



CONVENTION ON MIGRATORY SPECIES

UNEP/CMS/Resolution 12.21 (Rev.COP15)
Original: English

CLIMATE CHANGE AND MIGRATORY SPECIES

Adopted by the Conference of the Parties at its 15th Meeting (Campo Grande, March 2026)

Recalling Recommendation 5.5 and Resolutions 8.13, 9.7, 10.19, and 11.26,¹

Recognizing with extreme concern that climate change impacts are happening now, that some of the impacts on migratory species are catastrophic, and that changes are occurring both to individual species, and at ecosystem level,

Further concerned that the frequency and intensity of severe weather events, and the likelihood of severe impact of these events on species, their migratory routes and habitats, are increasing,

Recalling evidence that protecting and restoring wild animals and their habitats can enhance climate change adaptation and mitigation potential, including through nature-based solutions and/or ecosystem-based approaches,

Recognizing with equal concern that hard and soft limits to adaptation have been reached in some ecosystems and regions, with considerable impacts on migratory species and their habitats,

Recognizing that climate change is already having an adverse impact on migratory species and the phenomenon of animal migration (predicted in UNEP/CMS/ScC17/Inf.12, and evidenced in UNEP/CMS/ScC-SC6/Inf.12.4.1a, 12.4.1b, 12.4.1c and 12.4.1d),

Recognizing that due to climate change, ranges of migratory species are changing and that CMS instruments may need to adapt to these variations,

Acknowledging that changes in human activities as a result of climate change, including adaptation and mitigation measures, may have significant impacts on migratory species and their habitats,

Acknowledging the considerable threat that climate change poses for migratory species and their habitats based upon the findings of the 6th Assessment of the Intergovernmental Panel on Climate Change (IPCC) and its Synthesis Report and Summary for Policymakers, and the IPBES-IPCC co-sponsored workshop on biodiversity and climate change,

Acknowledging that the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services has approved to conduct a fast-track assessment on integrated biodiversity-inclusive spatial planning and ecological connectivity, with high relevance for the work on climate change and migratory species under the Convention,

¹ The *Recommendation* and *Resolutions* were repealed and consolidated into Resolution 12.21 (Rev.COP15).

Recognizing that the best available scientific information indicates that action to help migratory species adapt to climate change is urgently required in order to meet the objectives of the Convention; to give proper effect to Articles II and III, and to the instruments adopted under Article IV, whereas at the same time there is a need to expand and refine knowledge concerning the impacts of climate change on migratory species,

Emphasizing the need to coordinate action to help migratory species adapt to climate change within the framework of the CMS instruments,

Acknowledging the importance of current protected areas and protected area networks for migratory species conservation as a result of climate change, and *recognizing* the need to enhance them in order to maximize representativeness and improve connectivity within and between them, thereby increasing their contribution to migratory species conservation in light of climate change, including through integrating them more effectively into wider landscapes and seascapes, and through the use of Other Effective area-based Conservation Measures,

Recognizing that mitigation measures, such as renewable, low carbon and “clean” energy development, may affect migratory species and their habitats depending on how the installations are designed, sited and operated, and that further research and impact assessments, especially for new technologies, are required,

Recognizing the importance of appropriate environmental and social safeguards and strategic environmental assessment processes for renewable energy developments, including cumulative impact assessments,

Recalling Resolution 7.5 (Rev.COP12) on wind turbines and migratory species, which, inter alia, called for the application of strategic environmental impact assessment procedures to identify appropriate construction sites,

Also recalling Resolution 11.27 (Rev.COP15), *Renewable Energy and Migratory Species*, which endorses the Scientific Council’s “Renewable Energy Technologies and Migratory Species: Guidelines for Sustainable Deployment” (UNEP/CMS/COP11/Doc.23.4.3.2),

Aware that the Small Island Developing States (SIDS) and developing countries with small islands, which are important migratory sites for various species of birds, marine mammals, reptiles and fish, are highly vulnerable to impacts of climate change and are in need of support including capacity-building to address these issues, and

Acknowledging with thanks the contributions of the Climate Change Working Group established under the Scientific Council,

*The Conference of the Parties to the
Convention on the Conservation of Migratory Species of Wild Animals*

1. *Strongly urges* Parties, and non-Party Range States, to take both climate change mitigation and adaptation actions now, especially in the light of impacts that are already being observed;

