NAC
Environment and Trade Working Together

U.S. National Advisory Committee
Independent Federal Advisors on the
North American Agreement on Environmental Cooperation

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January 23, 2025

James Payne
Acting Administrator
U.S. Environmental Protection Agency
1200 Pennsylvania Avenue, N.W.
Washington, D.C. 20460

Dear Acting Administrator Payne:

The U.S. National Advisory Committee (NAC) to the U.S. Representative to the North American Commission for Environmental Cooperation held its 61st meeting on December 5, 2024, in Tucson, Arizona at the Tohono O'odham Nation. This letter represents our advice resulting from that meeting. The main objective of our meeting was to provide advice to the EPA Administrator on the upcoming CEC's 2026-2030 Strategic Plan.

Our meeting included presentations on: 1) *U.S. Priorities and Guidance* from Mark Kasman, EPA's Office for International and Tribal Affairs (OITA), 2) *CEC Update: Strategic Plan Overview*, from Jorge Daniel Taillant, Executive Director of the Commission for Environmental Cooperation in Montreal, Canada, 3) *JPAC Report-out* from Esteban Escamilla, Chair of the Joint Public Advisory Committee (JPAC), and 4) *Update on Arizona Project (CEC EJ4Clilmate Grant)*, from Jordan Sene, Education Program Manager at the Borderlands Restoration Network.

The meeting was opened with opening remarks from Federal Advisory Committee Management and Oversight Division (FACMOD) Director Robbie Young-Mackall, who provided an overview of FACMOD activities and responsibilities. The NAC appreciates the dedicated support provided by the FACMOD and thanks Director Young-Mackall, Oscar Carrillo our Designated Federal Officer, and all the FACMOD staff for their support in ensuring our meeting was a success. We hope our advice is useful to you in your work with the CEC, and wish you continued success in your future endeavors.

Sincerely,

Vincent R. Nathan
Chair, National Advisory Committee

cc:
Rafael DeLeon, Acting Assistant Administrator, OITA, EPA
Victoria Tran, Deputy Assistant Administrator, OITA, EPA
Robbie Young-Mackall, Director, Federal Advisory Committee Management & Oversight Division, EPA
Lisa Berrios, Acting Director, American Indian Environmental Office, EPA
Mark Kasman, Director, Office of Regional & Bilateral Affairs, OITA, EPA
Monisha Harris, Deputy Director, Office of Regional & Bilateral Affairs, OITA, EPA
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Oscar Carrillo, Designated Federal Officer, EPA
Esteban Escamilla, Chair, Joint Public Advisory Committee
Jorge Daniel Taillant, Executive Director, CEC
Members of the U.S. National and Governmental Advisory Committees

National Advisory Committee

(NAC) to the U.S. Representative to the

Commission for Environmental Cooperation (CEC)

Advice 2025-1 (January 23, 2025)

The United States seeks advice from the NAC/GAC on the following two broad categories:

1. The CEC's 2021-2025 Strategic Plan is currently structured around six key pillars: clean air, land, and water; preventing and reducing pollution in the marine environment; circular economy and sustainable materials management; shared ecosystems and species; resilient economies and communities; and effective enforcement of environmental laws. The success of the pillars depends on innovative and effective solutions, the positive impact on sustainable economic growth, and engaging stakeholders (named cross-cutting approaches).

As CEC looks to strengthen its impact and adapt to emerging environmental challenges, we are seeking your advice on the following:

a. Should any pillars be updated or expanded to address evolving/emerging environmental issues in North America?

Yes, Environmental issues in North America are evolving due to a combination of climate change, growing population pressures, urbanization, technological development, and shifting policy landscapes. Some of the key emerging or evolving environmental issues in the region include:

1. **Climate Change and Extreme Weather Events**

- **Heatwaves**: Rising temperatures are intensifying heatwaves, particularly in the southern U.S., Mexico, and parts of Canada. This increases health risks, energy demand, and strain on water resources.
- **Wildfires**: Increased frequency and intensity of wildfires in the U.S. (especially in California and the Pacific Northwest) and Canada (e.g., in British Columbia and the Yukon) are linked to hotter, drier conditions.
- **Flooding and Storms**: Heavy rainfall, rising sea levels, and more intense hurricanes (e.g., in the Gulf Coast and Eastern U.S.) are contributing to more frequent and devastating floods, coastal erosion, and storm damage.

2. **Biodiversity Loss**

   Habitat Destruction: Expansion of urban areas, agriculture, and infrastructure development is encroaching on wildlife habitats, leading to declines in species diversity, particularly in sensitive ecosystems like the Arctic, prairies, and forests.

   Invasive Species: The spread of non-native species (e.g., zebra mussels, emerald ash borer, and cane toads) is threatening local ecosystems and agricultural systems.

3. **Water Scarcity and Water Management**

   - **Drought**: Extended drought periods are affecting regions like the southwestern U.S., Mexico, and parts of Canada. This has significant impacts on agriculture, water supply, and energy production.
   - **Water Pollution**: Contaminants like PFAS (forever chemicals), agricultural runoff, and industrial discharges continue to affect freshwater resources, threatening public health and biodiversity.
   - **Over-extraction**: Groundwater depletion in regions like the Ogallala Aquifer, which spans across several U.S. states, is reducing water availability for agriculture, drinking, and other uses.

4. **Renewable Energy Transition**

   - **Energy Grid Resilience**: While there is significant growth in renewable energy (solar, wind), transitioning away from fossil fuels creates challenges in grid stability and energy storage, especially during periods of high demand or extreme weather.
   - **Infrastructure Needs**: Scaling up the infrastructure for electric vehicles (EVs) and renewable energy generation (e.g., offshore wind farms) requires large investments and coordination.
   - **Environmental Impact of Renewables**: Some renewable energy projects, such as largescale hydropower dams or wind farms, can have negative environmental impacts, such as habitat destruction or threats to bird populations.

5. **Carbon Emissions and Air Quality**

   - **Transportation**: The transportation sector remains a major source of carbon emissions in North America, with reliance on gasoline and diesel-powered vehicles contributing to air pollution and climate change.
   - **Industrial Emissions**: Heavy industries (oil, gas, manufacturing) continue to emit significant amounts of CO2 and other pollutants. This is particularly concerning in industrial regions like the U.S. Gulf Coast and the Alberta oil sands in Canada.
   - **Air Pollution**: While air quality has improved in some areas, there are still significant air pollution concerns, particularly in urban centers with high traffic congestion.

