceans Pole to Pole (MEOP) is an international association of researchers committed to spreading information on data and knowledge about wild animals and the polar oceans. Their objectives are to map the ecological habits of seals and to understand how melting glaciers affect the oceans and climate change. It is worth noting that tagging seals does not harm the mammals and the data is collected while the seals are carrying out their regular activities, such as swimming, feeding, and mating. The research area was the Amundsen Sea in western Antarctica. The Pine Island Glacier and Thwaites Glacier are considered the two fastest melting glaciers on the Antarctic continent, both are located within the Amundsen Sea, and research in this region provides a more accurate study.[100]

MEOP has been using sea lions and seals since 2004 as indicators of quality of life and global warming in Antarctica.

From 2004 to 2021, MEOP successfully increased the number of areas with mapped data in Antarctica from 1,000 to 20,000.[101] Satellites and tracking devices on seals collect data about the depth, temperature, and salt levels of the ocean. This helps scientists study places that are otherwise hard to reach. For example, meltwater (water from melting ice) is easy to spot because it is about 3°C warmer than the surrounding water and has less salt. This information is important because meltwater raises ocean temperatures, which then melts even more sea ice. It also creates warm areas in the sea called polynyas, which keep the cycle going: warmer water leads to more melting, which leads to even more warm water. This process affects ocean life, harms seals that depend on stable ecosystems, and adds to the impacts of climate change.[102]

95 IPCC, 2021: Summary for Policymakers. In: Climate Change 2021: The Physical Science Basis. Contribution of Working Group I to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change.
96 Justine Ramage, Leneisja Jungsberg, Alexandra Meyer, and Susanna Gartler. "'No Longer Solid': Perceived Impacts of Permafrost Thaw in Three Arctic Communities." *Polar Geography* 45, no. 3 (July 3, 2022): 226–39. https://doi.org/10.1080/1088937x.2022.2105973.
97 "IPCC AR6 Working Group 1: Summary for Policymakers."
98 Rebecca Cairns. "Antarctic seals are helping scientists learn more about melting glaciers." CNN World, May 26, 2021. https://edition.cnn.com/2021/05/26/world/antarctica-seals-scientists-glaciers-scn-c2e-hnk-spc-intl/index.html.
99 "IPCC AR6 Working Group 1: Summary for Policymakers."
100 Stef Lhermitte, Sainan Sun, Christopher Shuman, Bert Wouters, Frank Pattyn, Jan White, Etienne Berthier, and Thomas Nagler. "Damage Accelerates Ice Shelf Instability and Mass Loss in Amundsen Sea Embayment." *Proceedings of the National Academy of Sciences* 117, no. 40 (September 14, 2020). https://doi.org/10.1073/pnas.1912890117.
101 Roquet F., Williams G., Hindell M. A., Harcourt R., McMahon C. R., Guinet C., Charrassin J.-B., Reverdin G., Boehme L., Lovell P. and Fedak M. A., 2014. A Southern Indian Ocean database of hydrographic profiles obtained with instrumented elephant seals. Nature Scientific Data, 1:140028, doi: 10.1038/sdata.2014.28.
102 Roquet F et al, " Southern Indian Ocean database of hydrographic profiles obtained with instrumented elephant seals"

Northern elephant seals or *Mirounga angustirostris*, have also been used by marine biologists at the University of California, Santa Cruz.[103] A study published in Science magazine in February of 2025 points out that although this species' standard habitat is the North Pacific Ocean and the coasts of the United States, Mexico, and Canada. Moreover, they have one of the longest migration routes among seals, averaging 21,000 km round trip.[104] They spend most of the year in the water, but when they return to the mainland to reproduce and moult, biologists are able to attach the tags to them. These sensors, like those used on Antarctic seals, can measure water and air temperature, depth, location, and the seals' feeding habits. Additionally, they also have built-in audio and image capture to collect information along their migratory routes. A total of 50,000 seals have been observed since the beginning of the investigation. The study serves as an example for potential international cooperation in research. In this way, biologists at the University of California have been able to obtain innovative results about the mesopelagic zone of the ocean, also known as a twilight zone. Such a zone is present in all the world's oceans and extends from about 200 meters to 1,000 meters deep. Because it is an area that is difficult to access and has low light incidence, there is little research and consequently scarce data available on it. Northern Elephant seals access this zone during migration to feed. Through sensors, it has been discovered that even though the region appears to be uninhabited, there is actually an abundance of fish.[105]

Plastic Debris Affecting Seals

One of the most current, spreading and alarming issues to seals is plastic pollution in waters. Plastics are usually made of biomass or fossil fuels and reach the oceans mostly from illegal dumping of plastic waste, abandoned equipment from fishing, commercial shipping, industry, oil rigs, and tourism. Microplastics and other plastic pollution have harmed seals and can cause them to become ill. UNEP's 2019 report on microplastics already warned of the risk of these small debris negatively affecting marine life in the oceans.[106]

Still, according to UNEP, microplastics are the most abundant type of marine litter and their availability in the oceans has increased substantially over the last four decades. The greatest accumulation of plastic waste is in the Atlantic, the Pacific, and the Indian Ocean.[107] More research is needed in the Arctic, Antarctic, and Indian Ocean.[108] The impacts of plastics on marine life, particularly on seals, range from entanglement to ingestion. However, UNEP warns that it is difficult to obtain results on the consequences of microplastics, precisely because they are very small and only 5mm in diameter at most. UNEP also points out that it is not possible to clean the ocean of microplastics with current technology, it would be necessary to have new discoverages.[109] Nowadays, there are an estimated 170 trillion plastic particles scattered throughout the global oceans and this is harming seal populations.[110]

A 2025 study on the Spotted Seals of the Bering and Chukchi seas concluded that these seals ingested microplastics between 2012 and 2020 when feeding on prey that has the seabed as its natural habitat or that is at the top of the food chain. Studies on the effects of plastics

103 Julia Jacobo, "How Marine Biologists Are Using Elephant Seals as Nature's 'Artificial Intelligence.'"
104 NOAA. "Northern Elephant Seal," n.d. https://www.fisheries.noaa.gov/species/northern-elephant-seal.
105 Roxanne S. Beltran et al., "Elephant Seals as Ecosystem Sentinels for the Northeast Pacific Ocean Twilight Zone," *Science* 387, no. 6735 (January 2, 2025): 764–69, https://doi.org/10.1126/science.adp2244.
106 UNEP. "Microplastics in the Ocean: Emerging Issues." *United Nations Environmental Programme*, n.d. https://wedocs.unep.org/bitstream/handle/20.500.11822/12079/brochure-microplastics.pdf?sequence=1&%3BisAllowed=.
107 UNEP, "Microplastics in the Ocean: Emerging Issues."
108 Kevin Ugwu, Alicia Herrera, and May Gómez, "Microplastics in Marine Biota: A Review."
109 UNEP, "Microplastics in the Ocean: Emerging Issues."
110 Marcus Eriksen, Win Cowger, Lisa M. Erdle, Scott Coffin, Patricia Villarrubia-Gómez, Charles J. Moore, Edward J. Carpenter, Robert H. Day, Martin Thiel, and Chris Wilcox. "A Growing Plastic Smog, Now Estimated to Be Over 170 Trillion Plastic Particles Afloat in the World's Oceans—Urgent Solutions Required." *PLoS ONE* 18, no. 3 (March 8, 2023): e0281596. https://doi.org/10.1371/journal.pone.0281596.

Seal entangled in fishing gear (Credit: Mmnsr)

on the seals' internal organs are still lacking.[111] Equally important, southern African Cape fur seals are threatened by plastic pollution from commercial fishing. Around 100 Cape fur seals are trapped by fishing equipment every year.[112]

A 2022 study found microplastics in the intestines and stomachs of 63 Harbour seals (*Phoca vitulina*) and Gray seals (*Halichoerus grypus*) between 2014 and 2019. The study revealed that seals ingest microplastics when feeding, suggesting that further research is needed to confirm microplastic ingestion in their tissues.[113] Regarding the implications of plastic in seal organisms, there is a risk of inflammatory lesions in the digestive system, which can lead to impaired digestion. However, there are also indications of parasitic infection due to microplastic ingestion. Additionally, there are clues to the risks of stomach perforation, disruption of animal reproduction, and changes in feeding behavior due to difficulties with ingestion and breathing.[114]

In 2023, Mediterranean monk seals (*Monachus monachus*) analyzed in Greece showed microplastics present in all their feces. These monk seals are highly endangered, with a current population of around 700 individuals in the Mediterranean Sea. The study also hypothesizes on possible damage to the digestive system and even speculates on an increase in mortality.[115]

Additionally, a 2021 study observed Arctic seals. Since they are a source of sustenance for Indigenous peoples and prey for whales and polar bears, the microplastics in their bodies could also affect humans and other mammals. However, there is insufficient data in this region to discuss the amount of plastic ingested by them. Scientists have been reporting a decrease of more than 50 percent in the birth of pups nowadays compared to recent years. It was discovered that the pups come into contact with microplastics and plastics in the Arctic mainly due to remains of equipment dropped by fishing boats. Thus, migratory Arctic seals have significant contact with plastics and microplastics that

111 Sletten et al., "Microplastics in Spotted Seal Stomachs from the Bering and Chukchi Seas in 2012 and 2020."
112 Dominic Naidoo, "'Seals need our help': Urgent efforts to protect Cape fur seals from plastic pollution in South Africa," IOL, n.d., https://iol.co.za/news/environment/2024-09-05-seals-need-our-help-urgent-efforts-to-protect-cape-fur-seals-from-plastic-pollution-in-south-africa/#google_vignette.
113 Carolin Philipp, Bianca Unger, and Ursula Siebert, "Occurrence of Microplastics in Harbour Seals (Phoca vitulina) and Grey Seals (Halichoerus grypus) from German Waters," MDPI, February 23, 2022, https://www.mdpi.com/2076-2615/12/5/551.
114 J.F. Provencher et al., "Assessing Plastic Debris in Aquatic Food Webs: What We Know and Don't Know About Uptake and Trophic Transfer," *Environmental Reviews* 27, no. 3 (November 9, 2018): 304–17, https://doi.org/10.1139/er-2018-0079. Kevin Ugwu, Alicia Herrera, and May Gómez, "Microplastics in Marine Biota: A Review."
115 Gema Hernandez-Milian et al. "Monk seal faeces as a non-invasive technique to monitor the incidence of ingested microplastics and potential presence of plastic additives." Science Direct, June 30, 2023. https://www.sciencedirect.com/science/article/pii/S0025326X23006604.

accumulate on the coast during their reproductive and resting periods.[116]

The discussions presented above are extremely relevant to understanding the effects of marine pollution on seals. However, all of these studies suggest that more research is needed. Accessing seals is difficult, so the techniques used to survey them must adhere to non-invasive standards. For this reason, some results are imprecise and many conclusions are speculative.[117] Some research on plastics in seals is conducted through scientific hunting permits, which allow for the killing of seals for research purposes. Countries such as Denmark and Norway issue these licenses to regulate wild hunting.[118] These countries have legal frameworks for control, such as animal welfare laws, to accomplish this. Another example is the European Union, which has established a Directive to protect animals used for scientific purposes and ensure that research is carried out ethically.[119]

Sustainable Development Goals (SDGs)

The Sustainable Development Goals (SDGs) are part of the United Nations 2030 Agenda for Sustainable Development, which was adopted at the UN Sustainable Development Summit in 2015.[120] The 2030 Agenda acknowledges the integration between the social-economic and environmental realms, and suggests concrete actions to implement these objectives. They consist of 17 goals of equal importance and mutual benefit. These are interdependent, urging states to cooperate to achieve a better world.[121]

The Convention on Migratory Species is closely tied to the SDGs, constantly funding climate change mitigation, resilience and adaptation, as well as life above water protection and conservation.[122] Although there are challenges of consensus and investment, CMS believes it is possible to implement the goals counting on countries' political will to act. Furthermore, the CMS stands for the preservation of wild species habitat as key to implementing SDGs, due to their role in promoting ecosystem connectivity. Moreover, decisions 12.105 and 13.137 of the CMS provide directives for sustainable development linked to migratory species.[123] The CMS is, then, responsible for producing updated reports, compiling data, and making sure migratory species needs will be included when decision-makers create strategies to implement the SDGs.

Specially, it is crucial to mention Goal 17, known as Partnership for the Goals.[124] Without strong resources, achieving these goals will be very difficult. Partnerships between governments and private companies are needed. Funding should also support the least developed countries. International cooperation and inclusive policies that build skills and institutions are essential.

SDG 13, called Climate Action, sets a tone of emergency to address climate change, as its consequences are evident worldwide.[125] According to the SGDs Progress Report, 2024 was the hottest year in 175 years. Nevertheless, the World

116 Marianna Pinzone, Et Al. "First record of plastic debris in the stomach of a hooded seal pup from the Greenland Sea." *Science Direct*, April 14, 2021. https://www.sciencedirect.com/science/article/pii/S0025326X21003842#bb0050.
117 Lucas Desclos-Dukes, Andrew Butterworth, and Tristan Cogan, "Using a Non-invasive Technique to Identify Suspected Microplastics in Grey Seals (Halichoerus Grypus) Living in the Western North Sea," March 1, 2022.
118 Marianna Pinzone Et Al, "First Record of Plastic Debris in the Stomach of a Hooded Seal Pup."
119 "Directive - 2010/63 - EN - EUR-Lex," n.d. https://eur-lex.europa.eu/eli/dir/2010/63/oj/eng.
120 "Transforming Our World: The 2030 Agenda for Sustainable Development | Department of Economic and Social Affairs," n.d. https://sdgs.un.org/2030agenda.
121 "THE 17 GOALS | Sustainable Development," n.d. https://sdgs.un.org/goals.
122 Santanu Sen. "SUSTAINABLE DEVELOPMENT FOR WILDLIFE AND PEOPLE." Report. *SUSTAINABLE DEVELOPMENT FOR WILDLIFE AND PEOPLE*. UNEP / CMS Secretariat, 2021. https://www.cms.int/sites/default/files/publication/sustainable_development_wildlife_0.pdf.
123 "Decisions 12.105 - Sustainable Development and Migratory Species | CMS," n.d. https://www.cms.int/en/page/decisions-12105-sustainable-development-and-migratory-species.
124 The Global Goals. "Goal 17: Partnerships for the Goals - the Global Goals," January 23, 2024. https://globalgoals.org/goals/17-partnerships-for-the-goals/.
125 The Global Goals. "Goal 13: Climate Action - the Global Goals," January 23, 2024. https://globalgoals.org/goals/13-climate-action/.