2. *Endorses the Advice to Parties and other stakeholders on climate change and migratory species* annexed to this Resolution and urges Parties and Signatories to the CMS instruments and encourages non-Parties to implement actions including the incorporation of migratory species issues in national climate change strategies, nationally determined contributions, national adaptation plans, and National Biodiversity Strategies and Action Plans (NBSAPs) to the extent appropriate given the circumstances of each Party and non-Party;
3. *Encourages Parties and other stakeholders to take into account potential impacts on migratory species when developing and implementing relevant climate change mitigation and adaptation action and spatial planning in terrestrial, freshwater and marine ecosystems, in line with the provisions of Resolution 7.2 (Rev.COP15) Impact Assessment and Migratory Species and Resolution 11.27 (Rev.COP15) Renewable Energy and Migratory Species;*
4. *Requests Parties and Signatories to the CMS instruments to assess what steps are necessary to help migratory species adapt to climate change and changes in human activities as a result of climate change and take actions as listed in the Annexes to this Resolution;*
5. *Requests the Scientific Council, subject to the availability of resources, to promote work to address key gaps in knowledge and future research directions, in particular through the analysis of existing long-term and large-scale datasets, and through collaboration with other relevant work under the Convention and other Multilateral Environmental Agreements (MEAs);*
6. *Instructs the Secretariat, in collaboration with Parties and relevant international organizations, subject to the availability of resources from both public and private sources, to promote the implementation of the actions in the annexes of this Resolution, and share best practice and lessons learned in the effective mitigation of climate change impacts, including through the organization of thematic and regional workshops;*
7. *Calls on Parties, non-Parties and stakeholders, with the support of the Secretariat, to strengthen national and local capacity for the protection of species impacted by climate change, including, *inter alia*, by developing partnerships with key stakeholders and organizing training courses, translating and disseminating examples of best practice, sharing and implementing protocols and regulations, transferring technology, and promoting the use of online and other tools to address specific issues;*
8. *Urges Parties to encourage the full involvement of Indigenous Peoples and local communities in responding to climate change;*
9. *Urges Parties and Signatories to CMS instruments, and encourages non-Parties exercising jurisdiction over areas that a migratory species inhabits or is expected to inhabit in the near future due to climate change, to participate in CMS and relevant CMS instruments, in order to promote timely conservation measures where migration patterns have changed due to climate change;*

10. *Agrees* that Article I (1) (c) (4) of the Convention, on the definition of “favourable conservation status” could be interpreted as follows in light of climate change, and *invites* the governing bodies of relevant CMS instruments to also approve this interpretation:

According to Article I (1) (c) (4) of the Convention, one of the conditions to be met for the conservation status of a species to be taken as “favourable” is that: “the distribution and abundance of the migratory species approach historic coverage and levels to the extent that potentially suitable ecosystems exist and to the extent consistent with wise wildlife management”. While there is a continued need to undertake conservation action within the historic range of migratory species, such action will increasingly also need to be taken beyond the historic range of species in order to ensure a favourable conservation status, particularly with a view to climate-induced range shifts. Such action beyond the historic range of species is compatible with, and may be required in order to meet, the objectives and the obligations of Parties under the Convention;

11. *Urges* Parties and invites relevant international organizations, bilateral and multilateral donors and private sector organizations to support the implementation of actions in the Annexes of the Resolution including through the provision of financial and other assistance to developing countries, including Small Island Developing States, and economies in transition for relevant capacity-building;
12. *Requests* the Scientific Council, subject to the availability of resources, to implement work to support this Resolution, including, if appropriate, through an intersessional working group set up with Terms of Reference operating within the rules of procedure of the Scientific Council;
13. *Requests* the Secretariat to liaise with the secretariats of relevant MEAs, including in particular the secretariats of Convention on Biological Diversity (CBD), United Nations Framework Convention on Climate Change (UNFCCC), the United Nations Convention to Combat Desertification (UNCCD), the Convention on Wetlands of International Importance (Ramsar Convention), International Whaling Commission (IWC) and the World Heritage Convention (WHC), in collaboration with/through the Biodiversity Liaison Group, to promote synergies and coordinate activities related to climate change policies affecting migratory species, including, where appropriate, the organization of back-to-back meetings and joint activities;
14. *Further urges* Parties and Signatories to CMS instruments to enable and support the full participation in CMS of those States where migratory species are expected to occur in the near future due to climate change;
15. *Requests* Parties, non-Parties and other stakeholders at a range of geographic scales to ensure that investments in both renewable and non-renewable energy technologies are implemented in a way to minimize their impacts on biodiversity in general, and migratory species in particular, through application of appropriate impact assessments, design and siting; and
16. *Encourages* Parties, non-Parties and Signatories to CMS instruments to factor in climate change and its impacts when developing national strategies and plans for the conservation of migratory species and their migratory routes, including through a participatory, transparent and inclusive design, implementation and evaluation of nature-based solutions and/or ecosystem-based approaches when applicable.