6. **Plastic Pollution:**

   Single-Use Plastics: Plastic waste, particularly from single-use items like bottles, bags, and packaging, continues to be a major environmental concern. The issue is exacerbated by insufficient recycling infrastructure and rising levels of plastic in oceans and rivers.

   Microplastics: Small plastic particles are increasingly found in the environment, in marine life, and even in drinking water. These tiny particles pose significant risks to ecosystems and human health.

7. **Environmental Justice and Inequality**

   - **Disproportionate Impact on Marginalized Communities**: Low-income communities and communities of color are often more vulnerable to environmental hazards like air pollution, flooding, and heatwaves. Addressing these disparities through more inclusive and equitable environmental policies is an emerging priority.
   - **Access to Clean Water and Air**: In many areas, especially in Indigenous and rural communities, access to clean drinking water, sanitation, and breathable air remains a challenge.

8. **Indigenous Rights and Land Management**

   - **Land Stewardship and Restoration**: Indigenous communities are increasingly involved in environmental stewardship, advocating for traditional knowledge to be integrated into land and water management practices. This includes resistance to extractive industries (mining, oil, gas) that threaten sacred lands and ecosystems.
   - **Resource Extraction Conflicts**: Tensions between governments, corporations, and Indigenous groups over land and resource rights (such as pipeline construction and oil extraction) continue to be a source of environmental and social conflict.

9. **Food Security and Agricultural Practices**

   - **Soil Degradation**: Intensive farming practices, deforestation, and overgrazing are degrading soil health, which reduces agricultural productivity and increases vulnerability to drought.
   - **Sustainable Agriculture**: There is growing pressure to transition toward more sustainable agricultural practices that reduce water use, reliance on chemical fertilizers and pesticides, and improve carbon sequestration.

10. **Waste Management and Circular Economy**

    - **Landfill Overflow**: Landfills are reaching capacity, particularly in urban areas, and there is increasing pressure to adopt waste reduction practices and recycling programs.
    - **Circular Economy Models**: Efforts are growing to reduce waste through a "circular economy" approach, where materials are reused, repaired, or recycled rather than

disposed of. This includes extending product life cycles and creating more sustainable consumption patterns.

11. Urbanization and Green Space Preservation

Urban Heat Islands: As cities expand, the loss of natural green spaces and the replacement with concrete, asphalt, and buildings contributes to higher urban temperatures, exacerbating heatwaves and increasing energy use for cooling.

Green Infrastructure: The design and implementation of green spaces, parks, green roofs, and urban forests are gaining momentum as solutions to urban environmental challenges, including air quality improvement, stormwater management, and heat reduction.

These issues are interconnected and require comprehensive, multi-sectoral approaches. Federal, State and City governments, businesses, communities and individuals being called to address them through policies, innovation, and behavioral change to build a more sustainable and resilient future.

b. Do you see a need for new/additional strategic pillars to address gaps in the current approach?

Yes, potential new or evolving strategic pillars to address gaps or emerging challenges that could enhance the CEC's efforts should include:

1. Climate Change Mitigation and Adaptation

- **Rationale**: While the current CEC strategy touches on resilience (e.g., "resilient economies and communities"), there could be a more explicit focus on **climate change mitigation and adaptation**. This could include expanding efforts in reducing greenhouse gas emissions across sectors (energy, agriculture, transportation) and expanded efforts at fostering cross-border cooperation on climate adaptation, particularly in vulnerable regions like the Arctic, coastal zones, and drought-prone areas.
- **Potential Actions**:
    - Expansion of collaborative projects on carbon pricing and emissions reduction policies. *(Carbon pricing is an instrument that captures the external costs of greenhouse gas (GHG) emissions—the costs of emissions that the public pays for, such as damage to crops, health care costs from heat waves and droughts, and loss of property from flooding and sea level rise—and ties them to their sources through a price, usually in the form of a price on the carbon dioxide (CO_2) emitted.)*
    - Sharing and implementing best practices for climate-resilient infrastructure, water management, and disaster preparedness.
    - Supporting clean energy transitions and low-carbon technologies.

2. Biodiversity and Ecosystem-Based Management

- **Rationale**: Although the current strategic plan addresses **shared ecosystems and species**, the loss of biodiversity and ecosystem degradation could warrant a more detailed and targeted approach. This would be especially important in the context of species extinction, habitat loss, and ecosystem services degradation.
- **Potential Actions**:
    - Continued strengthening the protection of critical habitats, especially in biodiversity hotspots like the temperate rainforests of the Pacific Northwest or the monarch butterfly migratory route.
    - Promoting new and existing ecosystem-based management approaches that integrate environmental, social, and economic factors for better conservation outcomes.
    - Coordinating transboundary national and international wildlife corridors and ecosystem restoration projects.

3. Environmental Justice and Equity

- **Rationale**: There is a growing recognition of the need for **environmental justice** — addressing the disproportionate environmental burdens on marginalized and vulnerable communities. While the existing plan touches on resilient communities, it could benefit from a more focused approach on **equity and justice**.
- **Potential Actions**:
    - Expanding and enhancing partnerships with Indigenous communities to better incorporate traditional ecological knowledge into environmental governance.
    - Addressing the impacts of pollution, waste, and climate change on communities of color and low-income groups in urban and rural areas to ensure reduction of the environmental burden on these communities.
    - Ensuring that environmental policy development is inclusive, transparent, and participatory, with an emphasis on community-focused and community-partnered solutions.

4. Pollution Prevention and Green Chemistry

- **Rationale**: Although the CEC addresses pollution and waste management, a more proactive**, prevention-focused approach** could be adopted. Emphasizing **green chemistry** (designing chemicals, materials, and processes to minimize harm) and **pollution prevention** rather than just remediation would drive innovation and reduce environmental risks before they occur.
- **Potential Actions**:
    - Promoting and expansion of green chemistry and eco-design principles for industries such as manufacturing, agriculture, and electronics.

- Supporting new innovation in non-toxic alternatives and waste-minimizing production processes.
- Expanding efforts to prevent chemical contamination in water, land, and food systems, with a focus on emerging pollutants like PFAS and microplastics.

