Assisted Migration: A Viable Conservation Strategy to Preserve the Biodiversity of Threatened Island Nations?

Jessica Wentz
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I. Introduction

Anthropogenic climate change poses a substantial threat to biodiversity. The IPCC estimates that 20-30% of species will face an increased risk of extinction if the average global temperature rises more than 1.5 to 2.5 degrees Celsius.[1] Additional scientific studies indicate that 15-37% of species may become extinct by 2050 due to global warming, based on current emissions trajectories.[2] Domestic and international strategies to manage this threat have traditionally focused on conservation and mitigation. In the last few years, however, policy makers have recognized that near-term climate impacts are inevitable and thus adaptation strategies are required to protect both humans and ecosystems.

Endemic species on low-lying islands are particularly vulnerable to climate change impacts, such as rising sea levels, storm surges and shifting bio-climactic envelopes. These endemic populations occupy relatively fragile eco-systems, which have already been substantially degraded by human activities and are now disappearing at a rapid pace.[3] Species that cannot migrate to more suitable locations face imminent extinction, both from direct loss of habitat and indirect climate impacts (such as the rising incidence of avian disease and parasites as temperatures increase).

Thus, climate change raises special concerns for areas like the Micronesia-Polynesia Biodiversity Hotspot, an area comprising approximately 4,500 islands in the South Pacific, consisting of 11 countries, 8 territories and Hawaii, where over 50% of the species are endemic.[4] This region has been identified as one of 12 hotspots that are most vulnerable to climate change, because it exhibits "relatively high biome change and low migration rates."[5] Other island hotspots on this list include the Caribbean, New Caledonia, New Zealand, Indo-Burma and the Mediterranean Basin. In many of these areas, especially

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[1] Intergovernmental Panel on Climate Change, Summary for Policymakers: Climate Change 2007: Impacts, Adaptation, and Vulnerability: Contribution of Working Group II to the Fourth Assessment Report of the IPCC 7, 11 (2007).

[2] Chris D. Thomas et al., *Extinction Risk from Climate Change*, 427 Nature 125 (2004).

[3] Michael Parfit, *Hotspot: Islands of the Pacific*, National Geographic (2003), available at: http://ngm.nationalgeographic.com/ngm/0303/feature5/index.html.

[4] Jay R. Malcolm et al., *Global Warming and Extinctions of Endemic Species from Biodiversity Hotspots*, 20 Conservation Biology 538 (2004); Norman Meyers et al., *Biodiversity hotspots for conservation priorities*, 403 Nature 853 (2000); Conservation International, “Biodiversity Hotspots” (2010), http://www.biodiversityhotspots.org/Pages/default.aspx.

[5] Malcolm et al. (2004), supra note 4, evaluated the potential impacts of a "doubled CO2 climate in 100 years" on biodiversity hotspots; estimated that 3334 endemic plant and 223 endemic vertebrate species reside in the Micronesia-Polynesia hotspot; calculated broad range of potential endemic extinction rates (in 100 yrs) for the region, based on different climate modeling scenarios and biome definitions - from 2.2% to 58.2%.

the Polynesia-Micronesia hotspot, traditional conservation strategies such as bigger preserves and connecting corridors will not be sufficient to protect many endemic species from extinction.

One potential strategy to preserve biodiversity on low-lying islands is assisted migration. This process, also known as "assisted colonization" or "managed relocation," involves actively moving threatened species into new, more suitable habitats that are not necessarily within their historical range.[6] Significant debate has arisen over the ethical implications and technical viability of this strategy. Whereas proponents of assisted migration argue that active eco-system management is necessary in the face of climate change, opponents are concerned that the risk and uncertainty would outweigh any benefits. The core disagreement is whether this strategy will actually protect or enhance biodiversity.

There are very few laws or policies that explicitly regulate assisted migration as a conservation strategy. There are, however, many legal restrictions on the movement of species under both domestic and international law. Some of these laws restrict the species being moved (e.g., takings prohibitions), whereas others are designed to protect the relocation area (e.g., conservation zones, import restrictions). Although these laws may limit the design and scope of assisted migration projects, there are still many opportunities for private actors to implement such projects, even in heavily regulated countries like the United States and Australia. There are also domestic, regional and international instruments that could provide political, institutional and financial support for assisted migration, or at least preparatory activities such as data collection, climate modeling and ex-situ conservation.