Annex 1 to the Resolution

ADVICE TO PARTIES AND OTHER STAKEHOLDERS ON PRIORITY ACTIONS TO ADDRESS THE ISSUES MIGRATORY SPECIES FACE AS A RESULT OF CLIMATE CHANGE

Parties and other stakeholders are encouraged to implement actions, appropriate to their circumstances, to address the issues migratory species face in responding to climate change.

Measures to facilitate species adaptation in response to climate change

- Prepare single or multi-species action plans for CMS-listed species considered to be most vulnerable to climate change. Action plans should be prepared at an appropriate level (species or management unit level), but measures may be implemented at the national level. For species already covered by existing CMS instruments, those action plans should be developed and implemented under those instruments, where required. For other species, Range States should work collaboratively to prepare action plans at an appropriate scale.
- Improve the resilience of migratory species and their habitats to climate change, and ensure habitat availability for the full lifecycle of the species, now and in the future, *inter alia*, through the following actions:
 - Identify and prioritize areas currently experiencing rapid climate impacts that are important to migratory species.
 - Ensure that individual sites are sufficiently large, holding appropriate habitats and topography.
 - Ensure there is ecological connectivity between sites, aiding species dispersal and colonization when distributions shift.
 - Consider the designation of seasonal protected areas or restrictions on land-use in areas where migratory species occur at critical stages in their lifecycle and would benefit from such protection.
 - Undertake specific management to eliminate, counteract or compensate for detrimental impacts of climate change and other potential threats that may interact with or exacerbate climate change.
 - Consider expanding existing protected area networks to cover important stopover locations and sites for potential colonization, and ensure the effective protection and appropriate management of sites to maintain or to increase the resilience of vulnerable populations to extreme stochastic events. This may include increasing both the number and size of protected sites, and/or improving current management regimes.
 - Ensure effective monitoring of the site network in order to detect threats, and act on any deterioration in site quality, implementing specific actions to address important threats to sites.
 - Undertake studies to understand the degraded areas where conservation efforts need to be prioritized.
 - Undertake the restoration of degraded habitats and landscapes/seascapes.
 - Cooperate in respect of transboundary protected areas and populations, ensuring that barriers to migration are to the greatest possible extent eliminated or mitigated, and that migratory species are managed under commonly agreed guidelines. Where appropriate, this should be done within the framework of applicable CMS instruments.

- Identify migratory species that have special connectivity needs – those that are resource, area and/or dispersal limited.
- Consider ex-situ measures and assisted colonization, including translocation, as appropriate, for those migratory species most severely threatened by climate change while bearing in mind the need to minimize the potential for unintended ecological consequences.
- Periodically monitor the effectiveness of conservation actions in order to guide ongoing efforts and apply suitable adaptive responses as appropriate.

Vulnerability assessment

- Undertake climate change vulnerability assessments for CMS-listed species at an appropriate scale (national, regional, international), including consideration of the impacts of changes in the ecosystems that migratory species use, to identify those species most susceptible to climate change.
- Undertake climate change vulnerability assessments for other migratory species, not currently listed on CMS, to identify which, if any, may benefit from work under the CMS family instruments.
- Model projected future impacts of climate change to inform vulnerability assessments and action plans.
- Determine if species vulnerable to climate change should be listed on the CMS Appendices, as appropriate.