Meteorological Organization predicts this grade will even increase from 2024 to 2029. In light of the 2050 net-zero emission goal and the 1.5 °C warming limit, it is central to address the unprecedented melting of glaciers. Such phenomena are having a significant impact on ocean biodiversity and health, as well as on the sea level and marine life, including seals. Ocean warming is definitely another major concern for the United Nations when regarding climate change, which is also one of the reasons SDG 13 and SDG 14 are interlinked.

SDG 14, known as Live Below Water, recognizes the golden role oceans play in absorbing approximately 30 percent of the world's CO2.[126] To seize this ability, SDG 14 was projected to tackle marine issues caused by human interference and its consequences. These include preventing endangering of seals, expanding scientific research, enforcing maritime law, restoring ecosystems and conserving coastal areas whilst promoting sustainable development.[127] It is expected to establish ways to make safer areas for seals to breed, feed, and dwell. Moreover, it has been estimated that, by 2040, around 37 million tons of plastic are prone to be incorrectly discarded in the oceans each year. Thus, SDG 14 also aims to eliminate plastic pollution. Of equal importance, there is expected to be a huge loss of marine biodiversity, particularly corals that balance the marine food chain.

According to the SGDs Progress Report, only 8.4 percent of the world's marine areas and 46 percent of marine biodiversity were protected by 2024. Recalling the 30 percent target of protected marine areas coverage by 2030, the report emphasizes the urgent need to prevent illegal hunting and fishing, reduce ocean acidification and halt pollution. Nevertheless, the report still focuses on the fact that there is room for ocean recovery through accelerated measures. It also recognizes countries' efforts over the past few years to begin to do so. Hence, the 2025 United Nations Ocean Conference, entitled "The High-Level UN Conference to Support the Implementation of SDG 14," has been considered a turning point for life below water, resulting in a declaration with an ocean action plan claiming for oceanographic research.[128]

Bloc Analysis

Points of Division

It is clear that protecting migratory seals is an international responsibility. Three treaties exemplify this duty. The Bonn Convention under UNEP is the most significant legal framework for conserving migratory species.[129] Secondly, the Convention on Biological Diversity (CBD) calls on signatories to conserve biodiversity, including marine species, and urges states to cooperate in identifying and monitoring migratory species.[130] Lastly, the United Nations Convention on the Law of the Sea (UNCLOS) promotes cooperation regarding highly migratory species and also emphasizes the importance of ensuring conservation of marine mammals.[131]

Over 130 states have ratified these three treaties, creating a solid agreement on the matter. However,

126 "Goal 14: Life Below Water - the Global Goals."
127 United Nations. "How Is Climate Change Impacting the World's Ocean | United Nations," n.d. https://www.un.org/en/climatechange/science/climate-issues/ocean-impacts.
128 "UN 2025 Ocean Conference | Department of Economic and Social Affairs," n.d. https://sdgs.un.org/conferences/ocean2025.
129 Conservation of Migratory Species. "Convention on the Conservation of Migratory Species of Wild Animals," 1979. https://www.cms.int/sites/default/files/instrument/CMS-text.en_.PDF.
130 Convention on Biological Diversity. Secretariat for the Convention on Biological Diversity, 2011. https://www.cbd.int/doc/legal/cbd-en.pdf.
131 United Nations. "United Nations Convention on the Law of the Sea." *United Nations Convention on the Law of the Sea*, n.d. https://www.un.org/depts/los/convention_agreements/texts/unclos/unclos_e.pdf.

there is still disagreement about how to achieve full preservation, with some countries being reluctant to make strong commitments regarding migratory species. The United States of America, Andorra, and South Sudan are not parties to either the CBD or the UNCLOS.[132] The United States is also not a party to the CMS, followed by Canada, Mexico, Colombia, Suriname, Russia, China, Indonesia, Japan, Malaysia, Namibia, Iceland, Singapore, Sudan, Thailand, Qatar, and so on.[133] Despite not ratifying the Convention, some of these countries actively participate in CMS deliberations as observers and have even signed memorandums of understanding.[134]

The committee is expected to address the topic and pursue a unique and thoughtful solution to ensure the safety of migratory seals. Consequently, three blocs may arise: countries favoring non-binding policies, countries with strong environmental frameworks, and countries wishing to adjust or strengthen their policies. This division is based on three main reasons, though not exclusively. First, some countries prefer non-restrictive policies because their foreign policies focus on trade or other priorities outside the environment.[135] In contrast, countries that support stronger binding rules often have the resources to enforce them and can expand their efforts through international cooperation. Finally, some countries are willing to adjust their policies mainly because they host many migratory seals each year, but they may have fewer resources to fully address the issue.

Countries Favoring Non-Restrictive Policies

These countries favor non-binding or non-restrictive policies due to economic priorities or other non-environmental factors. The states within this bloc share two concerns: the reduction of seal populations does impact them ecologically, but also economically in majority. Dependence on fish stocks, ecotourism, and concerns about marine trade are additional issues for these countries. These states are not necessarily against the protection of seal populations, but they reckon that environmental measures often hinder trade and prefer to go for non-restrictive frameworks.

Many goods come out of seals, such as leather, oil, medical remedies, meat and bone meal, and fur products. These are huge economic drivers in Southern African countries, like Namibia.[136] Namibian politicians constantly propose increasing the annual quotas for permitted seal hunts. Currently, around 80,000 seals can be "legally" hunted each year in Namibia. The European Union, a former consumer market for Namibian seals, has banned seal products.[137] However, Namibia keeps on exporting these products to other markets. Namibia's export sector is pressuring the government to adopt non-restrictive policies in exchange for employment creation and job rates increased as a result.[138] Additionally, one of the most popular economic activities in Namibia is seal watching, also known as seal tourism.[139] Seal watching occurs not only in Namibia, but is also alarming in Iceland, where seals are getting disturbed in their ordinary behaviors because of tourists' presence.[140] This is not ecotourism,

132 Convention on Biological Diversity; United Nations, "United Nations Convention on the Law of the Sea."
133 Convention on the Conservation of Migratory Species of Wild Animals. "Parties and Non-Parties." CMS, March 1, 2022. https://beta.cms.int/parties?page=1.
134 Convention on the Conservation of Migratory Species of Wild Animals, "Parties and Non-Parties."
135 "Convention on the Conservation of Migratory Species of Wild Animals."
136 Roderick Campbell, Tristan Knowles, and Simon O'Connor, "The Economics of Seal Hunting and Seal Watching in Namibia" (Economists at Large, 2011), https://www.furfreealliance.com/wp-content/uploads/2016/01/The-Economics-of-Seal-Hunting-and-Seal-Watching-in-Namibia2011.pdf.
137 European Union. "Regulation (EC) No 1007/2009 of the European Parliament and of the Council of 16 September 2009 on trade in seal products," September 16, 2009. https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32009R1007.
138 Freight News. "Namibia Seals' Deal With Guaranteed Export Potential," April 22, 2025. https://www.freightnews.co.za/article/namibia-seals-deal-with-guaranteed-export-potential.
139 Campbell, Knowles, and O'Connor, "The Economics of Seal Hunting and Seal Watching in Namibia."
140 Sandra Magdalena Granquist, and Hrefna Sigurjonsdottir. "The effect of land based seal watching tourism on the haul-out behaviour of harbour seals (Phoca vitulina) in Iceland." Science Direct, April 23, 2014. https://www.sciencedirect.com/science/article/abs/pii/S0168159114001075.

despite some specialists considering seal watching less harmful than hunting.

Another example of economic use of seals is the ice seals in the Bering seas and in Alaska. They are a subsistence resource for native communities. Ice seals are hunted for their meat and to produce handmade goods to sell with their fur. Therefore, Ringed and Bearded seals are already threatened in those regions because of overhunting.[141] Japan, Canada, and Norway deemed the commercial hunting of seals an essential activity during the COVID-19 pandemic due to economic interests despite having neither limited resources nor weak environmental frameworks.[142] Thus, it is possible to say that even if some countries do not fully rely on seals trade, they may be defending some particular national exportation sectors.

Countries with Strong Environmental Frameworks and Research Capacity

These countries have managed to balance economic and political demands while considering environmental changes as a foundation. They have applied strong legislation under national jurisdiction to protect biodiversity. One argument supporting this point of view is that environmental degradation for economic purposes costs more in the long term than climate action and animal life protection costs now.[143] These countries also recognize the ecological importance of seals and encourage others to do the same. Moreover, they are already effectively implementing SDG 14, "Life Below Water," in three ways: a) increasing the economic benefits of the sustainable use of marine resources; b) increasing scientific knowledge, research, and technology for ocean health, and c) implementing and enforcing international sea law.[144]

The United Nations Environment Program World Conservation Monitoring Center (UNEP-WCMC) has identified European countries as leaders in marine conservation action. Particularly the Natura 2000 network of the European Union is a program responsible for implementing nature directives of the EU.[145] Between 2012 and 2022, Europe made progress as a result of this program. The marine area coverage doubled from 5.9 percent, in 2012, to 12.3 percent, in 2022. Notably, Germany, Belgium, and France surpassed 30 percent coverage of marine ecosystem protection by 2022.[146] However, there is still room for growth to enhance preservation. Additionally, the ultramarine territories of Europe in Latin America, Asia and the Pacific, and Africa are noteworthy. According to the Protected Planet Report 2024, Martinique, Saint Barthélemy, Saint Martin, Bonaire, New Caledonia, Pitcairn Islands, Mayotte, and Saint Helena managed to protect over 95 percent of their marine territories.[147]

Countries among this bloc have ratified international standard treaties on marine preservation such as OILPOL (1954), the Convention

141 L. Quakenbush, A. Bryan, J. Crawford, J. Olnes, and R. Stimmelmayr. "Ice Seals of Alaska." NOAA Arctic, 2024. https://arctic.noaa.gov/report-card/report-card-2024/ice-seals-of-alaska/.
142 Aristos Georgiou. "These Countries Consider Whale and Seal Hunting Essential Activities During the Coronavirus Pandemic." *Newsweek*, April 6, 2020. https://www.newsweek.com/these-countries-whale-seal-hunting-essential-activities-coronavirus-pandemic-1496370.
143 International Maritime Organization. "Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter," 1972. https://www.imf.org/en/Publications/WEO/Issues/2017/09/19/world-economic-outlook-october-2017; Matthew E. Kahn et al., "Long-term macroeconomic effects of climate change: A cross-country analysis," Science Direct, November 20, 2021, https://www.sciencedirect.com/science/article/pii/S0140988321004898?via%3Dihub.
144 The Global Goals. "Goal 14: Life Below Water - the Global Goals," January 23, 2024. https://globalgoals.org/goals/14-life-below-water/.
145 UNEP-WCMC and IUCN (2025), Protected Planet: The World Database on Protected Areas (WDPA) and World Database on Other Effective Area-based Conservation Measures (WD-OECM) [Online], July 2025, Cambridge, UK: UNEP-WCMC and IUCN. Available at: www.protectedplanet.net.
146 European Environment Agency's Home Page. "Marine Protected Areas in Europe's Seas," December 19, 2024. https://www.eea.europa.eu/en/analysis/indicators/marine-protected-areas-in-europes-seas.
147 Protected Planet. "Home," n.d. https://www.protectedplanet.net/en.

on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter (1972), and MARPOL (1973).[148] Additionally, they have effectively implemented these under national legislation over the past 50 years. These countries advocate against illegal hunting and fishing, marine pollution, and the exploitation of seas. Recognizing the impacts of climate change, countries in this bloc are willing to provide funding to conduct research on seal protection and to share best practices with their counterparts.[149] They acknowledge the lack of precise seal data and advocate for science-driven policies to broaden transnational seal research. On top of that, they stand for robust environmental protections and frameworks. To illustrate, one specific policy is the European Union's 2009 seal regime, amended in 2015, which introduced a general ban on seal products.[150]

Countries Wishing to Adjust or Strengthen Environmental Policies

These countries usually have weak environmental frameworks and limited resources, and wish to adjust them. Some of them are located in areas where migratory seals migrate to mate, breed, molt, and feed. Others are located along their migratory routes, including the St. Lawrence Seaway, Greenland, Alaska, the Bering Sea, the Sea of Okhotsk, the Antarctic Peninsula, the Subantarctic Islands, southern South America, and the Barents and Norwegian Seas.[151] United by an urgent need for conservation support and sustainable ecosystem management, these countries must enhance their legal frameworks to protect the seal population. They ought to also prepare for the possibility of having their ecosystems affected by the seals' activities. Seals are bioindicators of the health of these countries' oceans, so protecting them is crucial for the governments. One of the best ways to assist ocean recovery is to create marine protected areas. These areas give sea life a chance to bounce back, support healthier fisheries, and make oceans more resilient to the impacts of climate change.[152] However, they might face issues with limited resources to implement higher measures, as well as lack of capability, knowledge, and efficient institutions. Rather than favoring non-restrictive policies, the states in this bloc wish to adjust or strengthen their environmental policies. Therefore, they aim to advocate for foreign aid, inclusive decision-making dialogue forums, and capacity building through CMS funds. Moreover, during COP 14, some African states emphasized their responsibility to protect biodiversity despite the lack of resources that the least developed countries ought to deal with.[153]