Both private actors and governmental agencies have already implemented small-scale relocation projects, with some success, including several projects in the South Pacific to protect endangered birds from predators and habitat loss.

Section II of this paper provides an overview of assisted migration, its potential risks and benefits, and technical viability with respect to endemic species on threatened islands. Section III discusses the existing legal framework for implementing relocation projects, describing a number of mechanisms that may either facilitate or impede these activities.

II. Assisted Migration - Overview

The exact definition of "assisted migration" depends on the perceived distinction between man and nature. Whereas Vitt et al. (2010) describe assisted migration as "the purposeful movement of

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[6] Alejandro E. Camacho, *Assisted Migration: Redefining Nature and Natural Resource Law under Climate Change*, 27(2) Yale Journal on Regulation 171 (2010); Paul Vitt et al., *Assisted migration of plants: Changes in latitudes, changes in attitudes*, 143 Biological Conservation 18 (2010).

species to *facilitate or mimic natural range expansion*," Camacho (2010) defines it as "the deliberate movement of non-human refugees to a new area for which they are *believed to be better suited* due to projected changes in climate."[7] In the latter definition, there is no "natural" or "historic" baseline—only subjective opinion about what is beneficial for the purposes of biodiversity.

The distinction between these two definitions, although subtle, could have a substantial impact on policy choices and project design. When evaluating relocation sites, for example, is it preferable to mimic natural range expansion, or to abandon the distinction between "unnatural" and "natural" in favor of a utilitarian / functionalist perspective on eco-system suitability? These two methodologies are clearly interrelated: conservation policy pursues a natural baseline in order to promote high-functioning ecosystems. However, many assisted migration scholars argue that the pursuit of a historical, pre-human, or natural baseline is no longer feasible in the context of global climate change, and therefore should not be used as an automatic proxy for high-functioning ecosystems. Rather, policy should focus on promoting biodiversity and fortitude in the present and future.

A. Climate Change Adaptation

As noted above, "the justification for assisted migration starts with climate change—how it is fundamentally different from other environmental stressors, and how dramatic action is necessary to avert the damage it might cause to the world's biodiversity."[8] Environmental conditions are changing rapidly: the average global temperature has increased by approximately 1.6 degrees Fahrenheit since 1880,[9] sea levels are rising,[10] and bio-climactic envelopes are shifting.[11] In 2009, the National Oceanic and Atmospheric Administration (NOAA) concluded that, even if global emissions were halted at century's end, the CO2 concentrations would lock in rising sea levels (and other impacts) for at least

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[7] Vitt et al. (2010), supra note 6, at 19; Camacho (2010), supra note 6, at 174.

[8] Camacho (2010), supra note 6, at 179.

[9] Carl Zimmer, *A Radical Step to Preserve a Species: Assisted Migration*, New York Times, January 23, 2007, available at: http://www.nytimes.com/2007/01/23/science/23migrate.html.

[10] IPCC (2007), supra note 1, estimates 7 to 23 inches (18-51 cm) of sea level rise by 2100, based on six different scenarios.

[11] Vitt et al. (2010), supra note 6, from abstract: "Rapid climate change has the potential to alter the location of bioclimatic envelopes for a significant portion of the world's flora."

1000 yrs.[12] Thus, climate change "threatens to move ecosystems outside their historic variability at an exceptionally fast rate."[13]

Researchers have already documented natural adaptation to these changes: "many plant species are now budding earlier in the spring. Animals migrate earlier as well. And the ranges of many species are shifting to higher latitudes, as they track the climate that suits them well."[14] Of the various adaptation mechanisms, migration is the fastest and only option for many species. Climate change impacts "have already led species to shift their ranges" and many more will "need to shift their geographic distributions markedly or go extinct, as the locations they currently occupy will become unsuitable for them."[15] In particular, species will need to "move quickly" to keep up with rapidly shrinking / shifting habitats, and "species that are already limited to small ranges may not be able to survive the loss."[16] Some estimates suggest that, by 2050, "up to two-thirds of species will need to migrate or be moved to new habitats to survive."[17]

There are a number of barriers to migration. Some species are "unable to shift because there is no suitable habitat to serve as a bridge to adequate ecological conditions."[18] Others "face an obstacle course made of cities, farms and other human settlements."[19] Conservationists have emphasized the need to remove or prevent such barriers:

> In the context of future climate change, the greatest survival limitation for many species is not their ability to adapt, nor even their intrinsic ability to migrate appropriately, given a landscape with sufficient connectivity. The most significant hurdle is that the landscapes across which they will need to move lack connectivity, and scenarios in the latter half of this century predict increasing fragmentation and decreasing effectiveness of corridors, which will impact species differentially.[20]

Species that are confined to isolated and disappearing habitats—such as islands and mountains—create the greatest challenge. Because traditional strategies to preserve corridors will not facilitate migration in

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[12] NOAA, State of the Climate Global Analysis (January 2009), available at: http://www.ncdc.noaa.gov/sotc/global/2009/1.