Monitoring and research

- Undertake research on the status, trends, distribution and ecology of migratory species and their habitats, and ecosystem services provided by them. This includes identifying knowledge gaps and may require the use and refinement of existing technologies and tools, the development of new ones, promotion of citizen science, and coordination / knowledge exchange to improve capacity.
- Develop an understanding of migration routes, how they are changing and the connectivity between populations to identify key breeding, stopover and wintering locations and appropriate management units for particular species.
- Develop and implement monitoring regimes that are adequate for: distinguishing declines in populations from transboundary range shifts; diagnosing the causes of decline, and helping to identify the impact of climate change on migratory species.
- Continue to fill information gaps through research and monitoring, in order to make explicit the associated synergies and any trade-offs between biodiversity conservation, mitigation and adaptation efforts.
- Identify cases where the contribution of migratory species to the functioning of ecosystems maintains and enhances the ability of such ecosystems to provide nature-based solutions and/or ecosystem-based approaches to climate change, and promote the inclusion of measures to conserve such species in strategies and plans to address climate change.

Climate change mitigation, human adaptation, and land use planning

- Identify, evaluate and reduce the additional impacts on migratory species resulting from changes in human behaviour due to climate change (the so-called “tertiary effects”).
- Develop and/or revise environmental sensitivity and zoning maps, to include critical and important sites for migratory species, as a tool for sustainable spatial planning and management and adaptation projects.
- Develop guidelines (generic, national and/or sub-national as appropriate) for mitigation and human adaptation projects to ensure that they are not harmful to migratory species.
- Ensure that strategic environmental assessment of programmes, environmental impact assessment of projects, and cumulative impact assessments of multiple projects, are conducted prior to undertaking major adaptation and mitigation projects, as well as exploration and production projects, taking into account impacts on migratory species, to identify win-win solutions and avoid projects leading to perverse outcomes.
- Ensure that projects incorporate adaptive management in mitigation and adaptation activities, including understanding how the impact of projects may vary according to time of day or weather; for example, in their visibility to migrating species.
- Recognizing that there is considerable uncertainty regarding the potential effectiveness of offsetting as an approach to compensate for detrimental impacts of mitigation and human adaptation; undertake research to inform assessments of the likely role of compensatory or offsetting approaches designed to reduce and prevent detrimental impacts of mitigation and adaptation projects upon migratory species.
- Develop and apply appropriate methodologies to consider potential cumulative impacts of mitigation and adaptation projects across the entire life-cycle and range of migratory species. These may need to be applied at regional, national or international population levels, as appropriate.
- Ensure that where impacts on migratory species are significant, renewable energy and other climate change mitigation or adaptation structures are designed, sited and operated in ways that minimize negative effects on migratory species (for example, including short-term shutdowns or higher turbine cut-in speeds, with regard to wind farms).
- Ensure that any climate change mitigation and adaptation action has appropriate social and environmental safeguards in place at all stages, taking into account the needs of CMS-listed species.
- Ensure that the best available scientific information on the impacts of climate change on migratory species is accessible and useable for planning and decision-making.

Knowledge exchange and capacity-building

- Increase awareness among appropriate authorities of the impacts of climate change on migratory species and the benefits of conservation of migratory species for addressing climate change

- Commission technical reviews and best practice guidelines, and encourage the publishing, sharing and distribution of periodic scientific reviews on the following topics:
 - the impacts of climate change on migratory species;
 - the potential for conservation management to increase the resilience and adaptation of migratory species populations to climate change; and
 - the impacts of anthropogenic climate change adaptation and mitigation on migratory species;
 - the potential role of conserving migratory species in maintaining and enhancing the functionality of ecosystems important for mitigating and adapting to climate change.
- Disseminate the outcomes of such reviews through the CMS website and other appropriate channels, where possible translating the results of those reviews into different languages.
- Establish better links between developing country needs and developed country research through CMS family instruments to promote collaboration and coordinated actions.
- Increase the capacity of natural resource managers and other decision makers, and enhance their ability to address the impacts of climate change on migratory species and take advantage of the benefits of conserving migratory species for tackling climate change.
- Monitor the effectiveness of capacity-building efforts on climate change and migratory species.