5. Environmental Health and Ecosystem Services

- **Rationale**: There is increasing recognition of the link between **environmental health** and **human well-being**. The existing pillars focus on pollution and ecosystem conservation but could go further in addressing how environmental degradation affects public health.
- **Potential Actions**:
  - Expanding and developing new cross-border (state and international) monitoring and policy frameworks to assess the impacts of environmental pollutants on public health (air, water, and soil contaminants).
  - Strengthening and expanding efforts to protect ecosystem services such as clean air, water, pollination, and soil health that are crucial for public health.
  - Supporting new research and policy development on environmental factors influencing chronic diseases, such as asthma and cardiovascular issues.

6. Digital Transformation for Environmental Monitoring

- **Rationale**: The rapid pace of **digital innovation** in environmental monitoring, data collection, and artificial intelligence (AI) can enhance the CEC's capacity to address environmental challenges. The integration of **big data, remote sensing, and AI** could enable more effective and timely environmental decision-making, tracking, and enforcement.
- **Potential Actions**:
  - Developing new joint digital platforms for real-time environmental monitoring (air quality, water quality, biodiversity).
  - Promoting and expanding the use of satellite imagery and AI to track environmental changes such as deforestation, pollution, and climate impacts.
  - Enhancing cross-border country data-sharing on environmental conditions, climate data, and natural resource management.

7. Sustainable Supply Chains and Trade

- **Rationale**: Given the interconnectedness of North American economies, focusing on **sustainable trade and supply chains** could align economic activities with environmental sustainability. This would address concerns about resource depletion, unsustainable agriculture, and the environmental impacts of production and consumption patterns.

- **Potential Actions**:
    - Promoting circular economy principles in cross-border trade and supply chains.
    - Encouraging the adoption of environmental standards for imported and exported goods (e.g., carbon footprint labeling, sustainable sourcing).
    - Collaborating on policies that ensure trade and investment flows do not exacerbate environmental degradation.

8. Education, Awareness, and Capacity Building

- **Rationale**: There is an urgent need to increase public awareness and understanding of environmental issues across North America. This effort can foster a culture of sustainability and strengthen grassroots movements for environmental protection.
- **Potential Actions**:
    - Developing joint cross border and country-wide educational programs and campaigns on key environmental issues like climate change, biodiversity, and pollution.
    - Supporting capacity-building efforts in underserved regions (e.g., rural areas, Indigenous communities) to empower local leaders and organizations.
    - Promoting environmental literacy in schools and universities to prepare future generations for environmental challenges.

These potential new pillars would complement the existing CEC framework and address emerging environmental challenges in North America. Incorporating these strategies could also help the CEC stay responsive to fast-evolving environmental, social, and technological trends, ensuring more comprehensive and effective regional cooperation on environmental protection.

9. Plastics:

- Plastics are fueling the climate crisis. By 2040, up to 19% of global greenhouse gas emissions will stem from plastics. To meet the goal of 1.5° global temperature rise & to #BeatPlasticPollution, we need a plastics treaty that reduces plastic production. UN Secretary-General António Guterres, 15 November 2023. Every minute the equivalent of 1 garbage truck of plastic is dumped into the ocean. To Beat Plastic Pollution and mitigate its impacts, we must reduce the production of plastic. Change starts with each of us (UN Secretary-General António Guterres, 10 April 2023). The world will be "unable to cope" with the sheer volume of plastic waste a decade from now unless there is an agreement to curbs on production, the co-chair of a coalition of key countries has warned (Norway's minister for international development, Anne Beathe Tvinnereim). An agreement on a "phase out" of a list of single use plastic products, as well as bans on poisonous chemicals in plastic – including for food contact plastic and children's toys should be a goal of the CEC. There is a need for increased recycling and waste management to reduce production and consumption. If action is not taken the CEC will be unable to cope with the volume of plastic in the system 10 years from now.

c. Are there any emerging technologies or partnerships that should be integrated into the cross-cutting approaches to address emerging environmental challenges in North America

Yes, several **emerging technologies** and **partnerships** hold significant potential for addressing North America's evolving environmental challenges. Integrating these into cross-cutting approaches can drive innovation, scale solutions, and improve environmental outcomes. Below are key technologies and partnerships that could be integrated into strategies for tackling environmental issues in the region:

1. Artificial Intelligence (AI) and Big Data for Environmental Monitoring and Decision-Making

- **Technology**: AI and big data are transforming how we monitor, predict, and manage environmental risks. These technologies enable real-time tracking of environmental conditions (e.g., air and water quality, deforestation, wildlife movements), identify trends, and optimize resource management.
- **Applications**:
    - **Predictive Analytics**: AI algorithms can analyze vast datasets from sensors, satellites, and drones to predict environmental risks (e.g., wildfires, floods, droughts) and assist in disaster preparedness.
    - **Environmental Monitoring**: AI-powered systems can automatically detect pollution hotspots and irregularities in ecosystems, such as coral bleaching or illegal logging activities, enabling faster responses.
    - **Smart Cities**: AI can optimize energy use, reduce emissions, and improve waste management in urban areas, contributing to more sustainable cities.
- **Partnerships**:
    - Collaboration with tech companies (e.g., Google, IBM, Microsoft) to develop AIpowered tools for environmental monitoring and climate modeling.
    - Working with academic institutions and environmental organizations to develop open-source AI tools for public access and use by policymakers, NGOs, and local communities.

2. Blockchain for Transparency in Environmental Supply Chains

- **Technology**: Blockchain technology, known for its decentralized and tamper-resistant nature, can enhance **supply chain transparency** and accountability, particularly in industries that have significant environmental impacts, such as mining, agriculture, and fisheries.
- **Applications**:
    - **Sustainable Sourcing**: Blockchain can trace the origins of products to ensure they are sustainably sourced (e.g., conflict-free minerals, sustainable palm oil, deforestation-free products).

- **Carbon Credits and Offsets**: Blockchain can be used to track carbon credits and offset projects, ensuring that these mechanisms are transparent, verifiable, and free from fraud.
- **Circular Economy**: Blockchain can facilitate the efficient and transparent management of recycled materials, ensuring that the circular economy principles (reuse, remanufacture, recycle) are followed.

- **Partnerships**:
  - Partnerships with supply chain organizations (e.g., **Fair Trade**, **Rainforest Alliance**) to incorporate blockchain in ensuring sustainable and traceable product flows.
  - Collaboration with environmental NGOs and technology firms (e.g., **Everledger**, **Provenance**) to develop and scale blockchain-based systems for sustainable business practices.