[13] Camacho (2010), supra note 6, at 180.

[14] Zimmer (2007), supra note 9, at 1.

[15] Camacho (2010), supra note 6, at 180- 181.

[16] Zimmer (2007), supra note 9, at 2.

[17] Camacho (2010), supra note 6, at 181.

[18] *Id*. at 182.

[19] Zimmer (2007), supra note 9, at 2.

[20] Vitt et al. (2010), supra note 6, at 19.

this context, scientists now recognize that "translocation of [such species] to locations outside their historic range where conditions will be suitable in the medium- to long-term may be the only strategy to prevent extinction."[21]

B. Ethical Implications

Opponents of assisted migration have expressed concern that humans would be playing god, tinkering with nature's creation, and obliterating the distinction between natural and unnatural.[22] This fear is closely connected to the technical concern that we lack the information and capacity to effectively and safely make these types of decisions.[23]

According to this argument, the traditional "preservation" or "land ethic" that underlines much of modern environmental policy prescribes a more passive role for humans in the management of natural resources. Within this framework, conservation efforts should focus on facilitating natural range shifts by maintaining and restoring large-scale connectivity, and working with "fellow environmental professionals to avoid carbon-management solutions that will have unacceptable consequences for biodiversity."[24] These goals echo the precautionary principle, which dictates that unnecessary risk should be avoided, and the burden of disproving risk rests with the acting party. Opponents of assisted migration assert that practitioners cannot meet this burden, due to the current lack of information and predictive capacity, and therefore this strategy constitutes "ecological gambling" which would contradict the precautionary principle.[25] This concern is most acute with respect to projects implemented by private actors, with little or no government oversight.

Advocates of assisted migration respond to ethical concerns on two grounds. First, they assert that this strategy does not require a complete departure from the preservation ethic. Rather, relocation projects would complement other conservation activities, so long as they are implemented safely and

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[21] O. Hoegh-Guldberg, et al., *Assisted Colonization and Rapid Climate Change*, 321 Science 345, 346 (2008).

[22] Julio L. Betancourt, *Adaptive Management of Climate Change Impacts on Ecosystems: Some Personal Perspectives*, U.S. Geological Survey, Tucson, Arizona (2008).

[23] Anthony Ricciardi & Daniel Simberloff, *Assisted Colonization is not a viable conservation strategy*, 24 Trends in Ecology and Evolution 248 (2009).

[24] Malcolm L. Hunter Jr., *Climate Change and Moving Species: Furthering the Debate on Assisted Colonization*, 21(5) Conservation Biology 1356 (2007).

[25] Ricciardi & Simberloff (2009), supra note 23, at 248.

effectively.[26] This will probably require additional regulations at various levels of government, to ensure that certain protocols and standards are met. In the context of an adequately protective legal framework, assisted migration could be used to expand the portfolio of conservation options and buy additional time for mitigation efforts.[27]

Second, as described by Camacho (2010), any "categorical ethical claims" against actively interfering with nature are somewhat illogical:

> First, any attempts to safeguard notions of wild and uncontrolled natural systems are belated and artificial in a world in which climate change was caused by human alterations of the environment. Second, though a singular focus on protecting endangered species would be myopic, so would a fixation on maintaining preexisting biota... Third, there is scant ethical foundation for categorically arresting the evolution of preexisting ecosystems or dedicating increasing levels of limited resources to actively trying to return ecosystems to what is essentially an arbitrary historic state.[28]

Camacho notes that, because "human involvement in natural systems is inevitable," there is a "credible argument for an ethical duty to at least consider more active approaches like assisted migration as a way to reverse the effects of climate change."[29]

C. Technical Feasibility

Some scientists have expressed doubt that assisted migration is an effective strategy for conserving biodiversity, arguing that this strategy is neither cost-effective nor does it guarantee the preservation of biological diversity. The following sections discuss some of the specific concerns, particularly that such projects would typically involve a low potential for success, high biological risk, and significant uncertainty.