Cooperation and implementation

- Work closely with national Focal Points of the United Nations Framework Convention on Climate Change to provide expert guidance and support on how migratory species can be affected by human mitigation and adaptation activities, such as renewable energy and bio-energy development, and collaborate to develop joint solutions aimed at minimizing negative impacts on migratory species; and promote the benefits of incorporating measures to conserve migratory species into actions to address climate change.
- Strengthen synergies with the National Focal Points of the Convention on Biological Diversity, the United Nations Framework Convention on Climate Change, the United Nations Convention to Combat Desertification, the Ramsar Convention, the World Heritage Convention, the International Whaling Commission, the Arctic Council, the Convention on Arctic Fauna and Flora, the Convention on the Conservation of European Wildlife and Natural Habitats (Bern), and other international instruments and arrangements.
- Engage in and support work related to climate change across the CMS family.
- Incorporate appropriate legislative, administrative, management and other measures in national climate change strategies, Nationally Determined Contributions (NDCs) and National Adaptation Plans, National Biodiversity Strategies and Action Plans (NBSAPs), protected area management plans, and other relevant policy instruments and processes.

Annex 2 to the Resolution**DECISION FRAMEWORK TO PROVIDE GUIDANCE TO PARTIES ON IMPLEMENTATION OF PARAGRAPH 9 OF RESOLUTION 12.21 (REV. COP15)**

Resolution 12.21(Rev.COP15) Paragraph 10 states:

Agrees that Article I (1) (c) (4) of the Convention, on the definition of “favourable conservation status” could be interpreted as follows in light of climate change, and invites the governing bodies of relevant CMS instruments to also approve this interpretation:

According to Article I (1) (c) (4) of the Convention, one of the conditions to be met for the conservation status of a species to be taken as “favourable” is that: “the distribution and abundance of the migratory species approach historic coverage and levels to the extent that potentially suitable ecosystems exist and to the extent consistent with wise wildlife management”. While there is a continued need to undertake conservation action within the historic range of migratory species, such action will increasingly also need to be taken beyond the historic range of species in order to ensure a favourable conservation status, particularly with a view to climate-induced range shifts. Such action beyond the historic range of species is compatible with, and may be required in order to meet, the objectives and the obligations of Parties under the Convention;

The 5th and 6th meetings of the Sessional Committee of the Scientific Council considered the text above and provided the following guidance:

1. Scenarios and actions

Four scenarios are considered, which cover the different statuses of migratory species with respect to climate-induced range shifts. In the following, the term “barrier” is used to refer to any factor that inhibits migratory species from expanding their range or acts as an impediment to connectivity of their migratory route.

2. Categorizing scenarios**i. Species not present throughout suitable range**

Some CMS-listed species have been so severely depleted that they only occupy a small part of the range that is climatically suitable for them, such as addax (*Addax nasomaculatus*), or are extinct-in-the-wild, such as scimitar-horned oryx (*Oryx dammah*).

ii. Species range limited by natural barrier(s)

As climate change degrades habitat in one location, it may not be possible for that habitat to naturally recover in adjacent areas. Examples include the coral reef systems used by hawksbill turtles (*Eretmochelys imbricata*). A related issue is where breeding or nesting grounds are required to stay geographically fixed, whilst foraging grounds are pushed away by climatic change, as may be the case for loggerhead turtles (*Caretta caretta*) and grey-headed albatross (*Thalassarche chrysostoma*).

iii. Species range limited by anthropogenic barrier(s)

Where there is no natural barrier to range expansion, there may instead be a barrier resulting from human activity. This is the case at nesting sites for seabird species such as the black-footed albatross (*Phoebastria nigripes*), where sea-level rise on islands may push birds to nest at higher latitudes and/or altitudes which are unsuitable due to the presence of invasive predators and human disturbance. Anthropogenic barriers may also be present at boundaries between Regional Fisheries Management Organisations (RFMOs) where a range expansion may take species into seas with different bycatch mitigation standards.

iv. Species range likely to be limited by anthropogenic barrier(s) in future

Even where there is currently capacity for species to adapt their movements in response to climate change, there may be a probability that these future habitats will undergo changes that will make them unsuitable. This is particularly an issue in the Arctic, where retreating sea ice is permitting greater navigation and therefore more industrial activity. While much of the Arctic could currently accommodate poleward shifts of species such as bowhead whale (*Balaena mysticetus*), by the time these range shifts occur the Arctic marine environment may be further developed and thus less accommodating than it is today. Similarly, wetlands that are currently unused by waterbirds and under consideration for development may become more in demand as stopover sites due to sea-level rise. Finally, the advance of aridification in the Sahara and changing rainfall in the Sahel could push species such as dorcas gazelle (*Gazella dorcas*) to compete for habitat with land increasingly needed for agriculture.