3. Carbon Capture, Utilization, and Storage (CCUS)

- **Technology**: CCUS technologies capture CO2 emissions from industrial processes and power plants, preventing them from entering the atmosphere. Captured CO2 can then be stored underground or converted into useful products like synthetic fuels, building materials, or even agricultural fertilizers.
- **Applications**:
  - **Industrial Decarbonization**: CCUS is key to decarbonizing industries such as cement, steel, and chemical production, which are difficult to fully electrify.
  - **Negative Emissions**: Advanced CCUS technologies, combined with **bioenergy with carbon capture and storage (BECCS)**, can help achieve net-negative emissions by removing CO2 from the atmosphere and storing it long-term.
  - **Utilization of Captured CO2**: Converting captured CO2 into marketable products, such as chemicals or carbonates for construction materials, can generate economic value while reducing emissions.
- **Partnerships**:
  - Collaborative research with energy companies (e.g., **Shell**, **ExxonMobil**) and governments to develop and scale CCUS technologies.
  - Public-private partnerships for funding large-scale pilot projects to test and commercialize CCUS systems.
  - Coordination with international climate organizations (e.g., **Global CCS Institute**) to promote knowledge sharing and best practices in CCUS deployment.

4. Clean Energy Technologies (Solar, Wind, and Energy Storage)

- **Technology**: Renewable energy technologies, particularly **solar**, **wind**, and **energy storage** (e.g., batteries), are central to decarbonizing North America's energy sector.
- **Applications**:
    - **Grid Decarbonization**: Expanding renewable energy capacity (solar, wind) and integrating **energy storage solutions** to ensure grid stability as intermittent sources like wind and solar take a larger share of the energy mix.
    - **Microgrids**: Implementing decentralized energy systems in remote and underserved communities to improve energy access and resilience, especially in the face of natural disasters or grid failures.
    - **Offshore Wind**: Developing offshore wind farms in the U.S. East Coast and Canada, where large untapped potential exists, can help scale up clean energy.
- **Partnerships**:
    - Collaboration with **renewable energy firms** (e.g., **NextEra Energy**, **Orsted**) and **grid operators** to scale up clean energy deployment and integrate storage solutions.
    - Multilateral partnerships, including the **Clean Energy Ministerial** and **International Renewable Energy Agency (IRENA)**, to promote cross-border renewable energy sharing and joint infrastructure investments.

5. Nature-Based Solutions (NbS)

- **Technology**: **Nature-based solutions** leverage natural processes to address environmental challenges, such as carbon sequestration, flood management, and ecosystem restoration.
- **Applications**:
    - **Reforestation and Afforestation**: Expanding forest cover through tree planting initiatives, such as **the Trillion Trees initiative**, to capture carbon, protect biodiversity, and enhance water cycles.
    - **Wetlands Restoration**: Restoring wetlands to mitigate flooding, enhance water quality, and create habitat for wildlife.
    - **Coastal Resilience**: Implementing mangrove restoration, coral reef protection, and other coastal ecosystem strategies to buffer against rising sea levels and extreme weather events.
- **Partnerships**:
    - Collaboration with conservation groups (e.g., **The Nature Conservancy**, **WWF**) and **Indigenous communities** to implement large-scale restoration projects.

- Public-private partnerships for financing nature-based solutions, particularly in urban areas to reduce the impacts of climate change (e.g., **Greenbelt Alliance**, **Natural Resources Defense Council**).

6. Regenerative Agriculture and Precision Farming

- **Technology**: **Regenerative agriculture** practices (e.g., no-till farming, cover crops, agroforestry) focus on restoring soil health, increasing biodiversity, and improving the carbon sequestration capacity of agricultural lands. **Precision farming** uses data analytics, GPS, and sensor technologies to optimize resource use (e.g., water, fertilizers), reduce waste, and increase yields sustainably.
- **Applications**:
  - **Soil Carbon Sequestration**: Regenerative practices can capture carbon in the soil, helping to offset emissions and improve soil fertility for future crop production.
  - **Water Efficiency**: Precision irrigation systems use real-time data to optimize water use in agriculture, reducing waste and conserving water in drought-prone areas.
  - **Sustainable Food Systems**: Encouraging regenerative practices on a broader scale can reduce the environmental impact of food production while increasing resilience to climate change.
- **Partnerships**:
  - Collaborating with agritech companies (e.g., **Trimble**, **John Deere**) to promote precision agriculture and sustainable farming practices.
  - Partnering with research institutions and farmer cooperatives to scale up regenerative agriculture practices and knowledge-sharing.

7. Circular Economy Platforms and Partnerships

- **Technology**: **Digital platforms** and **IoT (Internet of Things)** can play a central role in tracking product life cycles, improving material recovery, and promoting circular business models. Technologies such as **robotics** and **artificial intelligence** can also be used for more efficient recycling processes.
- **Applications**:
  - **Waste-to-Energy**: Developing technologies to convert waste into usable energy or raw materials, such as using organic waste for biogas production.
  - **Product Take-Back Programs**: Creating platforms that facilitate take-back or recycling programs for products like electronics, textiles, and plastics.
  - **Material Flow Analysis**: Using digital tools to track the flow of materials through economies and supply chains to optimize recycling and reuse.

- **Partnerships**:
    - Partnering with **waste management companies** (e.g., **Waste Management Inc.**, **Republic Services**) and **tech firms** to create smart waste solutions that enhance recycling and reduce landfill use.
    - Collaboration with **government agencies** and industry stakeholders (e.g., **Ellen MacArthur Foundation**, **World Economic Forum**) to promote circular economy frameworks.

Conclusion

Integrating these emerging technologies and strategic partnerships into cross-cutting environmental approaches can help tackle some of the most pressing environmental challenges. By leveraging innovation, collaboration, and data-driven solutions, these technologies can enhance the effectiveness of environmental policies and accelerate the transition to a more sustainable, resilient, and equitable future.

National Advisory Committee
(NAC) to the U.S. Representative to the
Commission for Environmental Cooperation (CEC)

Advice 2025-2 (January 23, 2025)

Question #2 -- What other emerging environmental challenges should the CEC address? What opportunities exist to enhance collaboration and engagement with Indigenous communities, particularly in leveraging Traditional Ecological Knowledge (TEK) to address the triple planetary crisis and emerging environmental threats? Are there specific emerging technologies, tools, or approaches (such as artificial intelligence or earth observation technologies) that the CEC should consider integrating into its efforts?