Committee Mission

The Convention on the Conservation of Migratory Species of Wild Animals (CMS) functions revolve around uniting the range states of migratory species and establishing the grounds for international cooperation on conserving and preserving species and their habitats.[154] Thus, states

148 United Nations, "International Convention (With Annexes) for the Prevention of Pollution of the Sea by Oil, 1954." *United Nations — Treaty Series* 4 (July 26, 1958): 8, https://treaties.un.org/doc/Publication/UNTS/Volume%20327/volume-327-I-4714-English.pdf; "Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter," n.d. https://www.imo.org/en/ourwork/environment/pages/london-convention-protocol.aspx; and, "International Convention for the Prevention of Pollution From Ships (MARPOL)," n.d. https://www.imo.org/en/about/conventions/pages/international-convention-for-the-prevention-of-pollution-from-ships-(marpol).aspx.
149 "Environment Policy: General Principles and Basic Framework | Fact Sheets on the European Union | European Parliament," n.d. https://www.europarl.europa.eu/factsheets/en/sheet/71/environment-policy-general-principles-and-basic-framework.
150 "Regulation - 1007/2009 - EN - EUR-Lex," n.d. https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32009R1007.
151 "Species+," n.d. https://www.speciesplus.net/.
152 World Economic Forum. "This Pacific island has banned fishing for marine conservation," December 11, 2019. https://www.weforum.org/stories/2019/12/palau-pacific-marine-conservation-fishing-environment/.
153 Kate Harris et al., "Earth Negotiations Bulletin," ed. Pamela Chasek, *Earth Negotiations Bulletin* 89 (February 20, 2024): 2, https://enb.iisd.org/sites/default/files/2024-02/enb1889e.pdf.
154 "Legal Instruments | CMS"

are called upon to conserve species habitats, prevent their deterioration, minimize environmental harm, restore ecosystems, and compensate for violations. To achieve these goals, they are encouraged to adopt specific agreements, memorandums of understanding, and strategic or action plans to address threats to species and their potential impacts.[155]

To understand the role of these countries, it is important to acknowledge the preamble of the Convention on Migratory Species: "recognizing that the States are and must be the protectors of the migratory species of wild animals that live within or pass through their national jurisdictional boundaries."[156] In other words, countries that receive migratory seals are responsible for protecting these mammals while they safely stay in temporarily to breed or cross through to mate.

CMS delegates are able to create new frameworks to contemplate endangered species of seals, and sign treaties and agreements on them. Because the CMS operates under the United Nations' rules of procedure, it has a recommendatory nature as a committee and cannot force countries to adopt its resolutions.[157]

Therefore, recommendations suggest that countries promote national public policies in favor of fauna biodiversity, strengthen their regional cooperation, and share scientific knowledge.[158] Parties of CMS are prohibited from taking unilateral actions on migratory species that contradicts directives of the Convention, violate environmental commitments accorded under COP decisions, and/or justify such actions as reservations to the text. Moreover, non-party countries participating in CMS discussions are exempt from strict binding rules since they have not ratified the Convention.[159]

155 Common Wadden Sea Secretariat,"Wadden Sea Seal Management Plan 2023-2027," n.d. https://www.waddensea-worldheritage.org/sites/default/files/2022_Seal%20Management%20Plan%202023-2027.pdf.
156 "Convention on the Conservation of Migratory Species of Wild Animals."
157 United Nations. "Guidelines for United Nations Resolutions," 2020. https://unitar.org/sites/default/files/media/publication/doc/UN%20Resolution%20Guidelines_Handbook_English-7x10-Unitar_1.pdf; United Nations. "United Nations Charter (Full Text) | United Nations," n.d. https://www.un.org/en/about-us/un-charter/full-text.
158 "Convention on the Conservation of Migratory Species of Wild Animals."
159 "Convention on the Conservation of Migratory Species of Wild Animals."

Conservation of Migratory Bat Species

Photo Credit: Paramanu Sarkar

Over one third of the world's migratory bat species are considered threatened or near-threatened with extinction.[1] Migratory bats travel thousands of kilometers and connect ecosystems and economies across global borders.[2] They are essential for healthy ecosystems. They pollinate crops, spread seeds over deforested regions, and consume insects that would normally damage agriculture.[3] However, their mobility also exposes them to growing risks from habitat loss and pesticide exposure. Increasingly unsustainable renewable energy developments. As states build their solar and wind power to meet climate goals, the survival of these bats has become increasingly uncertain.

Migratory bats play a critical role in sustaining biodiversity. However, they remain underprotected around the world. Being nocturnal, they mostly move during the night, making it difficult to monitor and conserve. Many of these bats travel across Europe, depending on a network of habitats for survival.[4] However, many of these sites are unprotected and face pressures from human activity. Expanding urban zones frequently overlaps with migratory roosts. This causes displacement within essential habitats. Regions with many wind turbines have high bat mortality rates during peak migration periods. Some examples include the North Sea and the Appalachian Mountains in North America.[5] The consequences of such losses are extensive. Migratory bats help regulate insect populations. This reduces the need for chemical pesticides. They also play an important role in reforestation by spreading seeds over landscapes. Many of these benefits go unnoticed in environmental planning. This is especially true in countries with limited conservation efforts and loose environmental regulations.

Countries with high biodiversity possess a high number of endangered species. However, some of these countries lack the infrastructure and funding for conservation efforts.[6] Renewable energy development is often prioritized to meet energy needs and economic growth goals. However, these efforts can be very damaging to the environment. This leaves little time and space for biodiversity protections.

Addressing these challenges requires international cooperation. Bats and other species migrate regardless of borders. States can not act alone to protect them. Frameworks like the Bonn Convention and regional agreements such as EUROBATS provide important tools for this type of collaboration.[7] These encourage countries in similar regions to align their policies. Partnerships with international organizations, research institutions, and local communities are also critical. They illustrate how cross-sector cooperation can help promote community-based solutions.[8] The private sector also has an important role to play in adopting wildlife safe practices. It is necessary to build technologies designed to reduce bat deaths. This development can show that it is possible to balance energy development with wildlife conservation.

1 Frick, W.F., Kingston, T. and Flanders, J. "A review of the major threats and challenges to global bat conservation," *Ann. N.Y. Academy of Science*, 1469: 5-25, 202, https://doi.org/10.1111/nyas.14045
2 Peixoto, F.P., Braga, P.H.P. & Mendes, P. "A synthesis of ecological and evolutionary determinants of bat diversity across spatial scales," *BMC Ecology* 18, 2018, https://doi.org/10.1186/s12898-018-0174-z
3 Mariëlle L. van Toor, M. Teague O'Mara, Michael Abedi-Lartey, Martin Wikelski, Jakob Fahr, Dina K.N. Dechmann. "Linking colony size with quantitative estimates of ecosystem services of African fruit bats," *Current Biology*; 1 April, 2019, https://www.mpg.de/13271542/fruit-bats-seed-dispersal.
4 "Bat populations recovering, according to largest ever European study," *European Environment Agency,* 2016, https://www.eea.europa.eu/highlights/bat-population-recovering
5 Paul M. Cryan, Adam C. Brown. "Migration of bats past a remote island offers clues toward the problem of bat fatalities at wind turbines," *Biological Conservation*, Volume 139, Issues 1–2, 2007, https://doi.org/10.1016/j.biocon.2007.05.019.
6 Lu Zhang, Li Yang, Colin A. Chapman, Carlos A. Peres, Tien Ming Lee, Peng-Fei Fan. "Growing disparity in global conservation research capacity and its impact on biodiversity conservation," *One Earth,* Volume 6, Issue 2, 2023, https://doi.org/10.1016/j.oneear.2023.01.003.
7 "Convention on the Conservation of Migratory Species of Wild Animals," *Joint Nature Conservation Committee,* 2019, https://jncc.gov.uk/our-work/the-convention-on-the-conservation-of-migratory-species-of-wild-animals/.
8 Kingston, Tigga & Aguirre, Luis & Armstrong, Kyle & Mies, Rob & Racey, Paul & Herrera, Bernal & Waldien, "Networking Networks for Global Bat Conservation," *Bats in the Anthropocene: Conservation of Bats in a Changing World*, 2016 10.1007/978-3-319-25220-9_17.

Topic Background

The Ecological Importance of Migratory Bats

Migratory bats play a role that is overlooked in sustaining healthy ecosystems around the world. Bats are primary predators. They provide natural pest control by consuming high numbers of insects. Bats feed on beetles, moths, leafhoppers, and other insects whose larvae destroy crops.[9] For example, the big brown bat (*Eptesicus fuscus)* plays a key role in agricultural ecosystems by preying on cucumber beetles. These beetles lay eggs that develop into poisonous larvae on corn crops, one of the most destructive pests in North America.[10] The larvae feed on the roots of corn and other crops. They cause extensive damage and significantly reduce yields. In fact, a single colony of 150 big brown bats can consume enough cucumber beetles in three months to prevent the growth of about 33 million rootworm larvae.[11] By disrupting this pest, big brown bats help farmers avoid crop losses and reduce their reliance on chemical pesticides. In this case, bats save the agricultural sector millions of US dollars by contributing to higher crops and limiting the use of toxic substances. Biologist John Whitaker has confirmed the big brown bats' crucial, often underappreciated, role as a helper in sustainable agriculture.[12] Bats offer both environmental and economic value to communities.

Building on their role as insect predators, migratory bats also provide critical ecosystem services. These include pollination and seed dispersal. In the Sonoran Desert, species such as the lesser long-nosed bat (*Leptonycteris curasoae*), greater long-nosed bat (*Leptonycteris nivalis*), and Mexican long-tongued bat (*Choeronycteris mexicana*) are key pollinators. Over 60 species of agave and many species of cacti depend on them. These plants are important in the desert landscapes of the southwest United States and northern Mexico. The mutual dependence between these bats and their host plants is so prominent that, in the absence of bats, agave reproduction can decline to just 1/3000th of its normal level.[13]

Migratory nectar-feeding bats follow seasonal "nectar corridors" across vast desert regions. Nectar corridors refer to habitat patches laid out at critical times for pollinators containing plants and flowers that are necessary for pollination. Movements in these corridors are aligned with blooming patterns and ensure cross-pollination of plants.[14]

In tropical ecosystems, fruit-eating migratory bats play a role as seed dispensers. By carrying fruit away from parent trees and releasing seeds during flight, these bats help regenerate forests. This is extra important for deforested and degraded land. Bats can fly over 50 kilometers in a single night, proving the extent of migratory bats in building and strengthening global forests. In fact, in some regions of West Africa bats are responsible for 95 percent of natural forest regeneration.[15] Through these services, migratory bats boost biodiversity by rebuilding forests.

A study done by the journal Movement Ecology documented the long-distance movements of the *Pipistrellus nathusii*, a rare bat from the United Kingdom, across

9 Lagerveld, S., de Vries, P., Harris, J. et al. "Migratory movements of bats are shaped by barrier effects, sex-biased timing and the adaptive use of winds," Mov Ecol 12, 81 (2024), https://doi.org/10.1186/s40462-024-00520-7
10 Eben A. "Ecology and Evolutionary History of Diabrotica Beetles-Overview and Update," Insects, 2022 Jan 31, 13(2):156. https://pmc.ncbi.nlm.nih.gov/articles/PMC8877772/
11 Bat Conservation International, "Data Sheet," Eptesicus fuscus, https://www.batcon.org/bat/eptesicus-fuscus/
12 Fletcher, Noël. "Bats Save Billions In Agriculture Costs As Technology Helps Save Them," Forbes, (2024). https://www.forbes.com/sites/noelfletcher/2024/11/28/bats-save-billions-in-agriculture-costs-as-technology-helps-save-them/
13 "Lesser Long-Nosed Bat," Animalia.
14 Kier Holmes, "Ask the Expert: How to Create a Much-Needed 'Nectar Corridor'," *Gardenista,* September 6, 2022. https://www.gardenista.com/posts/ask-expert-create-much-needed-nectar-corridor/.
15 Madz Dizon, "Here's How Bats Utilize Weather to Travel Long Distances Without Using Much Energy," *Nature World News,* Jan 03 2025, https://www.natureworldnews.com/articles/72520/20250103/heres-how-bats-utilize-weather-travel-long-distances-without-using-much-energy.htm

multiple European countries. The study used high resolution GPS tracking to follow bats migrating from the United Kingdom to Belgium, the Netherlands, and Germany. This is used to observe small scale movement and patterns. The data showed that some bats traveled over 2,000 kilometers. They stopped at key foraging and roosting sites along the way. However, many of these lie outside protected areas.[16] This study highlighted the urgent need for cross-border conservation of migratory bats. Local or national conservations alone are not enough, considering the international element of the migratory bat.

Furthermore, the study shows the need for international frameworks. Most agreements often fall short because they are not binding. As a result, many countries implement bat conservation unevenly. This leads to gaps in protection in key countries along their routes. This reinforces the study's central warning: isolated, country-specific wildlife protection strategies are insufficient for migratory species. Migratory bats play essential ecological roles across multiple ecosystems. Their conservation requires strategies that reflect the full scales of their movements.