3. A framework for action

The following decision framework is influenced by approaches to ecosystem observation and management in fisheries (Link, et al., 2020); by decision science used to prioritize conservation (Xiao, et al., 2021) and by ranking of research priorities (Rushing, et al., 2020) for migrating birds. It is intended as a basis for engagement between Range States and for prioritization of actions for migratory species at risk from climate change. By combining this framework with careful analysis of scientific evidence for each species, strategies can be focused on actions that make best use of resources to protect species and their migration routes.

The Decision Framework considers four strategies: conservation, restoration, adaptation and translocation. The framework aims, first, to define and categorize the ecological, logistical, societal, financial and policy conditions that must be met for these strategies to be viable for migratory marine species experiencing climate change–induced range shifts.

4. Strategy definitions, timescales and scales of action

The definitions of each of the strategies below are for the purposes of the Decision Framework only.

i. Conservation

Conservation refers to the protection and management of existing habitat within the projected future range of a species or population to prevent further decline.

Examples of conservation strategies include setting aside buffer zones inland from current coastal wetlands (Wikramanayake, et al., 2020), and the limiting of industrial expansion into the Arctic, the latter perhaps utilizing tools such as the World Wildlife Fund (WWF) ArcNet 29.

ii. Restoration

Restoration refers to the active recovery or rehabilitation of degraded, damaged or destroyed habitats or populations to their former, functional or resilient states.

Examples of restoration strategies include the active removal of invasive predators from potential seabird nesting sites (Reynolds, et al., 2015) and enhanced bycatch mitigation measures across fishery boundaries to promote natural restoration (Krüger, et al., 2018).

iii. Adaptation

Adaptation refers to the process of adjusting conservation and management practices to respond to the current and anticipated impacts of climate change and other large-scale environmental changes for migratory species and their current habitats.

For example, loggerhead turtles are long-distance migratory species that return to specific beaches to nest. The sex of hatchlings is determined by sand temperature during incubation, with warmer sands associated with the production of more females. An adaptation example could be shading nests to cool sand in order to restore sex ratios.

iv. Translocation

Translocation refers to the intentional movement of individuals to establish, re-establish or reinforce a population in a suitably new or former habitat.

Examples of translocation strategies include the reintroduction of captive addax (*Addax Nasomaculatus*) into protected areas of north Africa (Newby, et al., 2016), and the use of light aircraft to guide Siberian crane (*Leucogeranus leucogeranus*) migration (the “Flight of Hope” project) in Russia.

Planning time frame: 2100

To ensure the long-term persistence, recovery and ecological functionality of species under climate change, it is critical that conservation, restoration, adaptation and translocation actions are designed with a forward-looking perspective. The year 2100 is widely accepted as the standard long-term time horizon in climate science, serving as the endpoint for most global and regional climate models, including those used by the Intergovernmental Panel on Climate Change (IPCC).

Using 2100 as the planning horizon provides a scientifically grounded and policy-relevant time frame for evaluating the viability and effectiveness of management interventions. Climate projections through 2100 incorporate a range of plausible future scenarios (e.g., Shared Socioeconomic Pathways²), allowing decision makers to consider uncertainty and plan for a diversity of outcomes across temperature, precipitation, sea-level rise and extreme events.

² Shared Socioeconomic Pathways (SSPs) are climate change scenarios of projected socioeconomic global changes up to 2100 as defined in the IPCC Sixth Assessment Report on climate change in 2021.

Many species have long life cycles, rely on persistent habitat conditions, or are already facing cumulative pressures. Therefore, short- to mid-term planning (e.g., through 2050 or 2070) will probably underestimate the scale and duration of environmental change experienced. The 2100 benchmark ensures that actions account not only for current suitability but also future climatic stability. This is particularly important for species with migratory behaviour, specialized habitat needs or narrow environmental tolerances.