The December 5, 2024, Charge Questions to the National Advisory Committee (NAC) included:
As the CEC develops its new strategic plan, we are prioritizing the triple planetary crisis (climate change, pollution, and biodiversity loss):

a. Beyond this focus, what other emerging environmental challenges should the CEC address? [ex., the increase in vector-borne diseases linked to climate change]

As the Commission for Environmental Cooperation (CEC) continues to address the triple planetary crisis—climate change, pollution, and biodiversity loss—there are a number of emerging environmental challenges that the CEC should consider in its new Strategic Plan. While these three crises are central, other pressing issues are arising that also require coordinated action, technological innovation, and cross-border collaboration to mitigate their effects. Below are several additional emerging environmental challenges that the CEC may want to prioritize, in line with its efforts to stay responsive to evolving global and regional dynamics.

Below are eight additional emerging environmental challenges that the CEC may want to prioritize, in line with its efforts to stay responsive to evolving global and regional dynamics.

1. Emerging Infectious Diseases and Public Health Threats

- **Issue**: There is growing evidence that environmental changes, particularly **climate change**, are contributing to the rise in **vector-borne diseases** (e.g., malaria, dengue, Lyme disease) and other **zoonotic diseases** (e.g., COVID-19, Ebola) as shifts in temperature, humidity, and ecosystems alter the habitats of disease-carrying organisms like mosquitoes, ticks, and rodents.
- **Rationale**: Climate change can extend the range and duration of disease vectors, while habitat destruction, increased human-wildlife interaction, and encroachment into wilderness areas also elevate risks.
- **Actions for CEC**:
    - Collaborate on **cross-border disease surveillance**, research, and early-warning systems.
    - Develop strategies to **integrate public health and environmental protection** (e.g., eco-health initiatives).

- Promote research on **climate-sensitive health interventions**, such as the development of disease-resistant crops or early detection systems.

2. Water Scarcity and Transboundary Water Management

- **Issue**: **Water scarcity** is becoming an increasingly pressing issue across North America, particularly in the southwestern U.S., Mexico, and parts of Canada. Drought, overextraction, and pollution of freshwater resources are exacerbating tensions over water access and usage.
- **Rationale**: Water stress is a key driver of conflict, food insecurity, and migration, and is compounded by climate change. The growing competition for water among urban, agricultural, and industrial sectors requires improved governance and cross-border cooperation.
- **Actions for CEC**:
  - Strengthen transboundary **water management frameworks** for shared aquifers and rivers, such as the **Colorado River** and **Rio Grande**.
  - Promote **water-efficient technologies** and practices in agriculture, industry, and urban settings.
  - Facilitate **cooperative agreements** for the equitable distribution of water resources among communities and sectors.

3. Soil Degradation and Desertification

- **Issue**: **Soil degradation**, driven by deforestation, overgrazing, intensive agriculture, and urbanization, is leading to reduced soil fertility, lower agricultural yields, and greater vulnerability to erosion and desertification. Desertification is particularly a threat in arid and semi-arid regions like the southwestern U.S., northern Mexico, and parts of southern Canada.
- **Rationale**: The loss of soil health and productivity directly impacts food security, livelihoods, and ecosystem services. As climate change exacerbates drought conditions, the problem of desertification is becoming more widespread.
- **Actions for CEC**:
  - Promote **regenerative agriculture** practices, such as no-till farming, agroforestry, and crop rotation, to restore soil health.
  - Support **soil conservation programs** to prevent desertification and restore degraded lands (e.g., reforestation, afforestation, and grassland restoration).
  - Develop cross-border initiatives for **land rehabilitation** and **sustainable land management** practices.

4. Environmental Migration and Displacement

- **Issue**: As climate change, natural disasters, and environmental degradation worsen, **environmental migration** is expected to rise. Communities, particularly in vulnerable regions (e.g., coastal areas, arid zones), may be forced to relocate due to rising sea levels, extreme weather events, or the collapse of local ecosystems (e.g., fisheries, agriculture).
- **Rationale**: The potential displacement of millions of people due to environmental factors creates both humanitarian challenges and socio-political tensions, particularly in areas with shared borders and limited resources.
- **Actions for CEC**:
    - Facilitate cross-border **migration policies** that address the root causes of displacement and protect the rights of environmentally displaced persons.
    - Support **climate-resilient infrastructure** and community adaptation plans to reduce the need for forced migration.
    - Strengthen regional cooperation on **disaster response** and **climate-induced displacement**, ensuring that communities receive the support they need to stay in place or resettle.

5. Plastic Pollution and Chemical Contaminants

- **Issue**: The growing accumulation of **plastic waste**, particularly in oceans and waterways, poses significant threats to marine ecosystems, biodiversity, and human health. In addition, **emerging chemical pollutants**, such as **PFAS (per- and polyfluoroalkyl substances)**, microplastics, and pharmaceuticals, are increasingly contaminating water supplies, soils, and food chains.
- **Rationale**: The impact of plastic pollution on marine life and the increasing prevalence of toxic chemicals in ecosystems calls for urgent action on waste reduction, chemical regulation, and sustainable materials management.
- **Actions for CEC**:
    - Develop cross-border strategies for **plastic waste reduction**, focusing on sustainable packaging, better waste management systems, and international agreements on plastic bans.
    - Promote **innovative recycling technologies** and **material alternatives** to plastics, such as biodegradable polymers and sustainable composites.
    - Address the issue of **emerging contaminants** by promoting stronger chemical safety standards, research, and monitoring programs.

6. Urban Sprawl and Habitat Fragmentation

- **Issue**: **Urbanization** and **urban sprawl** are encroaching on natural habitats, leading to **habitat fragmentation**, reduced biodiversity, and the disruption of ecosystem services such as pollination, water filtration, and carbon sequestration.
- **Rationale**: As cities expand, the destruction of ecosystems and wildlife corridors can lead to biodiversity loss, diminished air and water quality, and increased vulnerability to natural disasters.
- **Actions for CEC**:
    - Encourage **green urban planning**, focusing on sustainable, nature-based solutions like green roofs, urban forests, and wildlife corridors.
    - Promote the use of **smart growth principles** to limit sprawl and prioritize infill development that minimizes environmental impacts.
    - Support the **restoration of urban ecosystems** and the creation of protected areas within cities (e.g., parks, green spaces).