Direct and Indirect Threats to Migratory Bats

Bats face a range of direct threats, many of which are human induced. One major issue is pesticide exposure. When bats fly through recently sprayed areas or consume contaminated insects, they risk pesticide poisoning. Bats are directly exposed to pesticides through ingestion, inhalation, and absorption through the skin.[17] Their high insect consumption rates make them particularly vulnerable to ingesting contaminated prey. For instance, the straw colored bat (*Eidolon helvum*) which inhabits agricultural areas, has been found with high levels of pesticides in its body. This is due to consumption of insects or fruit exposed to these chemicals.[18]

Bats also drink from open water sources, such as irrigation canals and ponds. Pesticide runoff may be highly present.[19] A study done by the journal Science of the Total Environment reviewed how much pesticide exposure bats face in areas where farming and chemical use are common. Scientists studied several bat species, including the little brown bat (*Myotis lucifugus*), by collecting tissue samples from their bodies.[20] The study tested the samples of different pesticides, including older pesticides like Dichlorodiphenyltrichloroethane, commonly known as DDT. DDT was once widely used to kill insects on crops and to control mosquitoes. However, it has since been banned or restricted in many countries due to its harmful effects on wildlife and the environment. However, it can remain in soil and water for extended periods of time.[21]

Toxic substances can often build up over time and exposure. Many older pesticides like DDT are stored in the fat tissue of animals rather than being broken down right away.[22] This is a major concern for bats, who rely on fat reserves to survive during periods such as hibernation, migration, and reproduction. When bats burn this fat or energy, the stored pesticides are released back into the bloodstream of the bat.[23] This can lead to nerve damage, reproductive issues, and a weakened immune system. Since these effects build

16 Lagerveld, de Vries, and Harris, J. et al. "Migratory movements of bats are shaped by barrier effects."
17 Oliveira JM, Destro ALF, Freitas MB, Oliveira LL. "How do pesticides affect bats? - A brief review of recent publications," *Braz J Biol.* 2021. https://pubmed.ncbi.nlm.nih.gov/32428097/
18 "Straw-Coloured Fruit Bat," Animalia. https://animalia.bio/straw-coloured-fruit-bat
19 Salvarina, I. "Review of bats' use of aquatic habitats," *Mammal Review*, 46: 131-143, https://doi.org/10.1111/mam.12059
20 Brooks, A.C., Nopper, J., Weyers, A., Crosland, H., Foudoulakis, M., Haaf, S., Hackett, M. and Lawrence, A. "Assessing the Risks to Bats from Plant Protection Products: A Review of the Recent European Food Safety Authority Statement Regarding Toxicity and Exposure Routes," *Environ Toxicol Chem*, 40: 2978-2989.
21 Srivastava, Akhileshwar Kumar, Kumar, Dhruv, Singh, Divya , Singh, Rajesh Kumar. "Chapter 10 - Endocrine disruptor activity of xenobiotics in carcinogenesis," Xenobiotics in Chemical Carcinogenesis, *Academic Press*, 2022, Pages 175-196, https://doi.org/10.1016/B978-0-323-90560-2.00004-2.
22 Srivastava and Kumar et al. "Chapter 10 - Endocrine disruptor activity of xenobiotics in carcinogenesis."
23 Hernández-Jerez A, Adriaanse P, Aldrich A, et al. "Scientific statement on the coverage of bats by the current pesticide risk assessment for birds and mammals," *EFSA Panel on Plant Protection Products and their Residues (PPR),* 2019 Jul 29. https://pmc.ncbi.nlm.nih.gov/articles/PMC7009170/

up over time, it can be hard to link to a single exposure event. As a result, they often go unnoticed in conservation assessments.[24] These harmful substances can also be passed by mother to baby bats during pregnancy or nursing, putting young bats at risk even before they are born. In fact, in some cases, young bats born to exposed mothers showed developmental issues or died early as a result of the chemical pesticides in their bodies. This is especially worrisome for bats who only have one baby bat per year. The little brown bat *(Myotis lucifugus)* in North America, the greater horseshoe bat *(Rhinolophus ferrumequinum)* in Europe and Asia, and the grey-headed flying fox *(Pteropus poliocephalus)* in Australia typically only give birth to one baby per year.[25] With such slow reproductive rates, even small losses can have long-term impacts, gradually reducing bat populations over time and making recovery difficult.

Bats play an essential role in the food chain. Bats are predators of insects and connect many seasonal and ecological systems. Endangered species like the Indiana bat *(Myotis sodalis)* and the gray bat *(Myotis grisescens)* consume high proportions of aquatic insects. The Indiana bat is primarily found in the eastern and midwestern United States. It hibernates in limestone caves during winter and roosts under dead or dying trees during summer.[26] Its diet means Indiana bats frequently forage near streams, rivers, and wetlands. This means their survival is directly tied to healthy freshwater systems.[27] By consuming aquatic insects, Indiana bats help move nutrients from aquatic to terrestrial ecosystems and keep insect populations in control.[28]

Habitat loss is also a significant threat to bat populations.

Similarly, the gray bat lives in the southeastern United States and is one of the few bat species that relies almost only on caves for roosting all year round. Gray bats also depend on high proportions of aquatic insects.[29] Both species' dependence on aquatic insect prey makes them particularly sensitive to changes in water quality and insect availability. Pesticide use, pollution, and habitat degradation that reduce aquatic insect populations can directly threaten these bats' survival.

Habitat loss increases the risk of other threats that directly harm bats. Forests and caves are two critical habitats for bats. Forests support high levels of habitat abundance for many different species of bats.[30] They also provide essential resources for foraging and roosting. Roosting refers to areas where bats settle. In forests, these include tree hollows, crevices under bark, and dense foliage for shelter. However, large-scale deforestation has severely diminished these resources. This is especially true in tropical regions like Southeast Asia and Africa. The study notes that as tropical forest loss keeps dropping at an alarming rate, a disproportionate amount of species lose key habitats. This threatens the existence of their population entirely.[31]

Similarly, agricultural expansion also harms bat habitats. Expansion to create land for single-crop farms eliminates many roosting options

24 Brooks, Nopper, Weyers, Crosland, Foudoulakis, Haaf, Hackett, and Lawrence, A. "Assessing the Risks to Bats from Plant Protection Products."
25 "Different Types of Bats," Critter Control, accessed August 20, 2025, https://www.crittercontrolofkansascity.com/wildlife/animals/bats/different-types-of-bats.html
26 "Indiana Bat (Myotis sodalis)," U.S. Fish & Wildlife Service, accessed August 15, 2025, https://www.fws.gov/species/indiana-bat-myotis-sodalis
27 Camila Guimarães Torquetti, Ana Tereza Bittencourt Guimarães, Benito Soto-Blanco. "Exposure to pesticides in bats," *Science of The Total Environment,* Volume 755, Part 1, 2021, https://doi.org/10.1016/j.scitotenv.2020.142509
28 Bernard, Willcox, Jackson, Brown, Mccracken. "Feasting, not fasting."
29 Fukui, Dai, Murakami, Masashi, Nakano, Shigeru, Aoi, Toshiki. "Effect of emergent aquatic insects on bat foraging in a riparian forest," *The Journal of animal ecology,* 2006. https://www.researchgate.net/publication/6763575_Effect_of_emergent_aquatic_insects_on_bat_foraging_in_a_riparian_forest
30 Frick, Winifred, Kingston, Tigga, Flanders, Jon. "A review of the major threats and challenges to global bat conservation," *Annals of the New York Academy of Sciences*, 2019. https://www.researchgate.net/publication/332146982_A_review_of_the_major_threats_and_challenges_to_global_bat_conservation
31 Voigt CC, Phelps KL, Aguirre LF, Corrie Schoeman M, Vanitharani J, Zubaid A. "Bats and Buildings: The Conservation of Synanthropic Bats," *Bats in the Anthropocene: Conservation of Bats in a Changing World,* August 29, 2015, https://pmc.ncbi.nlm.nih.gov/articles/PMC7123121/

and reduces insect prey availability for bats. In regions where bats consume fruit, habitat loss forces bats into agricultural zones. This is the case for the Mauritian flying fox. Increased human-wildlife conflict due to habitat loss has led to slaughter of the species.[32] Though serving as only an indirect threat, this illustrates how habitat degradation can increase existing threats.

Urban development also contributes to the threat of habitat fragmentation. Rapid urban expansion is predicted to increase by over 1.2 million square kilometers by 2030. Urbanization isolates bat populations by disrupting natural habitats and introducing barriers. Roads, buildings, and lighting can interfere with movement, foraging, and roosting. While some species can adapt to urban environments, roosting in buildings or bridges, others are highly sensitive to the changes. In some cases, urban areas may function as traps, where bats are attracted to poor habitats that reduce their survival. Moreover, there are many faulty perceptions about bats posing disease risks to humans. This leads to many bats in urban areas being killed. This threatens individual colonies and complicates the broader effects of urban habitat loss, challenging conservation in urbanizing landscapes.[33]

These factors create poor conditions that make it extremely difficult for bats to survive and reproduce. Predators and extreme weather both contribute to these conditions. Deforestation, agriculture, and urban developments are ongoing threats to global bat diversity. In regions of the world with limited conservation resources, it is harder than ever for bats to survive.

Migration Bottlenecks for Migratory Bats

Migratory bottlenecks are areas where species from wide ranging breeding populations are funneled through narrow paths. This is often due to natural terrain features.[34] Bottlenecks are documented for many endangered birds and bats. In regions like Central America, narrow pieces of land create migratory pathways. These regions have high concentrations of birds and bats at specific points.[35] Although bats have received far less attention, evidence shows that migratory bottlenecks influence their migratory behavior. To navigate these bottlenecks, some migratory bats use major landmarks, such as hills, mountains, and rivers. These types of land also serve as navigational helpers during movement across large areas of land. These may also act as natural bottlenecks, particularly in regions where other pathways are limited. Some examples are large bodies of water like the Gulf of Mexico and the Great Lakes in North America.[36]

However, the concentration caused by bottlenecks can also make them vulnerable to environmental hazards.[37] To minimize this risk, scientists have attempted to map out migration corridors. However, this can be challenging due to the difficulty of tracking small nocturnal animals over great distances. As such, geographic bottlenecks remain a largely underexplored area of research.

One risk factor highly present in migration corridors is wind turbines. For instance, some bats fly along Appalachian ridges during their migrations. However, this region is home to a high concentration of wind turbines. As such, bats flying through this

32 Frick, Winifred & Kingston, Tigga & Flanders, Jon. "A review of the major threats and challenges to global bat conservation," *Annals of the New York Academy of Sciences*, 2019. https://www.researchgate.net/publication/332146982_A_review_of_the_major_threats_and_challenges_to_global_bat_conservation

33 Elmqvist, Thomas, ZippererWayne C. and Guneralp, Burak. "URBANIZATION, HABITAT LOSS AND BIODIVERSITY DECLINE," *United States Forest Service for Research Development,* 2016, https://www.srs.fs.usda.gov/pubs/ja/2016/ja_2016_zipperer_001.pdf

34 Sherry, TW. " Identifying migratory birds' population bottlenecks in time and space," *Proceedings of the National Academy of Sciences of the United States of America,* 2018 Apr 3, https://pmc.ncbi.nlm.nih.gov/articles/PMC5889679/

35 Whalen, Ryan. "Storm Surfing Bats Are Revealing Secrets to How They Conserve Energy During Long Migrations," *The Debrief,* 2025, https://thedebrief.org/storm-surfing-bats-are-revealing-secrets-to-how-they-conserve-energy-during-long-migrations/.

36 Cryan, Paul and Veilleux, J.P.. "Migration and use of autumn, winter, and spring roosts by tree bats," 2007. https://www.researchgate.net/publication/232424516_Migration_and_use_of_autumn_winter_and_spring_roosts_by_tree_bats

37 Lagerveld, de Vries, and Harris, J. et al. "Migratory movements of bats are shaped by barrier effects."

area are at higher risk of harm.[38] In North America alone, turbines are estimated to cause 144,000 bat fatalities annually.[39] Wind turbine fatalities peak from July to October coinciding with bat migration and mating periods.[40] Statistics in Germany show similar concerns. In two months during migration season, a set of three wind turbines killed about 70 bats each.[41] If this pattern holds across the thousands of turbines operating in Europe, it could mean millions of bat deaths every year. These alarming numbers highlight the importance of understanding migration patterns, especially in areas where wind energy products are being built. Better knowledge of migratory bottlenecks can help guide where and how turbines are placed to reduce harm to bat populations.

Germany's Wind Turbines (Credit: Tony Webster)

Finally, stopover needs are a critical aspect of migration. When traveling, bats need opportunities to rest, feed, and recover from long distance travel. The use of stopover habitats is already well-established in bird research. Similar processes are being noticed in migratory bats. New evidence suggests that bats depend on a network of transitional habitats.[42] These serve as temporary roosting sites during seasonal movements. Migratory tree bats often use day roosts in trees during fall migration.[43] These roosts are typically found in isolated or edge habitats, such as forest gaps, woodland edges, or areas near open clearings. These types of roosts allow for increased exposure to sunlight to aid in body temperature regulation. Being in more isolated locations also reduces competition among bats for roost sites. Finally, these locations often have fewer predators than denser forests.[44] However, data is very limited about bat stopover habits during the day.[45] This makes it harder to assess the effects of habitat loss on these critical pathways. The loss of these transitional habitats could have serious consequences for survivability. Roosting sites are essential for bats during one of the most demanding phases of their annual cycle. As such, protecting these areas may be essential to safeguarding bats.