However, some decisions may warrant a different time horizon depending on the species, ecosystem or management context. The table below outlines commonly used time frames, their corresponding model coverage and intended use:

Time Horizon	Model Coverage
2025–2040	Near-term projections
2041–2060	Mid-century projections
2061–2100	Long-term projections

Scales of action: population, sub-population and species-level planning

Climate change does not affect all populations within a species uniformly; local conditions, adaptive capacity and exposure vary widely across a species' range. As such, conservation and management actions should be considered at multiple biological scales:

Species level: When climate threats or range shifts affect the entire species distribution or when actions (e.g., large-scale translocation or habitat corridor development) are required to ensure overall persistence.

Population level: When distinct, geographically separated populations face different climate exposures, making them unequally vulnerable to range shifts, habitat loss or genetic bottlenecks.

Sub-population level: When local adaptations, behaviours (e.g., nesting sites, breeding grounds) or ecological conditions demand site-specific strategies.

Managers must evaluate the appropriate scale for action based on ecological distinctiveness, connectivity, demographic trends and conservation value. For example, a sub-population in a climate refuge may require habitat protection, while a more exposed population may warrant assisted migration or genetic support. Multi-scale planning allows for targeted action where it is most needed, while also supporting overall species resilience.

In practice, this means that decision frameworks should include criteria to:

- Assess whether range shifts affect the entire species or only specific populations
- Determine the feasibility and ecological justification for intervening at smaller scales
- Evaluate how local actions contribute to or potentially conflict with broader species conservation goals

5. Core conditions

i. Conservation

- Suitable habitat lies within a region that is projected to remain or become climatically suitable for the species (or population), or can be managed to retain suitability under future climate scenarios
- Viable wild populations still exist
- Species is still occupying critical parts of its natural range
- Breeding and migratory behaviour remain functional
- Threats (e.g. bycatch, pollution, habitat loss) are ongoing but manageable or abatable
- Critical habitats (breeding, feeding, stopover sites) are still intact or partially degraded
- Genetic diversity is sufficient to support natural reproduction
- There are no natural or human-made barriers preventing access to suitable habitat, or if such barriers exist, they can be removed in a logistically and cost-effective manner

ii. Restoration

- Suitable habitat lies within a region that is projected to remain or become climatically suitable for the species (or population), or can be managed/restored to retain suitability under future climate scenarios
- The current or projected habitat conditions are degraded or unsuitable for sustaining the target species or population
- Habitat degradation is reversible (e.g. through reef recovery, wetland rewetting) and manageable long-term
- Environmental conditions (e.g., water quality, vegetation) and ecological interactions (e.g., prey availability) can be restored to a functional state
- Sufficient source populations exist for natural or assisted [re]colonization
- Restoration will not result in harmful ecological imbalances (e.g., trophic cascades, disease transmission)

iii. Adaptation

- Suitable habitat within the species' natural range is currently unavailable or too limited in extent or quality to support a viable population
- Suitable habitat conditions can be actively created or modified to support species persistence under current and/or projected climate scenarios
- The actions required (e.g., water management, shading, erosion prevention) are logistically and financially feasible long-term

iv. Translocation

- The habitat is climatically suitable at the time of translocation and projected to remain suitable for meeting the behavioural and environmental needs of the species (or population) across all life stages
- Natural [re]colonization is not possible or too slow
- Threats (natural or human) at the release site are low or manageable
- Individuals can survive and reproduce at the new site without human intervention

- The species' movement or habitat use is flexible enough to allow establishment
- Risk of disease introduction at the candidate site is low
- Risk of competition or predation on other at-risk species in the candidate site is low
- Risk of hybridization with another species in the candidate site is low
- Donor populations are genetically diverse and can withstand removal of individuals
- Monitoring of both the source and translocated populations is financially feasible. Required monitoring includes assessments of genetic fitness, reproductive success, survival rates, predator-prey interactions, habitat use, and overall population health
- It is logistically and financially feasible to move a sufficient number of individuals to establish a viable, self-sustaining population in the new habitat
- There are no significant social or cultural barriers that would prevent or undermine the success of the translocation effort, and local communities and stakeholders are informed, engaged and supportive of the action

At each stage of the decision process, other factors will have to be taken into account, such as cost (Shoo, et al., 2013) and the potential risks and benefits incurred by other species that share the habitats in question. In particular, any attempt at translocation – either for assisted colonization or recolonization – should follow the International Union for Conservation of Nature (IUCN) Guidelines for Reintroduction and Other Conservation Translocations.