7. Synthetic Biology and Biotechnology Risks

- **Issue**: Advances in **synthetic biology** and biotechnology hold promise for solving some environmental challenges, such as developing drought-resistant crops or bio-based materials. However, these technologies also pose risks, such as unintended ecological consequences, ethical concerns, and potential for bioterrorism.
- **Rationale**: As biotechnology evolves, it is critical to develop regulatory frameworks and governance structures that ensure these technologies are used safely and equitably.
- **Actions for CEC**:
    - Develop guidelines and frameworks for the **safe use of synthetic biology** and **genetic modification** technologies, particularly in agriculture and environmental management.
    - Foster international cooperation to **monitor and regulate biotechnology** in a way that safeguards ecosystems and public health.
    - Encourage transparency in the development and deployment of biotechnologies, with a focus on **public engagement** and **ethical considerations**.

8. The Circular Economy and the End of "Take-Make-Dispose" Models

- **Issue**: The traditional **linear economy** (take, make, dispose) is a key driver of resource depletion, waste, and pollution. Moving toward a **circular economy**—where products are designed for reuse, repair, and recycling—can reduce the environmental footprint of consumption while creating economic opportunities.
- **Rationale**: The shift to a circular economy is necessary to address overconsumption, reduce waste, and minimize environmental harm from resource extraction and manufacturing.

- **Actions for CEC**:
    - Promote policies that encourage the **reuse, repair, and recycling** of products and materials across North America.
    - Develop cross-border collaboration on **circular supply chains** and resource sharing, particularly in key sectors like electronics, textiles, and packaging.
    - Advocate for **product design standards** that prioritize sustainability and recyclability.

Conclusion

While the triple planetary crisis remains central, these emerging environmental challenges— ranging from public health risks linked to environmental change to the rise of synthetic biology and the circular economy—are equally important to address. As the CEC develops its new Strategic Plan, integrating these issues into a comprehensive, forward-thinking approach will not only enhance regional cooperation but also ensure that North America remains proactive in tackling the most urgent and evolving environmental challenges. Collaboration with governments, industries, Indigenous communities, and environmental organizations will be critical in developing sustainable, inclusive solutions for the future.

b. What opportunities exist to enhance collaboration and engagement with Indigenous communities, particularly in leveraging Traditional Ecological Knowledge (TEK) to address the triple planetary crisis and emerging environmental threats?

Enhancing collaboration with Indigenous communities, especially by leveraging Traditional Ecological Knowledge (TEK), offers a unique and invaluable opportunity to address the triple planetary crisis (climate change, pollution, and biodiversity loss) as well as other emerging environmental threats. Indigenous communities have long been stewards of the land, possessing deep knowledge of local ecosystems, sustainable land management practices, and adaptation strategies that have been honed over thousands of years. Integrating TEK alongside modern scientific approaches can offer more holistic, adaptive, and culturally relevant solutions to pressing environmental challenges.

Here are several opportunities for the Commission for Environmental Cooperation (CEC) to enhance collaboration and engagement with Indigenous communities, particularly in leveraging TEK:

1. Co-Creation of Environmental Management Plans

- **Opportunity**: Indigenous communities can play a central role in **co-creating environmental management plans** that integrate both TEK and contemporary environmental science. This can be particularly valuable in **ecosystem restoration**, **wildlife conservation**, and **sustainable resource management**.
- **Actions**:
    - Partner with Indigenous communities to **develop co-management strategies** for shared ecosystems, such as forests, rivers, and coastlines. This could involve using TEK to inform

conservation practices alongside modern ecological data (e.g., species tracking, habitat restoration).

- Co-develop **ecosystem monitoring** and **biodiversity protection plans** using a blend of traditional knowledge and modern scientific tools (e.g., remote sensing, GIS mapping).

2. Incorporating TEK in Climate Change Adaptation

- **Opportunity**: Indigenous communities have developed highly adaptive strategies to cope with environmental changes over millennia. Integrating these adaptive strategies with modern climate change models can significantly enhance **climate resilience**.
- **Actions**:
  - Develop **climate adaptation frameworks** that incorporate TEK, such as Indigenous practices for managing droughts, floods, and wildfires, to improve community resilience.
  - Facilitate **knowledge-sharing platforms** where Indigenous knowledge systems about weather patterns, seasonal cycles, and land regeneration are integrated into broader climate planning efforts.
  - Support **Indigenous-led research** and data collection on climate change impacts, ensuring that TEK is included in climate models and assessments, particularly in vulnerable regions like the Arctic or coastal areas.

3. Revitalizing Traditional Resource Management Systems

- **Opportunity**: Many Indigenous cultures practice **sustainable land and resource management** systems that can offer solutions to modern challenges such as overfishing, deforestation, and soil degradation. These systems often prioritize ecological balance and the preservation of biodiversity.
- **Actions**:
  - Work with Indigenous communities to **revitalize traditional agricultural practices**, such as agroecology, companion planting, and permaculture, which can help mitigate soil degradation, promote biodiversity, and increase food security.
  - Support **community-based fisheries management**, using TEK to complement modern science and improve sustainable fisheries practices that protect aquatic ecosystems and livelihoods.
  - Engage in **collaborative forest management** where Indigenous fire management techniques, such as controlled burns, are integrated with modern wildfire prevention strategies to reduce the risk of catastrophic wildfires.

4. Supporting Indigenous Leadership in Conservation and Restoration Projects

- **Opportunity**: Indigenous communities are often at the forefront of conservation efforts, but they may lack the financial resources and institutional support to scale their initiatives. There is

an opportunity to increase **Indigenous leadership** in environmental conservation and restoration projects by providing funding, resources, and technical support.

- **Actions**:
    - Develop **funding mechanisms** that specifically support Indigenous-led conservation and restoration projects, particularly those that use TEK to restore damaged ecosystems, such as wetlands, forests, and grasslands.
    - Establish **collaborative conservation initiatives** where Indigenous knowledge of species habitat, migration, and growth cycles is used to design effective conservation strategies.
    - Encourage **Indigenous land-based education programs** that integrate TEK and environmental science to train the next generation of Indigenous leaders in both conservation science and community engagement.

5. Strengthening Indigenous Rights to Land and Resources

- **Opportunity**: Recognizing and respecting **Indigenous rights to land and resources** is essential for empowering communities to engage in environmental protection and sustainable management. Legal recognition of Indigenous territories can help safeguard ecosystems and biodiversity from exploitation.
- **Actions**:
    - Advocate for the **recognition of Indigenous land rights** and the full implementation of the **UN Declaration on the Rights of Indigenous Peoples (UNDRIP)**, which includes the right to free, prior, and informed consent (FPIC) for any development on their lands.
    - Support **land protection agreements** that allow Indigenous communities to have a say in land-use decisions and integrate their traditional land management practices with broader environmental goals.
    - Collaborate with Indigenous governments and organizations to **establish Indigenous Protected and Conserved Areas (IPCAs)** that are governed and managed according to Indigenous laws and knowledge systems.