38 "Wind Farms and Wind Turbines," *Bat Conservation Trust*, accessed August 11, 2025, https://www.bats.org.uk/about-bats/threats-to-bats/wind-farms-and-wind-turbines
39 Thompson M, Beston JA, Etterson M, Diffendorfer JE, Loss SR. "Factors associated with bat mortality at wind energy facilities in the United States," *Biology Conservation,* 2017. doi: 10.1016/j.biocon.2017.09.014
40 Goldenberg SZ, Cryan PM, Gorresen PM, Fingersh LJ. "Behavioral patterns of bats at a wind turbine confirm seasonality of fatality risk," Ecol Evol. 2021; 11: 4843–4853, https://doi.org/10.1002/ece3.7388
41 Christian C. Voigt, Klara Kaiser, Samantha Look, Kristin Scharnweber, Carolin Scholz. "Wind turbines without curtailment produce large numbers of bat fatalities throughout their lifetime: A call against ignorance and neglect," *Global Ecology and Conservation*, Volume 37, 2022. https://doi.org/10.1016/j.gecco.2022.e02149.
42 Wiederholt, R., L. López-Hoffman, J. Cline, R. A. Medellín, P. Cryan, A. Russell, G. McCracken, J. Diffendorfer, and D. Semmens. "Moving across the border: modeling migratory bat populations," *Ecosphere* 4(9):114, 2013, http://dx.doi.org/10.1890/ES13-00023.1
43 Cryan and Veilleux. "Migration and use of autumn, winter, and spring roosts by tree bats."
44 Hutchinson, Jeffrey & Lacki, Michael. "Possible microclimate benefits of roost site selection in the Red Bat, Lasiurus borealis, in mixed mesophytic forests of Kentucky," *Canadian Field-Naturalist,* 2001. https://www.researchgate.net/publication/286992798_Possible_microclimate_benefits_of_roost_site_selection_in_the_Red_Bat_Lasiurus_borealis_in_mixed_mesophytic_forests_of_Kentucky
45 Werber, Y., Sextin, H., Yovel, Y., & Sapir, N. "BATScan: A radar classification tool reveals large-scale bat migration patterns," *Methods in Ecology and Evolution*, 14, 2023, 1764–1779, https://doi.org/10.1111/2041-210X.14125.

International Conservation of Migratory Bats

Migratory species cross national boundaries throughout their journeys, so their conservation cannot be addressed by individual countries alone. The CMS was established in 1979 to provide a legal framework for the protection of migratory species. Under the CMS, a number of binding and non-binding programs have been developed to address the needs of specific species groups. One of the most relevant to that conservation is EUROBATS, the Agreement on the Conservation of Populations of European Bats. Established in 1991, EUROBATS brings together states across Europe to protect bat species through habitat conservation and harmonization legislation. It encourages countries to identify and protect critical roosting and foraging sites, and regulates harm to bats.[46] In Europe there are over 50 bat species. More than 35 percent of them are considered threatened or near-threatened.[47] Through EUROBATS, 38 member states now collaborate to address these threats by protecting over 1,000 critical roosting and migratory sites across the continent.[48]

The migratory patterns of the Mexican free-tailed bat (*Tadarida brasiliensis mexicana*) offers a clear example of why international cooperation is essential for the protection of migratory bat species. These bats travel between Northern Mexico and the southwestern United States. They rely on a connected network of summer roosts that span national borders. Habitats across the two countries each play a distant role in the species' annual cycle.[49] For instance, colonies in Texas and northern Mexico support many individuals and serve as key hubs within the border migratory system. If these roosts are lost, the effects would ripple across the entire population, affecting bats across the continent.

The Mexican free-tailed bat is not currently listed as threatened or endangered under the US Endangered Species Act (ESA). One of the primary frameworks that indirectly safeguards this species is the National Environmental Policy Act (NEPA). This requires federal agencies to assess environmental impacts before approving major projects such as highways, wind farms, or energy infrastructure. NEPA assessments can play a critical role in identifying and mitigating threats to key roosting habitats. These assessments often include suggestions to preserve bat foraging areas and to regulate urbanization and construction activities during sensitive periods of the bats' migratory or breeding seasons. For example, large colonies of Mexican free-tailed bats roost in caves located on or near public lands. One example is Bracken cave in Texas. It houses one of the largest bat colonies in the world. NEPA protects this colony from projects that could be harmful to the bats that live there.[50]

In addition to NEPA, various state laws in the United States provide more local protections. For example, the Texas Parks and Wildlife Department recognizes the ecological value of bat populations. As such, it has supported public awareness campaigns to educate the public. It has also contributed to research focused on roost protection and habitat management.[51] Texas also has informal conservation practices surrounding major bat colonies. Many roosting sites in Texas and Arizona are located on land managed by state or non-profit conservation groups.[52] These laws reflect an increasing awareness of the importance of bats. However, a major challenge lies in the lack of consistent coordination

46 Hutson, Marnell, Petermann. "A guide to the implementation of the Agreement on the Conservation of Populations of European Bats (EUROBATS)"
47 "A call for action to defend nature," *Bat Conservation Trust,* May 12, 2015. https://www.bats.org.uk/news/2015/05/a-call-for-action-to-defend-nature
48 "EUROBATS Press Release: 30 years of successful international bat conservation," *UNEP/EUROBATS,* https://www.eurobats.org/bat_news/eurobats_press_release_30_years_successful_international_bat_conservation
49 Wiederholt, R., L. López-Hoffman, J. Cline, R. A. Medellín, P. Cryan, A. Russell, G. McCracken, J. Diffendorfer, and D. Semmens. "Moving across the border: modeling migratory bat populations," *Ecosphere* 4(9):114, 2013. http://dx.doi.org/10.1890/ES13-00023.1
50 "What is the National Environmental Policy Act?," *United States Environmental Protection Agency.*
51 Plateau,Edwards and Timbers, Cross. "WILDLIFE MANAGEMENT ACTIVITIES AND PRACTICES: COMPREHENSIVE WILDLIFE MANAGEMENT PLANNING GUIDELINES," *Texas Parks and Wildlife,* April 2010, https://tpwd.texas.gov/publications/pwdpubs/media/pwd_bk_w7000_0788.pdf
52 "The United States–Texas," *The Nature Conservancy,* https://www.nature.org/en-us/about-us/where-we-work/united-states/texas/

between federal, state, and non-governmental actors. It is important to note that the United States is not a member of the CMS. However, it is still involved in these regional efforts to protect migratory species.

Non-governmental and research driven conservation networks also play a vital role protecting migratory species. One such organization is Bats without Borders (BWB). BWB is a charity based in the United Kingdom. It works across Southern Africa, a region home to more than 130 bat species. Many of these species are migratory and face mounting conservation pressures.[53] BWB focuses on protecting bats through capacity building, education, and applied conservation. It is especially active in countries like Malawi, Zambia, South Africa, and Zimbabwe.[54] Bats without Borders places emphasis on local empowerment and training. To do so, it provides field-based training for interns interested in conservation. Since its launch in 2022, BWB interns in Malawi and Zambia have been trained in bat monitoring techniques, conflict mitigation, and public outreach.[55] The program is designed to foster long-term local leadership in bat conservation. The goal is to address the gap in regional expertise that often prevents effective wildlife protection across southern Africa. Ultimately, regional non-state actors are vital in areas of study where formal legal protections may be limited or under enforced. They can contribute to conservation efforts by bridging the gap between science, policy, and action.

Bat roost protection site in Wales, UK (Credit: David Medcalf)

Renewable Energy and the Protection of Bat Habitats

Many countries have shifted toward renewable energy to fight climate change. To do so, more ground-mounted solar panel farms are being built across rural landscapes. While solar energy is important for reducing carbon emissions, it can also affect wildlife, especially bats. The southwest of England is a region rich in bat diversity and solar developments. However, bat activity has decreased in areas with solar panels. Six out of eight noted bat species were less active around solar panels. Some, like the Common pipistrelle (*Pipistrellus pipistrellus*) and Nyctalus species, who were mainly affected in the middle of fields and along field edges. Others, such as the Myotis species and the Serotine bat (*Eptesicus serotinus*), showed reduced activity near hedgerows. Finally, the Soprano pipistrelle (*Pipistrellus pygmaeus*) and Plecotus species were mostly impacted in open areas between the panels.[56]

53 "Conserving African bats," *Inside Ecology,* February 2021, https://insideecology.com/2021/02/26/conserving-african-bats/
54 "Our strategy," *Bats without Borders,* https://www.batswithoutborders.org/our-strategy.html
55 "Conservation Interns," *Bats without Borders,* https://www.batswithoutborders.org/conservationinternship.html
56 Tinsley, E., Froidevaux, J. S. P., Zsebők, S., Szabadi, K. L., & Jones, G. "Renewable energies and biodiversity: Impact of ground-mounted solar photovoltaic sites on bat activity," *Journal of Applied Ecology*, 60, 1752–1762, 2023. https://doi.org/10.1111/1365-2664.14474

These effects are due to various factors. Solar panels change the terrain, breaking up flight paths and making it harder for bats to navigate or find food. In some cases, bats may mistake the panels for water and attempt to drink from them, which could lead to injury. Currently, in the UK and many parts of Europe, grounded solar farms are not always required to undergo an Environmental Impact Assessment (EIA) unless they are in especially protected areas.[57] The EIA is a process that checks how a planned project, like a wind farm or new road, might harm the environment. It helps look at infrastructure changes to protect wildlife, land, and nearby communities before the project begins. Not requiring the EIA can be a serious oversight, especially given how sensitive bats are to the changes in their habitat and the legal protections they are afforded. Failing to properly assess and plan these developments risks harming bat populations.

However, not all bat species respond to solar farms in the same way. Some bats have adapted to human modified landscapes. Some appear to use solar farms as foraging grounds.[58] Species such as the Savi's pipistrelle (*Hypsugo savii*), the Common noctule (*Nyctalus noctula*), and Kuhl's pipistrelle (*Pipistrellus kuhlii*), are frequently recorded at solar sites. Based on acoustic monitoring, these bats pass through these areas and feed there. Acoustic monitoring is a technique that uses specialized sensors to record, detect, and consider animal sounds to gather data about various environments.[59]

Solar farms may offer two main sources of food. First, the vegetation growing underneath and around the panels can support insect populations. Second, the panels themselves reflect polarized light, similar to water. This can attract aquatic insects, key prey for many bats.[60] This influx of insect life may make solar farms helpful for certain species. Still, overall that activity and species richness at solar farms resemble what's seen in arable fields. Arable fields are generally considered one of the least suitable environments for bats.[61] This means solar farms likely do not replace higher quality habitats like forests, water edges, or grasslands. To improve their value for bat conservation, solar forms should be designed with biodiversity in mind. Keeping and planting hedgerows and trees, promoting insect friendly vegetation, and avoiding locations near critical habitats can help. While solar energy is essential for a low carbon future, it is equally important to reduce harm and, when possible, help wildlife.

Wind energy is also a direct threat to many bat populations. Wind energy is essential for reducing greenhouse gas emissions. However, it also poses short-term threats to certain species.[62] Roughly 72 percent of bat fatalities at wind farms involved just three species of migratory tree bats. These deaths are not evenly distributed and vary significantly by region and season.[63] The American Wind Wildlife Information Center (AWWIC) compiles data from over 200 wind energy projects across the United States, representing more than USD 20 million invested in monitoring.[64] Individual wildlife studies at wind farms often cost more than USD 100,000. This centralized database allows researchers, conservationists, and developers to assess risks and develop better solutions. One major outcome has been the implementation of smart curtailment systems. These temporarily slow or stop turbines during times of high bat activity,

57 "NatureScot pre-application guidance for solar farms," *Scotland's Nature Agency,* February 2025. https://www.nature.scot/doc/naturescot-pre-application-guidance-solar-farms
58 Szabadi,et al "The use of solar farms by bats in mosaic landscapes: Implications for conservation."
59 "Acoustic Monitoring for Conservation and Ecological Research," *World Wildlife Fund,* https://www.wwf.org.uk/project/conservationtechnology/acoustic-monitoring
60 Szabadi,et al "The use of solar farms by bats in mosaic landscapes: Implications for conservation."
61 Tinsley, Froidevaux, Zsebők, Szabadi, and Jones, "Renewable energies and biodiversity."
62 "Wind-wildlife interactions are focus of newest Issues in Ecology report," *Ecological Society of America,* September 2019, https://esa.org/esablog/2019/09/23/wind-wildlife-interactions-are-focus-of-newest-issues-in-ecology-report/.
63 "Making Wind Energy Safer for Bats," *Renewable Energy Wildlife Institute,* https://rewi.org/news-events/success-stories/success-story-bats/
64 Vinson, Tom. "Wind Wildlife Research Fund announces 2021 research projects: Addressing risk, minimization strategies for wind energy and wildlife," *The Power Line,* April 2021, https://cleanpower.org/blog/wind-wildlife-research-fund-announces-2021-research-projects-addressing-risk-minimization-strategies-for-wind-energy-and-wildlife/.

particularly at low wind speeds when bats are more likely to be active. These targeted shutdowns have been shown to be more effective and less expensive than earlier, non-specific curtailment methods.

Building on efforts to reduce harm to bats at wind energy sites, one of the most promising tools of smart curtailment is a method known as Acoustically Triggered Curtailment (ATC). ATC uses real-time acoustic monitoring to detect bats as they approach turbines. It then immediately pauses blade rotation when needed.[65] This system relies on ultrasonic microphones that listen for echolocation calls from bats flying near rotor heights. Ultrasonic microphones are specialized microphones designed to listen to sound frequencies beyond the range of human hearing.[66] When the number of calls crosses a threshold, the system sends a signal to the turbine's control mechanism, triggering a temporary stop to reduce collisions.[67]

This real-time responsiveness offers major advantages. One of the most significant is its efficiency. ATC can reduce turbine downtime by up to tenfold compared to standard curtailment strategies. This helps operators avoid substantial losses in energy production. The US Fish and Wildlife Service (USFWS) recognizes ATC as a preferred option in its 2024 guidance for protecting the tricolored bat.[68] Facilities that implement ATC not only reduce mortality but also demonstrate compliance with best practice recommendation. This helps them stay ahead of regulatory requirements to remain active. Operators can also adjust the system's sensitivity. They can change how many calls trigger a shutdown or how long the blades pause. This adaptability makes ATC especially attractive for sites with varying bat activity levels. When used alongside other methods, like weather-based predictive models or seasonal curtailment plans, ATC strengthens a wind farms conservation strategy. Ultimately, like the improvement scene in solar farm design, smart curtailment technologies show that with the right tools and proper planning, renewable energy can advance without putting vulnerable bat populations at risk.