1. Potential for Success

With respect to cost-effectiveness, opponents argue that manually relocating species is relatively inefficient due to high administrative costs and low success rates, and thus it would be more prudent to allocate scarce resources to other strategies. Both sides acknowledge that assisted migration is a potentially costly endeavor—it requires careful planning, implementation and long-term monitoring.

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[26] Kayri Havens, Ove Hoegh-Guldberg, & Pati Vitt, *Assisted migration: part of an integrated conservation strategy,* 24 Trends in Ecology and Evolution 473 (2009).

[27] Hunter (2007), supra note 24, at 1356.

[28] Camacho (2010), supra note 6, at 210-211.

[29] *Id*. at 226-227.

The primary concern is that these costs are not justified by the potential benefits. Indeed, the success rate of relocation projects has been inconclusive (approximately 50%). As described in one study:

> Our collective experience with species reintroductions suggests that the risk of failing to establish a viable population under AM could be greater than the risk of unintentionally creating an invader (Van Andel & Grootjans 2006). For example, Wolf et al. (1996) found that 58% of all threatened bird and mammal translocations fail to establish self-sustaining populations.[30]

Because there are still significant technological limitations (i.e., many unknown or unpredictable factors), the likelihood of success among specific projects will vary considerably.[31] Additional research to improve available information as well as the capacity to make predictions will be necessary in order to reduce uncertainty in this context.

Proponents of assisted migration assert that the actual cost and success of any relocation project will depend largely on the scope and nature of the activity, and therefore costs can be mitigated by careful project design. Significant factors include the biology of the target species, the choice of relocation site, and the procedures used to reduce risk and uncertainty.[32] Moving plants, for example, will be less expensive than moving live animals—ex situ measures, in particular, will be less expensive in the short-term than implementing all phases of a relocation project. The scale of the project is also a major factor—even with seed banking, the cost of implementing a wide-scale project can be substantial.[33]

Proponents acknowledge that there may be a trade-off between effectiveness and risk, because smaller projects are safer but "success is more likely as the number of individuals introduced and the number of introduction events increase."[34] Also, the species that are most likely to thrive in new locations often share the same characteristics as invasive or pest species (dominant biological roles, predatory traits).[35] Some balance will need be struck between the potential for a successful colonization, and the risk posed to other species in the relocation area.

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[30] Jillian M. Mueller & Jessica J. Hellmann, *An Assessment of Invasion Risk from Assisted Migration*, 22 Conservation Biology 562, 566 (2008).

[31] J. Fischer & D. B. Lindenmayer, *An assessment of the published results of animal relocations*, 96 Biological Conservation 1 (2000).

[32] Hunter (2007), supra note 24, at 1357.

[33] Vitt et al. (2010), supra note 6, at 23: Seeds of Success (SOS) Program in U.S. estimates that it will cost approximately $500 million / take 10 years to collect / bank the entire US Flora (~15,000 species) and develop restoration protocols and bulked seed for 1000 species.

[34] Camacho (2010), supra note 6, at 184-185.

[35] R. B. Allen et al., *Updated Perspectives on Biological Invasions in New Zealand*, 186 Ecological Studies 435 (2006).

2. Biological Risk

The second technical concern is that relocating species involves so much risk and uncertainty that it may actually "decrease biodiversity rather than increase it."[36] Scientists view the potential to "erode biodiversity and disrupt ecosystems" as the primary cost or disadvantage of assisted migration projects.[37]

The main risk is that such projects may "inadvertently establish populations that harm their new environment in a manner similar to an invasive species."[38] There is no question that "invasive species have played a major role in extinctions and can cause substantial changes to biotic communities."[39] They are "among the biggest threats to biodiversity in some parts of the world," especially island and coastal habitats like the Micronesia-Polynesia hotspot.[40] It can be difficult to predict whether a species will be invasive, and the degree of harm that it will cause to a particular ecosystem.[41] Many exotic species have caused "considerable ecological and economic harm, whether intended for commercial, aesthetic, or recreational purposes."[42] Although most of these introductions were accidental, some species "were intentionally moved with great confidence that they would do no harm."[43]

The threat of invasive species is not the only biological risk of relocation. Introduced species may bring diseases or parasites, to which local populations have no resistance.[44] It is also possible that there could be "genetic consequences to existing populations that overlap with human-migrated ones."[45] Specifically:

> Moving maladapted genotypes into the target zone and interbreeding of native and translocated populations leading to the disruption of co-adapted gene complexes... may also result in cryptic invasions or genetic swamping, where a single genotype becomes dominantly

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[36] Camacho (2010), supra note 6, at 186.