6. Building Partnerships for Biodiversity Monitoring and Protection

- **Opportunity**: TEK can be instrumental in **biodiversity monitoring**, particularly in remote or hard-to-reach areas. Indigenous communities have detailed knowledge about local flora and fauna, and their observations can help track changes in biodiversity and environmental health.
- **Actions**:
    - **Partner with Indigenous communities** to co-create **biodiversity monitoring programs** that combine TEK with modern scientific methods. This could include tracking endangered species, invasive species, and ecosystem health indicators.
    - Support **community-led monitoring networks** where Indigenous peoples collect data on environmental changes and collaborate with researchers to analyze trends.

- Integrate TEK into **species protection efforts**, using traditional practices such as seasonal harvesting restrictions, sacred areas, and species protection protocols to complement formal conservation policies.

7. Empowering Indigenous Youth in Environmental Leadership

- **Opportunity**: Empowering **Indigenous youth** through education and mentorship can build a new generation of environmental leaders who understand both their cultural heritage and the scientific approaches needed to address contemporary environmental challenges.
- **Actions**:
  - Partner with **Indigenous youth organizations** to create leadership programs that foster the next generation of environmental stewards, integrating both TEK and environmental science.
  - Promote **Indigenous-led environmental education** in schools and universities that combines traditional knowledge with climate science, sustainable development practices, and modern environmental policy.
  - Establish mentorship opportunities where **elders** can pass on TEK to younger generations, ensuring the transmission of both practical and spiritual environmental knowledge.

8. Leveraging Technology to Preserve and Share TEK

- **Opportunity**: Modern technology can be used to **preserve** and **share** TEK while respecting intellectual property rights and the sacred nature of some knowledge. Digital tools such as databases, mapping technologies, and mobile apps can help document and protect this knowledge for future generations.
- **Actions**:
  - Develop **digital platforms** and databases for sharing TEK in a way that respects **Indigenous ownership** and rights over their knowledge. These platforms could be used for educational purposes, conservation efforts, or traditional medicine.
  - Support **digital mapping projects** that combine TEK with geographic information systems (GIS) to create detailed land use and ecological management maps.
  - Ensure that the use of technology to share and document TEK is done in partnership with Indigenous communities, with an emphasis on **ethical data-sharing** and **community consent**.

9. Enhancing Indigenous Participation in Policy and Decision-Making

- **Opportunity**: Indigenous communities have a critical role to play in environmental **policy development** and **decision-making** at local, national, and international levels. Ensuring that Indigenous voices are heard and respected in these processes can lead to more effective and inclusive environmental policies.

- **Actions**:
    - Establish **mechanisms for Indigenous consultation** and participation in environmental decision-making processes, ensuring that TEK is integrated into national and regional environmental policies.
    - Foster partnerships between **Indigenous leadership** and government bodies to develop **climate change policies**, **pollution control measures**, and **biodiversity conservation strategies** that are rooted in Indigenous worldviews and priorities.
    - Advocate for **Indigenous representation** in international environmental forums and policy bodies, such as the **UN Climate Change Conferences (COP)** and the **Convention on Biological Diversity**.

Conclusion

Through continued strengthening and expansion of partnerships with Indigenous communities and integrating **Traditional Ecological Knowledge (TEK)** into environmental strategies, the CEC can gain further knowledge into a vast reservoir of wisdom and experience that complements modern scientific approaches. These collaborations can lead to more **inclusive, culturally appropriate, and effective solutions** to the triple planetary crisis, emerging environmental threats, and the broader goals of sustainable development. By empowering Indigenous communities and respecting their rights, the CEC can help foster a more equitable and resilient future for all of North America.

c. Are there specific emerging technologies, tools, or approaches (such as artificial intelligence or earth observation technologies) that the CEC should consider integrating into its efforts?

Yes, there are several **emerging technologies, tools, and approaches** that the **Commission for Environmental Cooperation (CEC)** should consider integrating into its efforts to address the **triple planetary crisis** (climate change, pollution, and biodiversity loss), as well as other emerging environmental challenges. These technologies offer innovative solutions for monitoring, managing, and mitigating environmental impacts, and can significantly enhance the effectiveness of the CEC's strategic priorities. Below are key technologies and approaches that could be integrated into the CEC's work:

1. Artificial Intelligence (AI) and Machine Learning (ML)

- **AI and Machine Learning** are transforming the way we process environmental data, predict trends, and make decisions. These technologies can help optimize resource management, predict environmental risks, and automate monitoring and enforcement tasks.

Applications for CEC:

- **Predictive Analytics for Climate and Environmental Hazards**: AI can analyze vast datasets to predict climate patterns, natural disasters, and environmental risks. For example, AI models could forecast extreme weather events (e.g., floods, hurricanes) or monitor drought conditions in real-time.

- **Biodiversity Monitoring**: AI tools, such as **image recognition algorithms**, can process large volumes of wildlife monitoring data (e.g., camera traps, acoustic sensors) to track species populations and migration patterns without human intervention.
- **Pollution and Waste Management**: AI can be used to optimize waste sorting and recycling processes, as well as track pollution sources (e.g., air and water quality monitoring) to improve response times and regulatory enforcement.
- **Natural Resource Management**: AI can support precision agriculture by analyzing soil health, water usage, and crop productivity, enabling more sustainable farming practices across North America.

Potential Partnerships:

- Collaboration with **AI research institutes** (e.g., **OpenAI**, **DeepMind**) and **environmental NGOs** (e.g., **WWF**, **Conservation International**) to develop AI-based solutions tailored to environmental challenges.
- Partnering with tech companies like **Google** and **IBM** for AI-powered climate models or **satellite-based monitoring systems**.

2. Earth Observation (EO) Technologies and Remote Sensing

Earth Observation via **satellite imagery** and **remote sensing technologies** provides valuable real-time data on ecosystems, climate change impacts, land use, and pollution. These technologies allow for large-scale environmental monitoring across remote and inaccessible areas, helping inform decision-making and policy.