Current Status

Public Awareness and Education in Bat Conservation

Public awareness and education are vital to the success of bat conservation efforts. They are vital to overcome negative stereotypes and encourage communities to protect these animals. Across Europe, a wide range of outreach initiatives under the EUROBATS agreement have been developed to engage the public with science in everyday life. One of the most popular and effective public events is the annual International Bat Night. EUROBATS began International Bat Night EUROBATS in 1997.[69] The event seeks to raise awareness of bats' vital ecological roles and dispel myths fueling fear and misunderstanding of bat species.[70] The core of Bat Night is immersive experiences designed to engage people of all

65 Demic, Heather. "Acoustically Triggered Curtailment as a Strategic Investment for Wind Farms," *Wildlife Acoustics,* March 2025, https://www.wildlifeacoustics.com/resources/blog/smart-curtailment-for-tricolored-bat-wind-guidance?token=rhTTY_v7p5T3l3nHEcvVRyedpNhZ3kyV

66 "THE HIDDEN WORLD OF ULTRASONIC SOUND: USING ULTRASONIC MICROPHONES IN SOUND DESIGN," *Sam Elia Audio,* https://www.sameliaaudio.com/blog/ultrasonic-microphones-sound-design-guide#

67 Demic, "Acoustically Triggered Curtailment as a Strategic Investment for Wind Farms."

68 Andrea Wortzel, Morgan Gerard & Viktoriia De Las Casas. "FWS Prepares for Tricolored Bat Listing With New Guidance," *Environmental Law and Policy Monitor,* April 2024, https://www.environmentallawandpolicy.com/2024/04/fws-prepares-for-tricolored-bat-listing-with-new-guidance/

69 "Promoting Bat conservation in Northwest Africa (Morocco, Algeria and Tunisia) through awareness and capacity building of relevant stakeholders," *EUROBATS,* 2018, https://www.eurobats.org/node/2728.

70 "International Bat Night," *EUROBATS,* 2025. https://www.eurobats.org/international_bat_night

ages. Local conservation groups organize bat walks using ultrasonic detectors. This allows participants to hear bats' echolocation in real time. There are also interactive exhibits that highlight bat life cycles, behaviors, and essential contributions to healthy ecosystems. Workshops, such as bat-box building and habitat creation, inspire communities to take direct action at home or in local green spaces to protect the habitats of their local bat species. Visual storytelling plays another role in bringing bat conservation to life. These forms of media help connect audiences with bats and learn by making scientific facts more relatable and memorable. Bat Night has grown steadily since its inception. Only 14 countries participated in the first event. By 2021 more than 46 countries had registered. Bat Night activities took place across Europe, Africa, the Middle East, and the Americas.[71]

Targeted regional projects have also played a vital role in spreading awareness. One example is BAT4MAN ("Bats for Mankind"). BAT4MAN was a cross border project carried out between 2020 and 2022 across Hungary, Slovakia, Romania, and Ukraine.[72] BAT4MAN aimed to raise awareness about the ecological value of bats. This was focused in rural and religious communities where bats are often misunderstood or unwelcome.[73] BAT4MAN was funded by the European Union and led by EConsult Association from Romania. Conservation partners included the Slovak Bat Conservation Society, BirdLife Hungary, and Ukraine's Institute of Ecological and Religious Studies.[74] These groups worked to shift perceptions and encourage conservation across cultural and political boundaries. Population surveys were conducted to track endangered bat species.

BAT4MAN combined scientific monitoring with wide-reaching public education.

Conservation teams installed numerous bat boxes to compensate for habitat loss. In a unique effort to blend cultural heritage with species protection, volunteers helped clean and maintain local churches. Churches are often important roosting sites for bats. This program was meant to make them safer for both wildlife and religious communities. The initiative directly reached more than 3,500 residents through community workshops and school visits. These included students, local families, church leaders, and NGO staff.[75]

Mobile exhibitions toured towns, and public information panels were installed in cities like Baia Mare. Over 40 children participated in bat camps offering outdoor learning experiences.[76] To expand its reach, BAT4MAN produced a 15-minute educational documentary. It distributed printed materials such as children's guides and conservation leaflets. One standout aspect of the project was the creation of signage for "Churches committed to bats." This highlighted the role of participating parishes and encouraged broader community involvement. This integrated approach linked habitat enhancement, educational outreach, and respect for cultural traditions. It enabled BAT4MAN to build long-term conservation capacity. This model of engagement shows how public understanding can build in regions where bats are traditionally viewed with fear. Building on large-scale celebrations like Bat Night, BAT4MAN shows how regional initiatives can create lasting change and foster coexistence between people and bats.[77]

71 "25 years of International Bat Night," *Bat Conservation Trust,* August 2021, https://www.bats.org.uk/news/2021/08/25-years-of-international-bat-night.
72 "The project that raises environmental awareness of bats in local communities by joint conservation in cross border regions of Hungary, Slovakia, Romania and Ukraine," *BAT4MAN*, https://bat4man.ecoedu.ro/.
73 "Project Aims," *BAT4MAN,* https://bat4man.ecoedu.ro/
74 "Who are behind the scenes?," *BAT4MAN*, https://bat4man.ecoedu.ro/
75 "Our achieved results," *BAT4MAN*, https://bat4man.ecoedu.ro/
76 "Local contribution for bat protection – installing bat boxes," *BAT4MAN,* September 2022. https://bat4man.ecoedu.ro/category/batnews/
77 "Stories of Cooperation: Programming Period 2014-2020," *Hungary-Slovakia-Romania-Ukraine ENI CBC Programme,* 2024, https://next.huskroua-cbc.eu/wp-content/uploads/2024/07/ENI_booklet_final_online.pdf

Furthermore, public events can help build volunteer networks to help conservation efforts. The National Bat Conference is organized by the Bat Conservation Trust (BCT) and it takes place every year at Durham University.[78] It is the largest gathering of its kind. The hybrid event welcomes bat ecologists, conservation practitioners, policymakers, volunteers, and educators from around the UK and the world. It provides space to present new innovative technologies. One example is real-time acoustic monitoring tools to track bat activity using artificial intelligence. Thermal imaging cameras can also be used in roost watches and population counts. Emerging techniques in eDNA (environmental DNA) analysis are also gaining fame for detecting bats in bodies of water or caves without disturbing them.[79] These tools make bat monitoring more accurate, efficient, and less invasive.

The conference also covers key updates in habitat restoration strategies. This includes practices for integrating bat-friendly planning into urban landscapes. One example is designing green infrastructure that supports foraging and roosting. There is also research into roosts and underpasses that protect bat flight paths near urban developments.[80] Underpasses are important for bats because they allow them to safely cross roads and other barriers that interrupt their natural flight paths. This helps reduce the risk of collisions with vehicles. It also minimizes exposure to light and noise, which can disturb their migratory patterns. Participants at the conference also explore evolving local community approaches. Among these are citizen science apps and immersive education programs aimed at schools and faith-based communities. The conference plays a vital role in strengthening the network of over 90 local bat groups supported by the Bat Conservation Trust (BCT). Many rely on research and knowledge presented here to continue their monitoring and advocacy work for local bat species.[81] All of these public events are essential to helping bat conservation efforts. Changing public perceptions makes it easier to enact popular policies to protect bats. Keeping citizens and organizations informed also helps local efforts achieve their missions.

Transboundary Migration of the Mexican Free-Tailed Bat in the United States and Mexico

The Mexican free-tailed bat (*Tadarida brasiliensis mexicana*) is an important migratory species that controls pests in agricultural areas across the United States and Mexico, helping to reduce the need for chemical pesticides and supporting crop production. Their conservation depends on international cooperation between the United States and Mexico. Every year these bats travel thousands of kilometers from central and southern Mexico to form large colonies in the US, especially in Texas and New Mexico.[82] This migration is one of the largest of any bat species in the world, with colonies such as Bracken Cave in Texas having tens of millions of bats.[83] The species' dependence on habitats in both countries means that threats to its survival in one region can have consequences across their entire migratory pathway.

Mexican free-tailed bats live in caves across both the US and Mexico, but these caves are under

78 "Event: National Bat Conference 2025," *EnvironmentJob,* 2025, https://www.environmentjob.co.uk/courses_events/105802-national-bat-conference-2025
79 "English Regional Bat Conferences," *Bat Conservation Trust,* 2025, https://www.bats.org.uk/our-work/conferences-symposia/english-regional-bat-conferences
80 "Landscape and urban design for bats and biodiversity," *Bat Conservation Trust,* 2012, https://cdn.bats.org.uk/uploads/pdf/Our%20Work/Landscape_and_urban_design_for_bats_and_biodiversityweb.pdf?v=1541085229
81 "Strategic Planning for Landscape-Scale Conservation Symposium 2018," *Bat Conservation Trust,* 2018, https://www.bats.org.uk/our-work/conferences-symposia/symposia/strategic-planning-for-landscape-scale-conservation-symposium-2018
82 "Pest-suppression services by Mexican free-tailed bats in the southwestern US," *Emigra,* 2015. https://emigra.arizona.edu/pest-control-services-by-bat.
83 "Visit Bracken Cave Preserve," *Bat Conservation International,* https://www.batcon.org/experience-bats/bat-happenings/visit-bracken-cave-preserve/

Mexican free-tailed bats (Credit: U.S. Fish and Wildlife Service Headquarters)

threat from human activities. As cities expand, land that used to be bat habitat is taken over, and tourism in caves can create noise and light that disturb bats and their ability to reproduce. Construction projects like roads, mining, and energy plants also break up their roosting areas, leaving fewer safe places for bats to live.[84] On top of this, pesticides kill the insects bats eat and can poison the bats themselves. Wind farms in Texas and northern Mexico pose another danger since they are built along the bats' migration routes. Because these bats have low birth rates and depend on adult survival to keep populations steady, even small increases in deaths can cause long-term population declines.[85]

Studies found that roost protection is especially critical, as the loss of even a small number of maternity roosts could lead to steep population declines. Maternity roosts are critical habitats where female bats gather to give birth and raise their young during the breeding season. In species like the Mexican free-tailed bat, maternity roosts house millions of baby bats, forming colonies in caves, bridges, or abandoned buildings.[86] Because baby bats cannot fly for several weeks after birth, the safety and stability of these roosts are essential to reproductive success and the survival of the next generation. Disturbance, degradation, or loss of maternity roosts can lead to mass mortality and population declines, especially for migratory species that rely on a limited number of suitable sites for their roosts. The study proposes a two state conservation strategy that reinforces the importance of protecting roosting sites, often located in ecologically and politically distinct areas.

Mexican free-tailed bats provide key ecosystem services as natural pest control agents. Their foraging patterns focus heavily on crop pests.[87] Their collective feeding habits contribute significantly to reducing pesticide needs across large agricultural regions as well. A 2014 study estimated that the annual economic value of pest control services provided by these bats to US cotton farming alone ranges between USD 12 and USD 173 per hectare, potentially amounting to hundreds of millions of dollars per year. These services offer a strong

84 Ren, Qiang & He, Chunyang & Huang, Qingxu & Zhang, Da & Shi, Peijun & Lu, Wenlu. "Impacts of global urban expansion on natural habitats undermine the 2050 vision for biodiversity," *Resources Conservation and Recycling*, 2023. https://www.researchgate.net/publication/366499037_Impacts_of_global_urban_expansion_on_natural_habitats_undermine_the_2050_vision_for_biodiversity

85 "Estimation of effects of pesticides on bats – residue analysis, 2009," *Agreement on the Conservation of Populations of European Bats*, 2009, https://www.eurobats.org/summaries_of_conducted_projects/estimation_effects_pesticides_bats_%E2%80%93_residue_analysis_2009

86 Wiederholt, Ruscena & Ulibarri-Svancara, Colleen & López-Hoffman, Laura & Thogmartin, Wayne & Mccracken, Gary & Diffendorfer, Jay & Bagstad, Kenneth & Cryan, Paul & Russell, Amy & Semmens, Darius & Medellín, Rodrigo. "Optimizing conservation strategies for Mexican free- tailed bats: a population viability and ecosystem services approach," *Biodiversity and Conservation*, 2014 https://www.researchgate.net/publication/265467342_Optimizing_conservation_strategies_for_Mexican_free-_tailed_bats_a_population_viability_and_ecosystem_services_approach.

87 Bijay Subedi, Anju Poudel, Samikshya Aryal. "The impact of climate change on insect pest biology and ecology: Implications for pest management strategies, crop production, and food security," *Journal of Agriculture and Food Research*, Volume 14, 2023, https://doi.org/10.1016/j.jafr.2023.100733.

economic argument for investing in transboundary conservation strategies and for increasing public awareness of the species' value across both countries. Public support for such efforts is incredibly important. US households expressed willingness to contribute USD 30 annually for habitat protection and USD 24 for habitat conservation in Mexico, while Mexican households expressed WTP of USD 8 and USD 5 respectively.[88] These values reflect differing economic contexts but also a shared recognition of the species' benefits and the international nature of its population. The results point toward high public support for international mechanisms for funding programs or conservation agreements that prioritize the protection of migratory bat populations.