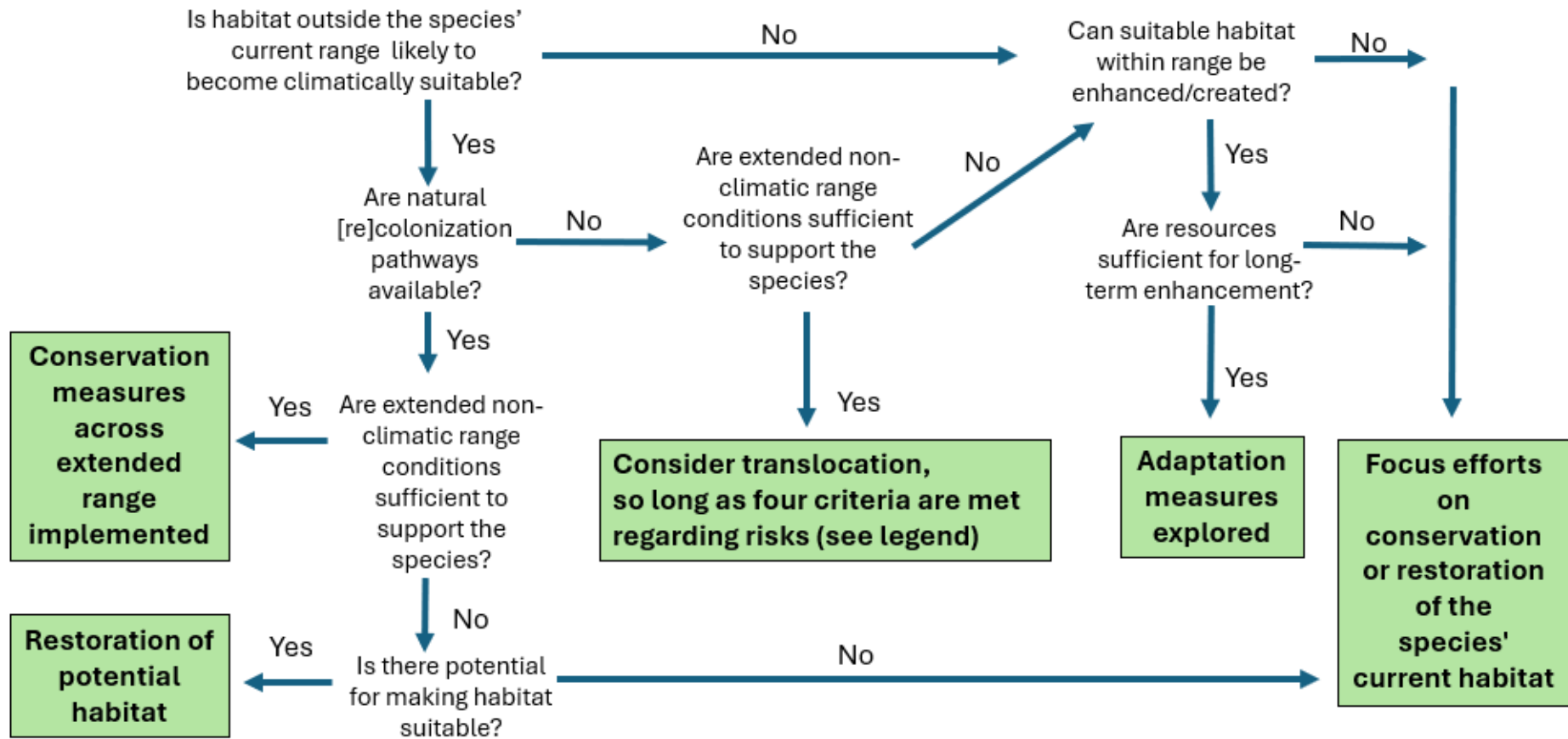


Figure 1. A Decision Support Framework to guide actions in support of migratory species experiencing climate change–induced range shifts. In all cases the climatic envelope in the medium term should be sufficient to sustain the habitat. Four criteria to be met if considering translocation to establish viable population: a) Source population sufficiently large and genetically diverse and resilient to withstand donating individuals; b) Risks of unintended ecological consequences are low; c) Operations, including long-term ecological and genetic monitoring of translocated and source populations, are logistically and financially feasible and viable; d) Social and cultural barriers do not exist, and there is evidence of community support.

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