[37] Ricciardi & Simberloff (2009), supra note 23, at 248.

[38] Mueller & Hellmann (2008), supra note 30, at 563.

[39] Camacho (2010), supra note 6, at 186.

[40] Zimmer (2007), supra note 9, at 3.

[41] Camacho (2010), supra note 6, citing: Rachel A. Levin et al., *Family-level Relationships of Onagraceae Based non Chloroplast RBCL and NDHF Data*, 90 American Journal of Botany 107 (2003).

[42] Camacho (2010), supra note 6, at 185.

[43] Zimmer (2007), supra note 9, at 3.

[44] Martin Wikelski et al., *Galapagos Birds and Diseases: Invasive Pathogens as Threats for Island Species*, 9 Ecology and Society 5 (2004).

[45] Vitt et al. (2010), supra note 6, at 19.

representative (e.g. *Phragmites australias*), although this generally arises from intercontinental movements that cause closely related taxa, without reproductive barriers, to meet anew. [46]

Thus, introducing new species—especially across long distances—may weaken the overall fortitude of the genetic pool in a receiving habitat.

There is also a risk of disruption to the translocated species—vulnerable populations are "likely to be less able to endure the loss of even a few members to a failed introduction effort."[47] Scientists have expressed concerns about harming individual animals, as well as "collecting large amounts of seed from natural populations, as this may diminish their genetic diversity or vital rates."[48] This is especially problematic where there is a low probability of success.[49] That said, the concern of harming the target species is less salient where the species faces imminent extinction and irreversible habitat loss.

3. Uncertainty

The core issue underlying concerns about both success rate and biological risk is the "considerable uncertainty [that] arises from any evaluation of assisted migration."[50] Opponents argue that "existing uncertainties confound reliable risk assessment on the feasibility of AM, making its current use perilous and even foolish."[51] Without a better understanding of eco-system interactions and climate change effects, assisted migration could "interfere with habitat preservation and restoration and compete with such efforts for resources."[52] In particular, we lack relevant data pertaining to species distribution, how they adapt to climate change, etc., as well as the "present capacity to obtain such information because of uncertainties in climate modeling."[53]

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[46] Vitt et al. (2010), supra note 6, at 19.

[47] Camacho (2010), supra note 6, at 184.

[48] Vitt et al. (2010), supra note 6, at 21.

[49] Mueller and Hellman (2008), supra note 30, at 566: "Wolf et al. (1996) found that 58% of all threatened bird and mammal translocations fail to establish self-sustaining populations, *but each unsuccessful attempt requires extraction from an at-risk source population*."

[50] Camacho (2010), supra note 6, at 186.

[51] *Id*. at 186.

[52] Richard Stone, *Home, Home, Outside the Range?* 329 Science 1592, 1593 (2010).

[53] Camacho (2010), supra note 6, at 186.

D. Mitigating Risk and Uncertainty

Proponents of assisted migration argue that we can mitigate risk and uncertainty, and increase the success rate of projects, with careful planning, implementation and oversight. These advocates acknowledge that the benefits of assisted colonization must be weighed against the risks of extinction and eco-system loss, and that "data gaps must be filled before the approach is ready for prime time."[54] They also note that the risk of inaction must be weighed against other risks, because it could entail the "significant, irreversible loss of biogenetic information."[55] Thus,

> The precautionary principle is not a stand-alone reason to rule out managed relocation... in the context of managed relocation, 'precaution' cuts both ways, as a motivation to avoid relocations that might cause unwanted harm and as a motivation to act before a species is driven extinct by climate change.[56]

Because extinctions are "permanent and irreversible," proponents recognize that "using managed relocation to reduce extinctions at the cost of changing the composition and functioning of ecosystems is a tradeoff that some managers might be willing to make."[57]

Furthermore, the actual degree of uncertainty in this context is debatable. Several studies indicate that we know more about the impacts of species invasions than the opposition asserts, and that the success rate of relocations is increasing due to improvements in technology and data.[58] For example, "extinctions are generally caused by predation as opposed to competition," and scientists can select non-predatory species for relocation.[59] An overview of past introductions illustrates that "most invasions appear to have only minor impacts, and these impacts are not necessarily detrimental."[60] In

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[54] Stone (2010), supra note 52, at 1593; *See also:* United Nations Environment Programme, Climate Change Science Compendium 2009: Systems Management, available at: http://www.unep.org/compendium2009/.