Despite this strong case for action, current conservation frameworks remain limited. While bilateral environmental agreements such as the North American Agreement on Environmental Cooperation (NAAEC) provide a foundation for cooperation, they lack specific enforcement or sustained funding. More targeted and enforceable international strategies are needed that align habitat protection, roost preservation, pesticide regulation, and renewable energy siting with the full migratory range of the species. Conservation planning would also benefit from the use of tools to identify key roosting and foraging areas across the landscape and to anticipate future risks such as climate-driven shifts in migration routes.[89]

Sustainable Development Goals (SDGs)

The Sustainable Development Goals (SDGs) are a set of 17 global objectives adopted by all 193 United Nations member states in 2015 as part of the 2030 Agenda for Sustainable Development.[90] This framework was established in response to growing international recognition that global challenges, such as poverty, inequality, environmental degradation, and climate change, are connected and require global solutions.[91] The formation of the SDGs was the result of an extensive process involving national governments, civil society organizations, youth representatives, the private sector, and its founding member, the United Nations. As a result, the SDGs are designed to be universal, applying to all countries regardless of income level. They address the three pillars of sustainable development: economic growth, social inclusion, and environmental protection. Each goal is accompanied by a series of targets and indicators to track global progress.[92]

Among the 17 Sustainable Development Goals, SDG 15 "Life on Land" plays a critical role in addressing the loss of biodiversity and of ecosystems on a global scale. This goal aims to protect, restore, and promote the sustainable use of ecosystems.[93] A major focus of this goal is to prevent the extinction of threatened species, recognizing the importance of maintaining biodiversity for the overall health of the planet. Among its specific targets, 15.1 aims to conserve terrestrial and inland freshwater ecosystems, ensuring that these vital habitats continue to support diverse plant and animal life. It also promotes sustainable forest management, as target 15.2 encourages practices that balance the needs of people with the preservation of forest ecosystems for future generations. Additionally, target 15.9 calls for the integration

88 Haefele, M. A., Loomis, J. B., Merideth, R., Lien, A., Semmens, D. J., Dubovsky, J., Wiederholt, R., Thogmartin, W. E., Huang, T. K., McCracken, G., Medellin, R. A., Diffendorfer, J. E., & López-Hoffman, L. "Willingness to Pay for Conservation of Transborder Migratory Species: A Case Study of the Mexican Free-Tailed Bat in the United States and Mexico," *Environmental management*, 62(2), 229–240, 2023. https://doi.org/10.1007/s00267-018-1046-1

89 Wiederholt, R., L. López-Hoffman, J. Cline, R. A. Medellín, P. Cryan, A. Russell, G. McCracken, J. Diffendorfer, and D. Semmens. "Moving across the border: modeling migratory bat populations," *Ecosphere* 4(9):114, 2013, http://dx.doi.org/10.1890/ES13-00023.1

90 United Nations. "THE 17 GOALS," *Department of Economic and Social Affairs Sustainable Development*, https://sdgs.un.org/goals

91 "Millennium Development Goals (MDGs)," *World Health Organization,* https://www.who.int/news-room/fact-sheets/detail/millennium-development-goals-(mdgs)

92 United Nations. "The Sustainable Development Agenda," *Sustainable Development Goals,* https://www.un.org/sustainabledevelopment/development-agenda/.

93 The Global Goals. "Goal 15: Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss," *Sustainable Development Goals,* https://globalgoals.org/goals/15-life-on-land/

of ecosystem and biodiversity values into national and local development plans, emphasizing that economic and social progress must take into account the health and benefits of natural systems.[94]

Bats are central to the aims of SDG 15. With over 1,400 known species, bats provide a range of ecosystem services that are essential for the functioning and sustainability of habitats.[95] The conservation of bat populations directly supports the implementation of several SDG 15 targets. For example, efforts to protect bat roosting sites and migratory routes contribute to Target 15.5, which calls for urgent and significant action to reduce habitat degradation and prevent species extinction. Additionally, Target 15.1's emphasis on maintaining ecosystem services is advanced by recognising the contributions of bats to pest control and pollination.[96] However, bats often receive insufficient attention in biodiversity policy and land-use planning, in part due to their nocturnal behaviour, cryptic ecology, and persistent negative cultural perceptions. This neglect can undermine broader conservation objectives, especially given the cross-border movements of many migratory bat species, which require coordinated, transnational approaches to habitat protection and threat mitigation.

Bloc Analysis

Points of Division

Countries differ significantly in their approaches to protecting endangered species, mainly due to varying levels of conservation effectiveness and commitment. These efforts are shaped by their economic priorities, legal systems, and their role in international cooperation, all of which influence how states protect their national wildlife. A way to compare these differences is by researching how effectively countries distribute protected areas and enforce anti-poaching laws, as these policies directly affect the survival of endangered species and ecosystems.

A state's capacity to implement conservation policies depends on its access to financial resources, governance structure, and access to technology. Countries with more funding can invest in conservation programs, such as advanced monitoring tools, and greater enforcement mechanisms. They also could have stronger legal frameworks and education systems that promote awareness for wildlife protection. However, countries with limited resources may struggle to enforce conservation laws and combat illegal wildlife trade, sometimes relying on such markets for economic survival.

These differences can be grouped into blocs. The first includes countries with high biodiversity and a strong commitment to conservation, where protecting endangered species is a national priority. The second bloc consists mostly of countries that possess the resources and capacity for conservation but may lack a sense of urgency due to lower biodiversity levels or weaker emphasis on wildlife protection. The third bloc includes countries that have made little or no effort to protect endangered species, due to dependence on illegal wildlife trade and a lack of legal commitment to conservation, with regard to their resource levels.

94 Eurostat. "SDG 15 - Life on land," *European Commission,* https://ec.europa.eu/eurostat/statistics-explained/index.php?title=SDG_15_-_Life_on_land.
95 L. Ancillotto, L. Bosso, V.B. Salinas-Ramos, D. Russo. "The importance of ponds for the conservation of bats in urban landscapes," *Landscape and Urban Planning*, Volume 190, 2019, https://doi.org/10.1016/j.landurbplan.2019.103607.
96 Martay, B., Macphie, K.H., Bowgen, K.M., Pearce-Higgins, J.W., Robinson, R.A., Scott, S.E. & Williams, J.M. "Climate change and migratory species: a review of impacts, conservation actions, indicators and ecosystem services. Part 1 – Impacts of climate change on migratory species," *JNCC*, 2023, https://data.jncc.gov.uk/data/9989a5a2-1745-4532-a9f4-92c0c50ca304/climate-change-migratory-species-review-part-1.pdf

Countries with Strong Environmental Frameworks and Cross-border Cooperation

Strong environmental frameworks and cross-border cooperation mean that a country not only has good environmental laws and policies domestically, but also works closely with neighboring countries to protect nature that crosses borders. A strong environmental framework includes clear laws that protect species in designated protected areas, monitors, and enforce rules that conserve its national biodiversity. Cross-border cooperation helps countries manage ecosystems that cross borders. Such as, rivers, forests, or the migration routes of animals, by coordinating and sharing information with neighboring states. Countries in this bloc include France, Norway, Canada, Costa Rica, among others.[97]

France offers a leading example within the European Union. Its *Code de l'environnement*, first created in 2000, serves as the foundation for national policy on biodiversity and instigating pollution.[98] France implements EU environmental directives such as the Habitats Directive and Birds Directive, which support the creation of a network of protected areas across the European Union.[99] In Norway, while the country is not a member of the European Union, it follows many EU environmental rules through its participation in the European Economic Area.[100] This allows Norway to align its policies with EU directives while maintaining national control over its environmental laws.[101] In Canada, key environmental laws such as the Canadian Environmental Protection Act, passed in 1999, regulates the release of toxic substances into the air, water, and soil.[102] It incentivizes the government to assess and manage risks from chemicals and to implement pollution prevention measures across regions. The Species at Risk Act, enacted in 2002, is designed to prevent wildlife species from becoming extinct by protecting both the animals and the habitats they depend on.[103] In Central America, Costa Rica is celebrated for embedding environmental protection into its national constitution. In 1994, Article 50 was amended to guarantee every citizen the right to a healthy and ecologically balanced environment.[104]

Countries Advancing Renewable Energy with Emerging Conservation Measures

This bloc includes countries that are expanding their clean energy capacity while working to integrate conservation. Advancing in renewable energy involves long-term investment in energy infrastructure and favorable policy frameworks that reduce greenhouse gas emissions. These efforts are critical to mitigating climate change, which itself poses a major threat to biodiversity. However, renewable energy development can also unintentionally harm wildlife and ecosystems if not managed carefully.

Spain is a leader in solar and wind energy in Europe, with over 60 percent of its electricity generation coming from renewables

97 IUCN. "A framework for monitoring biodiversity in protected areas and other effective area-based conservation measures," *WCPA Technical Report Series No. 7,* 2024, https://portals.iucn.org/library/sites/library/files/documents/PATRS-007-En.pdf
98 "ASSOCIATION FRANCE NATURE ENVIRONNEMENT (TEMPORARY IMPACTS ON SURFACE WATER)," *European Union Law,* JUDGMENT OF 5. 5. 2022 – CASE C-525/20, 2022, https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:62020CJ0525.
99 European Commission. "The Habitats Directive," *Environment Directorate General,* 2012, https://www.broads-authority.gov.uk/__data/assets/pdf_file/0028/109891/9.-Habitats-Directive-brochure.pdf
100 Lang, Arabella. "Norway's relationship with the EU," *House of Commons Library*, January 2023, https://researchbriefings.files.parliament.uk/documents/SN06522/SN06522.pdf
101 Royal Norwegian Ministry of the Environment. "National initiatives, activities and action plans contributing to the implementation of the Strategic Plan for Biodiversity 2011-2020," *Convention on biological diversity,* 2012, https://www.cbd.int/doc/world/no/no-nbsap-powpa-en.pdf.
102 "Understanding CEPA: Canada's Cornerstone of Sustainable Development," *Acquis,* July 2023, https://www.acquiscompliance.com/blog/understanding-cepa/.
103 Government of Canada. "About the Species at Risk Act," *Environmental and wildlife enforcement,* https://www.canada.ca/en/environment-climate-change/services/environmental-enforcement/acts-regulations/about-species-at-risk-act.html
104 "Amendment to article 50 of the Political Constitution of Costa Rica," *Zone Environmental Services,* May 2022, https://zone-es.com/en/reforma-al-articulo-50-de-la-constitucion-politica-de-costa-rica/

as of 2023.[105] To reduce the environmental impact of fast-growing solar and wind projects, Spain has created tools to protect endangered animals and nature. Large renewable energy projects must go through a special review process to check how they might affect wildlife, especially bird and bat migration paths.[106] Spain is also looking at solutions like stop-on-demand systems and rules for placing turbines to help protect vultures, eagles, and other important species.

India has been growing its renewable energy sector and aims to have a large amount of clean energy by 2030.[107] India's Wildlife Institute and the Ministry of New and Renewable Energy are testing ways to assess the impact on wildlife.[108] They are also encouraging the use of damaged or less useful land for renewable energy projects. New conservation steps include rules to avoid protected areas, careful monitoring of sensitive natural spots, and working with conservation groups to map out important habitats before any development.

South Africa has significantly increased its use of wind and solar power through the program Renewable Energy Independent Power Producer Procurement Programme (REIPPPP), which brought in over USD 20 billion by 2022.[109] To deal with the environmental impacts of these projects, South Africa requires Environmental Impact Assessments for all large energy projects and takes wildlife into account when deciding whether to approve them.[110] More recently, the government has worked with groups like BirdLife South Africa to create guidelines for placing wind turbines in ways that are safer for birds. They also monitor bird deaths near wind farms, especially for endangered birds like the Verreaux's eagle and the blue crane.

Lastly, Brazil is increasing its investment in solar and wind energy to cut carbon emissions and rely less on hydropower, which can be affected by drought.[111] Yet, wind farms in the northeast and solar projects in the Cerrado region have raised concerns about destroying natural habitats and harming migratory birds. Brazil's national environmental system, Sistema Nacional do Meio Ambiente (SISNAMA), requires studies and public input before projects move forward.[112] Conservation groups have called for stronger protections, and some states are now working to include wildlife corridors in their energy plans. Some early efforts also use ecological zoning to keep wind farms away from important natural areas.