Applications for CEC:

- **Climate Monitoring and Change Assessment**: EO technologies, such as **satellite-based thermal imaging**, can track changes in temperature, sea level rise, and land surface characteristics. This is critical for monitoring the effects of climate change on ecosystems and infrastructure.
- **Deforestation and Habitat Loss**: EO can track deforestation rates and changes in land cover over time, supporting efforts to conserve biodiversity and combat land degradation.
- **Pollution Tracking**: EO tools can be used to monitor air quality, water contamination, and land-based pollution, enabling real-time alerts and responses for both local communities and policymakers.
- **Disaster Response and Resilience**: Satellites can monitor natural disasters (e.g., wildfires, hurricanes) in real time, providing key data for emergency response teams and facilitating better recovery efforts.

Potential Partnerships:

- Collaboration with **space agencies** like NASA, the European Space Agency (ESA), or private satellite firms such as **Planet Labs** to access high-resolution satellite data.

- Work with **remote sensing companies** (e.g., **SkyWatch**, **Descartes Labs**) to develop localized EO applications for environmental monitoring.

3. Blockchain for Environmental Transparency and Accountability

- **Blockchain** is a decentralized, transparent ledger technology that can be used to enhance the **traceability** of resources, supply chains, and environmental credits, ensuring greater **accountability** and **data integrity**.

Applications for CEC:

- **Tracking Carbon Credits**: Blockchain can create secure, verifiable records for carbon credits and carbon offset projects, ensuring transparency and reducing fraud in carbon markets.
- **Sustainable Supply Chain Management**: Blockchain can trace the origins of goods (e.g., palm oil, timber, minerals) to ensure that they are sourced sustainably and do not contribute to deforestation or human rights abuses.
- **Waste Management and Circular Economy**: Blockchain can facilitate waste tracking systems to improve the efficiency of recycling programs, track the life cycle of products, and support the circular economy by ensuring materials are reused or remanufactured.

Potential Partnerships:

- Partner with **blockchain-focused environmental startups** (e.g., **Everledger**, **Provenance**) and **corporations** interested in sustainable sourcing (e.g., **Unilever**, **Nike**) to integrate blockchain into supply chain transparency and environmental governance. Blockchain environmental startups are **companies that utilize blockchain technology to address environmental issues and promote sustainability**

4. Internet of Things (IoT) for Real-Time Environmental Monitoring

- The **Internet of Things (IoT)** consists of interconnected sensors and devices that can gather and share real-time environmental data. This technology can support continuous monitoring of various environmental parameters such as air quality, water levels, soil moisture, and biodiversity indicators.

Applications for CEC:

- **Smart Environmental Monitoring Networks**: IoT-enabled sensors can be deployed across vast areas (e.g., forests, oceans, cities) to monitor air quality, water pollution, and wildlife health in real time. This can significantly improve response times for environmental hazards.
- **Wildlife Tracking**: IoT devices such as GPS collars or bio-logging tags can track animal movement patterns and migration, contributing to more effective conservation and species protection efforts.

- **Sustainable Agriculture**: IoT devices can optimize water and energy use in agriculture by providing data on soil conditions, crop health, and irrigation needs, promoting more sustainable practices and reducing resource waste.

Potential Partnerships:

- Collaboration with **IoT technology providers** (e.g., **Bosch**, **Cisco**, **Siemens**) to design and deploy environmental monitoring systems.
- Work with **research institutions** to develop IoT solutions tailored to biodiversity conservation, urban sustainability, and climate resilience.

5. Synthetic Biology and Biotechnology for Environmental Remediation

- **Synthetic biology** and **biotechnology** have the potential to revolutionize environmental remediation by using engineered microorganisms or plants to clean up pollution or restore damaged ecosystems.

Applications for CEC:

- **Bioremediation**: Synthetic microbes can be designed to break down pollutants such as oil spills, heavy metals, or plastic waste, providing an eco-friendly solution for environmental cleanup.

  Carbon Sequestration: Genetic modification of plants, algae, or soil bacteria could enhance carbon capture and sequestration, helping to offset greenhouse gas emissions.
- **Restoring Ecosystem Services**: Biotechnologies can be used to restore lost ecosystem services, such as reintroducing species or reviving damaged soil ecosystems to promote biodiversity recovery.

Potential Partnerships:

- Collaborate with **biotech firms** and **research universities** (e.g., **MIT's Synthetic Biology Center**, **Bioclear Earth**) to develop and test sustainable bioremediation technologies.
- Work with **government agencies** to support the safe and ethical deployment of biotechnology in environmental conservation and climate change mitigation.

6. Regenerative Agriculture and Precision Farming Technologies

- **Regenerative agriculture** and **precision farming** are technologies that optimize land use to increase productivity while restoring soil health, conserving water, and reducing the environmental footprint of agriculture.

Applications for CEC:

- **Soil Health and Carbon Sequestration**: Precision agriculture can enhance soil management practices, promoting healthier soils that sequester more carbon, support biodiversity, and improve water retention.

- **Water Management**: IoT sensors and data analytics can optimize irrigation schedules, reducing water use in agriculture—critical for regions facing water scarcity.
- **Integrated Pest Management (IPM)**: Machine learning models can predict pest outbreaks, reducing the need for chemical pesticides and minimizing pollution in agricultural systems.

Potential Partnerships:

- Collaborate with **agritech companies** (e.g., **John Deere**, **Trimble**) and **research institutions** focused on sustainable farming technologies to pilot precision agriculture solutions across North America.

7. Geoengineering and Carbon Capture Technologies

- **Geoengineering** technologies, such as **direct air capture (DAC)** and **solar radiation management**, are being explored as potential tools to address global warming by removing CO2 from the atmosphere or manipulating solar radiation to cool the planet.

Applications for CEC:

- **Direct Air Capture (DAC)**: Scaling up DAC technologies could provide a way to reduce the concentration of greenhouse gases in the atmosphere, helping North America meet its netzero emissions goals.
- **Ocean Alkalinity Enhancement**: Geoengineering techniques aimed at increasing the ocean's capacity to absorb CO2 could contribute to combating ocean acidification and mitigating climate change.

Potential Partnerships:

- Engage with **climate engineering startups** (e.g., **Climeworks**, **Carbon Clean Solutions**) to evaluate the feasibility of these technologies for use in North America.
- Collaborate with **research institutions** focused on carbon removal and geoengineering (e.g., **Harvard's Solar Geoengineering Research Program**).

Conclusion

Incorporating emerging technologies such as **AI**, **earth observation tools**, **IoT**, **blockchain**, and **biotechnology** into the CEC's strategies can enhance environmental monitoring, foster innovation, and accelerate the transition to more sustainable and resilient ecosystems. By integrating these technologies, the CEC can amplify its efforts to address the triple planetary crisis.