[55] Climate Change Science Compendium (2009), supra note 54.

[56] Dov F. Sax et al., *Managed relocation: a nuanced evaluation is needed*, 24 Trends in Ecology and Evolution 473 (2009).

[57] Sax et al (2009), supra note 56, at 473.

[58] Stone (2010), supra note 54, at 1594 (quoting Dov Sax): "of the 1049 deliberate releases for the biological control of weeds in the past 100 years (Kluge 2000), only 8 have caused damage to non-target organisms… Of these 8, damage was anticipated in 5 cases and was minor in all but 1… for instance, extinctions facilitated by exotic species occur primarily on islands (>90%) as opposed to continent." (Translocation of butterfly species in England - first "AC field trial" - was relatively successful, Sax says it "makes a strong case that managed relocation is feasible"). *See also*: Stephen G. Willis et al., *Assisted colonization in a changing climate: a test-study using two U.K. butterflies*, 2(1) Conservation Letters 46 (2009).

[59] Sax et al. (2009), supra note 56, at 473.

[60] *Id*. at 473.

fact, "many exotic species provide important ecosystem services; for example, invasive aquatic plants can maintain water quality and provide habitat for native species."[61]

Studies also indicate that, although the intercontinental movement of species has resulted in some invasive problems, the vast majority of introduced species do not become invasive.[62] Specifically, the Vitt et al. (2010) found evidence that "less than 1% of species become invasive when imported to a new range, and only a small percentage of those (7.5% of invasives in the US) are a result of intra-continental introductions."[63]

1. Project Selection

Many scientists assert that the potential "damage" (i.e., invasion risk) should be the principle factor when determining whether and how to implement a relocation project. Hoegh-Guldberg (2008) developed parameters to "identify low-risk situations where the benefits of [AM] can be realized and adverse outcomes minimized."[64] This decision-making framework "can be used to outline potential actions under a suite of possible future climate scenarios" and involves three main inquiries:

> (1) Is there a high risk of decline or extinction under climate change? If not, an alternate conservation strategy would be preferable.
>
> (2) Are translocations and establishments of the species technically possible? If not, the framework recommends either creating habitat (e.g., artificial reef, wetlands) at higher latitudes to accommodate "natural movement", or using ex situ conservation practices (e.g., store egg/sperm/seed).
>
> (3) Would the benefits of translocation outweigh the biological and socioeconomic costs and restraints?

If all three conditions are all met, then Hoegh-Guldberg (2008) recommend undertaking translocation. Similar frameworks have been suggested for the selection of specific sites and species.[65]

Camacho (2010) recommends a similar framework for project selection—a "justifiability cautious approach" that would restrict assisted migration to situations where:

- it is technically and economically feasible
- the species is at high risk of extinction in its current location and has substantial ecological value

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[61] Sax et al. (2009), supra note 56, at 473.

[62] Mueller and Hellmann (2008), supra note 30, at 563.

[63] Vitt et al. (2010), supra note 6, at 19.

[64] Hoegh-Guldberg et al. (2008), supra note 21, at 345.

[65] See Section E: Implementation, at page 21.

- the species could be relatively easily removed or contained on the target site
- introduction is unlikely to cause substantial harm to proposed site
- the proposed site is and will likely be compatible with the introduced population for a substantial period.[66]

These frameworks implicate three types of inquires relating to the selection and design of assisted migration projects. Specifically, practitioners need to identify: (1) species that are more or less acceptable to translocation; (2) sites that are more or less acceptable for receiving translocations; and (3) projects that are more or less acceptable because of their socioeconomic ramifications and feasibility.[67]

Rather than viewing assisted migration as a "last-alternative option after interrogating a linear decision tree", Richardson (2009) argues for a "more inclusive" evaluation of this strategy.[68] Specifically, he asserts that the "pace of modern climate change demands decision making with imperfect information," and that we can use "tools that elucidate this uncertainty" while still taking action.[69] Rather than prescribing hard rules, this study identifies the Ecological and social considerations for evaluating individual projects, including

Controlling invasive species is a major concern, but as indicated by these frameworks, there are criteria for assessing the potential for this risk. For example, "severe invasions are likely to occur when invaders are from genera not represented in the native community… and introduced species least related to species in their introduced range are the most invasive."[79] Additional precautions will be necessary when a species is selected to fill a niche gap, transported across a long distance, or has dominant / predatory characteristics. Species that reproduce quickly or have strong ecological roles may be poor candidates for assisted migration. That said, some of the most vulnerable and low-risk species (i.e., slow reproduction rate, limited range and impact) may fail to establish a population or otherwise thrive.