Countries with High Biodiversity and Limited Conservation Capacity

Some of the world's most biodiverse countries, such as Indonesia, the Democratic Republic of Congo, Madagascar, and parts of Central America, face challenges in protecting wildlife and ecosystems.[113] These regions are home to thousands of unique species, many of which are found only in these regions. However, limited resources and a lack of funds as well as competing

105 J. Julián Cubero, Pilar Más, Rafael Ortiz, Pep Ruíz. "Reaping the benefits of renewable energy in the Spanish economy," *BBVA Research*, February 2025, https://www.bbvaresearch.com/wp-content/uploads/2025/02/EW_Reaping_the_benefits_edi2docx-2.pdf
106 "Biodiversity and solar power in Spain—Why smart planning makes all the difference," *GRESB,* June 2025, https://www.gresb.com/nl-en/biodiversity-and-solar-power-in-spain-why-smart-planning-makes-all-the-difference/
107 "Roadmap to India's 2030 Decarbonization Target," *The Energy Transitions Commission,* August 2022, https://www.energy-transitions.org/publications/roadmap-to-indias-2030-decarbonization-target/.
108 Government of India. "ECO FRIENDLY MEASURES TO MITIGATE IMPACTS OF LINEAR INFRASTRUCTURE ON WILDLIFE," *Ministry of Environment, Forest and Climate Change,* 2016, https://moef.gov.in/uploads/2018/03/Inviting%20commnets%20%26%20suggestions.pdf
109 "South Africa's Renewable Energy Independent Power Producer Procurement Programme," *Nationally Determined Contributions Partnerships,* https://ndcpartnership.org/knowledge-portal/good-practice-database/south-africas-renewable-energy-independent-power-producer-procurement-programme.
110 Docrat, Nadeemah. "The negative impact of wind turbines on wildlife in South Africa," *School of Architecture and Planning, University of the Witwatersrand,* 2023, https://tethys.pnnl.gov/sites/default/files/publications/Docrat_2023.pdf.
111 "Wind and solar benchmarks for a 1.5°C world," *Next Climate Institute,* 2022 https://newclimate.org/sites/default/files/2024-09/windsolarbenchmarks_brazil_0.pdf
112 Government of Brazil. "O Sistema Nacional do Meio Ambiente (SISNAMA)," *Guardiãs da Sociobiodiversidade,* https://www.gov.br/mma/pt-br/composicao/secex/dsisnama/conheca_o_sisnama
113 Butler, Ayers Rhett. "The top 10 most biodiverse countries," *Mongaby,* May 2016, https://news.mongabay.com/2016/05/top-10-biodiverse-countries/

development pressures make it difficult to manage the risks posed by rapid renewable energy expansion.[114] Conservation efforts often lack funding, trained staff, and enforcement power. Many environmental agencies operate with minimal budgets and are understaffed, making it difficult to carry out fieldwork or monitor existing environmental regulations. As a result, even when environmental protections are written into law, they are often not implemented in practice. [115]

To improve outcomes in countries with high biodiversity and limited conservation capacity, stronger international support and meaningful partnerships with local NGOs and civil society are essential. International organizations, such as the United Nations Development Programme, the International Union for Conservation of Nature, and regional development banks, can play a crucial role in funding and resource sharing.[116] These institutions can help build stronger environmental governance systems by supporting environmental education and training and helping governments design and enforce better regulatory frameworks for renewable energy development.

Collaboration with the private sector is also key. By working closely with conservationists, companies can adopt practices, such as adaptive biodiversity mitigation strategies, to invest in habitat restoration projects. Voluntary industry standards, such as those developed by the International Finance Corporation and the Equator Principles, offer frameworks for aligning renewable energy investment with environmental and social responsibility.[117] When enforced, such standards can ensure that clean energy growth does not come at the expense of critical ecosystems.

Committee Mission

The Convention on the Conservation of Migratory Species of Wild Animals, serves as a key international framework for the protection of migratory wildlife. The convention classifies species into two categories. Appendix I lists those migratory species currently threatened with extinction, requiring the strictest level of protection, including efforts to conserve their habitats and manage or eliminate threats to their survival.[118] Appendix II includes species that are not necessarily endangered but would greatly benefit from enhanced international cooperation.[119] For these species, the CMS encourages the development of global or regional agreements among range states, focusing on collaborative measures such as shared research and coordinated protection systems.

Since 1999, the CMS has included several migratory bat species under Appendix II. These species rely on roosting, foraging, and stopover habitats across Europe, North Africa, and parts of the Middle East.[120] Despite being listed, however, conservation

114 Collins N. Nwagu, Chika Oliver Ujah, Daramy V.V. Kallon, Victor S. Aigbodion. "Integrating solar and wind energy into the electricity grid for improved power accessibility," *Unconventional Resources*, Volume 5, 2025, https://doi.org/10.1016/j.uncres.2024.100129.
115 Gutierrez-Inostroza, Ricardo. "What are Wildlife Corridors?," *Legacy Habitat Banks,* https://legacyhb.co.uk/insights/what-are-wildlife-corridors.
116 Neunuebel, C., Atre, G., Laxton, V. "Why national development banks are key to environmental solutions," *Green Central Banking,* June 2025, https://greencentralbanking.com/2025/06/03/national-development-banks-an-untapped-source-of-climate-finance/
117 "The Equator Principles," *Equator Principles,* accessed August 17, 2025, https://equator-principles.com/
118 "About CMS," *Convention on the Conservation of Migratory Species of Wild Animals*, 2024, https://www. cms.int/en/legalinstrument/cms.
119 "Appendix CMS," Convention on the Conservation of Migratory Species of Wild Animals.
120 "Offshore Energy SEA 4: Appendix 1 Environmental Baseline," *GOV UK*, 2014, https://assets.publishing.service.gov.uk/media/62308e42d3bf7f5a8a6955b8/Appendix_1a.7_-_Bats.pdf

agreements under the CMS specific to bats are limited and there are no dedicated legal instruments for their protection.[121] Thus, critical threats such as habitat loss, pesticide exposure, and mortality from wind turbines continue to affect bat populations across migratory ranges.

This gap between recognition and action highlights the urgent need to move toward implementation. Strengthening the conservation of migratory bats will require mixed efforts including the identification and protection of key habitats. Partnerships with academic institutions, NGOs, and the private sector, particularly in the energy and agriculture sectors, are essential to ensure that conservation measures are effectively enforced. Without strong environmental planning, the expansion of clean energy infrastructure can disrupt migratory corridors, resulting in habitat loss in already vulnerable bat populations. To fulfill its mandate, the CMS must take action to develop a regional agreement dedicated to the conservation of migratory bat species before these vital animals are at even a greater risk.

121 Convention on the Conservation of Migratory Species of Wild Animals. "REPORT ON A FEASIBILITY STUDY ON ADDITIONAL BATS AGREEMENTS UNDER CMS," *Twelfth Meeting of the CMS Scientific Council*, 2004, https://dev-d9.cms.int/sites/default/files/document/Doc_13_Bats_Study_combined_E_0.pdf

Research and Preparation Questions

The following research and preparation questions are meant to help you begin your research on your country's policy. These questions should be carefully considered, as they embody some of the main critical thought and learning objectives surrounding your topic.

Topic A

1. How does your delegation plan on protecting the wildlife of seals, limiting the trade-offs that will come with it?
2. How can your delegation contribute to the improvement of the climate that in turn will help seals thrive in its environment?
3. What steps can your country take to mitigate the amount of ocean pollution and chemicals that have accumulated as a result of plastic mass-production?
4. What are past resolutions your delegation has signed that further establishes your delegation's stance on migratory seals? How does your delegation plan on incorporating past resolutions and actions in order to develop new strategies?
5. Where can intersections be found among different countries and within their boundaries to enhance transnational cooperation, coordination, and foreign aid?

Topic B

1. Why are migratory bats key for ecosystems and human communities in your country? How does your delegation currently benefit from migratory bat species?
2. What challenges does your delegation face in protecting migratory wildlife across its borders?
3. How does your delegation work with regional organizations and NGOs to improve conservation efforts? How can these be reinforced?
4. What are the main barriers your delegation faces to reaching development goals, such as sustainable agriculture or renewable energy, and biodiversity protection?
5. How can your delegation strengthen its national policies to align with international agreements on migratory species?
6. What role can your delegation play in supporting education, research, and public awareness on migratory bats and similar species?

Important Documents

Topic A

Common Wadden Sea Secretariat, Wadden Sea Seal Management Plan 2023-2027, (Wilhelmshaven: Common Wadden Sea Secretariat, November 2022), 1-23, https://www.cms.int/sites/default/files/instrument/Wadden%20Sea%20Seal%20Management%20Plan%202023-2027.pdf

Convention on the Conservation of Migratory Species of Wild Animals, opened for signature June 23, 1979, U.N.T.S 1651 (entered into force Nov. 1, 1983), https://www.cms.int/sites/default/files/instrument/CMS-text.en_.PDF

Convention on the Conservation of Migratory Species of Wild Animals, Appendices I and II, June 23, 1979, U.N.T.S 1651 (entered into force Nov. 1, 1983) [hereinafter Convention on Migratory Species],https://www.cms.int/sites/default/files/uploads/revised-appendices_cop14_e.pdf

Irene T Roca; Lars Kaleschke and Ilse Van Opzeeland, "Sea-ice anomalies affect the acoustic presence of Antarctic pinnipeds in breeding areas," Frontiers in Ecology and the Environment 21, no. 5 (April 9, 2023): 227-233, https://doi.org/10.1002/fee.2622

United Nations Convention on the Law of the Sea, opened for signature December 10, 1982, U.N.T.S. 1833 (entered into force Nov. 16, 1994), https://www.un.org/depts/los/convention_agreements/texts/unclos/unclos_e.pdf

United Nations' Department of Economic and Social Affairs, The Sustainable Development Goals Report 2025 (New York: UN DESA, July 14, 2025), 1-48, https://unstats.un.org/sdgs/report/2025/The-Sustainable-Development-Goals-Report-2025.pdf

Topic B

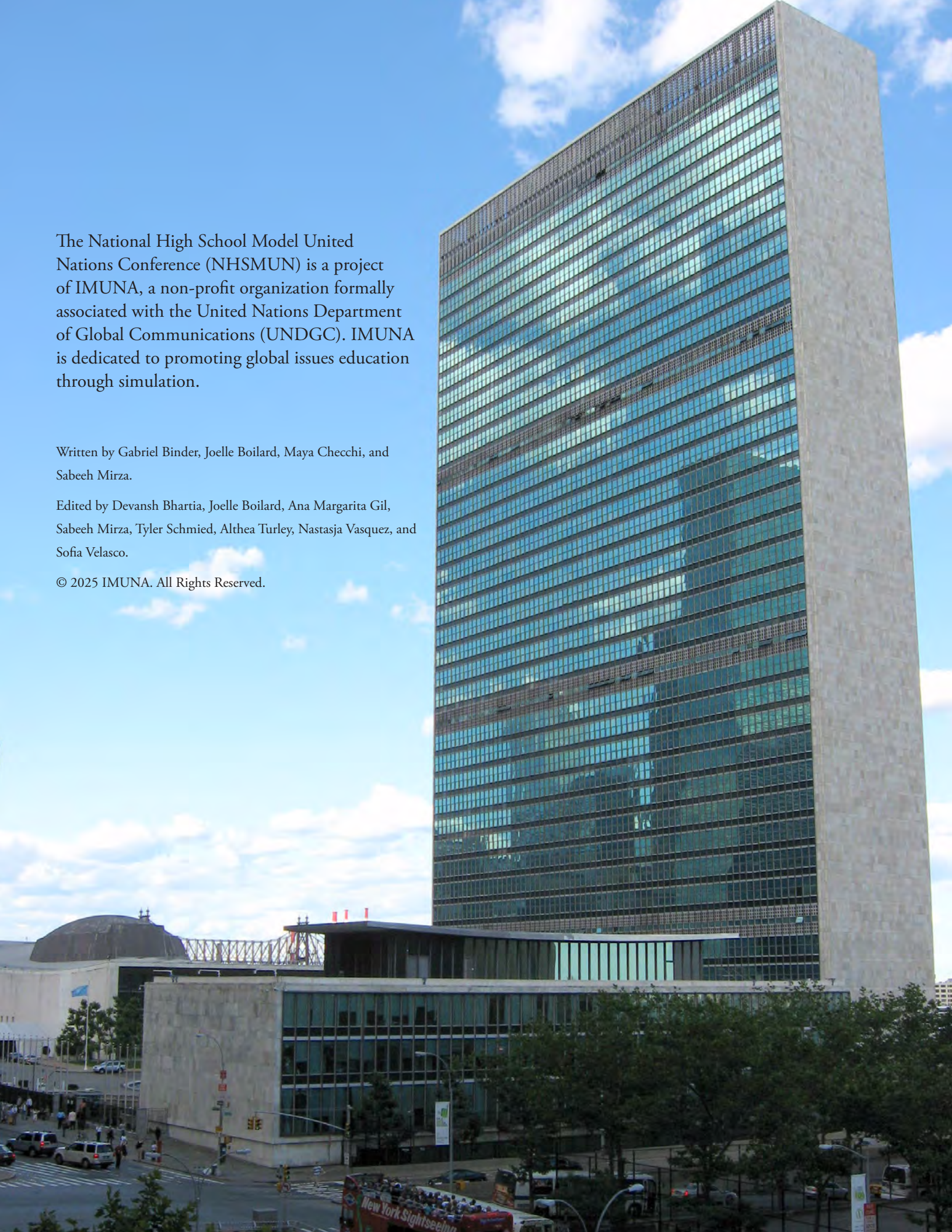
Frick, F.W., Kingston, T., Flanders, J., "A review of the major threats and challenges to global bat conservation," Annual N.Y. Academy of Science, 2019, ISSN 0077-8923, https://www.batcon.org/wp-content/uploads/Fricketal2019NYAS.pdf

Jung, K. & Threlfall, C., "Urbanisation and Its Effects on Bats—A Global Meta-Analysis," Springer Open, December 2015, https://www.researchgate.net/publication/293649142_Urbanisation_and_Its_Effects_on_Bats-A_Global_Meta-Analysis

Kasso, M., Balakrishnan, M., "Ecological and Economic Importance of Bats (Order Chiroptera)," International Scholarly Research Notices, November 10, 2013, https://doi.org/10.1155/2013/187415

Lewanzik, D., Straka, T. M., Lorenz, J., Marggraf, L., Voigt-Heucke, S., Schumann, A., Brandt, M., & Voigt, C. C., "Evaluating the potential of urban areas for bat conservation with citizen science data," Environmental pollution, March 15, 2022, https://pubmed.ncbi.nlm.nih.gov/34979170/.

Voigt, C. C., Kaiser, K., Look, S., Scharnweber, K. and Scholz, C. "Wind turbines without curtailment produce large numbers of bat fatalities throughout their lifetime: A call against ignorance and neglect," Global Ecology and Conservation 37, September 2022, https://doi.org/10.1016/j.gecco.2022.e02149



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Written by Gabriel Binder, Joelle Boilard, Maya Checchi, and Sabeeh Mirza.

Edited by Devansh Bhartia, Joelle Boilard, Ana Margarita Gil, Sabeeh Mirza, Tyler Schmied, Althea Turley, Nastasja Vasquez, and Sofia Velasco.