The distinction between a useful keystone species and an invasive pest is not always clear. As noted in one study, "invasion is not simply about dispersal and establishment... successful invaders ultimately become an integral part of the biota, changed by their environment, and in turn, changing it."[80] Island eco-systems, for example, are particularly vulnerable to invasion, but this is not always a detriment to biodiversity in such habitats.[81] Recent research indicates that, by filling these gaps, invaders can actually increase biodiversity and overall species fortitude.[82] As noted above, some of the characteristics of invasive species that contribute to their fortitude and ability to adapt would also increase the probability of successfully relocation, and thus an adequate balance between fortitude and risk must be achieved when selecting species.

Scholars note that implementing this strategy may require a more subtle distinction between “invasive” and “pest” species. Indeed, assisted migration “confounds the definition of an invasive species because dispersal would be human-mediated and established populations would be outside of the species' native range."[83] Thus, a relocated species “would, in essence, be an invasive one… and it might thrive so well that it would start to harm other species.”[84] In this context, rather than

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[79] Mueller & Hellmann (2008), supra note 30, at 563, citing studies by: Lockwood et al. (2001); Ricciardi & Atkinson (2004); Strauss et al. (2006).

[80] M. McGlone, *Becoming New Zealanders: Immigration and the Formation of the Biota*, 186 Ecological Studies 17, 17 (2006).

[81] R.B. Allen, R.P Duncan & W.G. Lee, *Updated Perspective on Biological Invasions in New Zealand*, 186 Ecological Studies 435, 438 (2006): “due to their isolation, island biotas are often considered to be missing taxonomic and functional groups, creating opportunities for alien species to exploit those gaps.”

[82] Allen et al. (2006), supra note 81.

[83] Mueller and Hellmann (2008), supra note 30, at 565.

[84] Zimmer (2007), supra note 9, at 3.

automatically assuming that “non-native” and “successful” is always a problem, we should look at ecological role of the invasive species. [85]

There are certain taxonomic groups that will be more or less eligible for assisted migration. For example, moving freshwater fish between discrete bodies of water could be very risky, based on the disastrous results from past introductions both intentional and unintentional.[86] In contrast, many studies confirm that moving plants involves less risk, fewer costs, and higher success rates.[87] As described by Vitt et al. (2010):

> Translocating plants is nothing new. Humans have been moving plants, particularly edible, medicinal, and more recently ornamental, species throughout our history. Modern horticultural and agricultural industries are responsible for wide scale translocations… Restoration ecologists have been moving species from site to site for decades in attempts to revegetate marginal or highly impacted areas, or in response to large disturbances such as wildlife. Conservation biologists around the world have been translocating and reintroducing populations for decades ... Inter-continental translocation has also proven an important conservation tool to help species escape diseases driving them to extinction in their native range.[88]

Plants are also better candidates for ex-situ conservation measures. In particular, seed collection and banking is a low-risk, low-cost strategy to prepare for future relocation projects. Vitt et al. (2010) provide a useful set of guidelines for seed collection, to ensure that enough samples are collected for genetic diversity, but not too many so as to impact vital rates of the target population.[89]

3. Site Selection

Several frameworks have been recommended for identifying habitats where the selected species will be able to establish a population, and for reducing risks to the native habitat. Camacho

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[85] Zimmer (2007), supra note 9, at 3.

[86] Mueller and Hellmann (2008), supra note 30, at 565.

[87] *Id*. at 565: “Plants, in contrast, have a low risk of intra-continental invasion, and, given dispersal constraints for most plants, AM might be useful in this taxon."

[88] Vitt et al. (2010), supra note 6, at 19.

[89] *Id*. at 21. Table 1: (1) Collect from at least 50 maternal plants to capture 95% of genetic diversity; collect no more than 10-20% available seeds on any given day; collect from center and periphery of population density center, including even the smallest plants; collect a minimum of 3000 seeds, optimal target of 30,000 seeds; may be necessary to collect across years; keep records. (2) "Each seed collection must be accompanied by data to fully document the occurrence, including GPS coordinates, associated species and other habitat and population data" because this data is "essential for future restoration of these species to occur in matching habitats." (3) “[P]rocess of collection also provides an opportunity to collect baseline data on plant species distribution. Data on locality, population size, associated threats and phenology can be used over time to measure potential response to climate change, potentially providing an early warning system for the effects of climate change.” It may also "provide a baseline for evolutionary changes that occur in species as they adapt to climate change.”

(2010) recommends that we evaluate candidate sites based on: (1) projected climate and other abiotic conditions at the site and their likely compatibility with candidate species; (2) the site's biotic environment and its likely compatibility with a candidate species; (3) phylogenetic uniqueness of the target site or biota therein; (4) level of human presence or prior human "disturbance" at candidate site; (5) extent to which the target species can be removed from or at least contained on the site (i.e., the reversibility of the introduction); (6) ecological health or stability of the receiving ecosystem.[90]

Hunter (2007) also identifies a set of criteria for site selection, which are heavily influenced by the desire to mitigate risk and uncertainty. First, the "amount of disturbance at a potential translocation site is a significant issue;" good candidate sites may include places that have already been impacted by humans, as opposed to pristine wilderness - such as "cut-over forest that has experienced some extirpations and exotic invasions."[91] Second, the geographic isolation of a site can also have an important bearing on risk. The author notes,

> Moving species into a well-connected site that has experienced major changes in species composition as species have shifted their ranges in response to natural climate change would be far more acceptable than using a site that has long been an island (in the largest sense of the word, e.g., an isolated mountain or lake). Importantly, and often easier to measure, an isolated site will be more likely to harbor a unique biota such as endemic species and genetically differentiated populations. Conversely, because it would be wise to treat initial translocations as experiments, an ideal first site might be one that was well-connected historically, but is currently surrounded by human-dominated landscapes that might be a barrier if the translocated species had unacceptable effects.[92]

This raises issues about moving endemic species between islands in the South Pacific. Hunter's framework strongly cautions against using such sites, but then again, perhaps some low-lying islands could be used as experimental locations.

Third, Hunter recommends that any "paleobiological evidence (scarce for most taxa) that the site occurs within a species' long-term geographic range" should factor in favor of relocation. Fourth, "all other things being equal, a species-rich ecosystem may be less likely to be disrupted by a translocation than a species-poor ecosystem." [93] This final criteria may be controversial, due to concern about disrupting species-rich eco-systems. Other scholars seem to favor relocation in habitats that are

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[90] Camacho (2010), supra note 6, at 237.

[91] Hunter (2007), supra note 24, at 1357.

[92] *Id*. at 1357.

[93] *Id*. at 1357.

incomplete, or perhaps being rehabilitated (pursuant to Hunter's first recommendation).[94] In such contexts, the risk is lower and the potential benefit from a new species is higher.

Studies have identified a variety of methods for reducing risk in site selection. For example, it is beneficial to move short distances, preferably within a continent.[95] There is evidence that "risks escalate as species are moved across bio-geographical boundaries."[96] Based on past experiments and accidents, island-to-island and lake-to-lake scenarios can be especially dangerous.[97]

Additional research is needed to manage uncertainty in site selection. Specifically, "to identify regions where species can survive in a warmer climate… scientists need to know how climate controls the range of species today." [98] Unfortunately this information is lacking in many countries.[99] Assisted migration proponents recommend the use and continued development of climate modeling, GIS profiles, and species distribution algorithms to compensate for the lack of historical data.[100] As noted above,

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[94] *See e.g.,* Mueller & Hellman (2008), supra note 30; Vitt et al. (2010), supra note 6.

[95] Vitt et al. (2010), supra note 6, at 19: "Most discussions of assisted migration in the context of climate change involve moving species relatively short distances poleward or higher in elevation within a continent, and many focus on species with limited dispersal ability which are less likely to become weedy (Rejmanek and Richardson, 1996). In many anthropogenically fragmented habitats, migration assistance in the form of short distance jump dispersal or corridor creation may be necessary for species to survive. These types of dispersal pathways are less likely to result in enemy release and biological invasion than are long distance and mass dispersal. (Wilson et al., 2009)" ; "When introducing species to novel ranges, there may be genetic consequences to existing populations that overlap with human-migrated ones... moving maladapted genotypes into the target zone and interbreeding of native and translocated populations leading to the disruption of co-adapted gene complexes... may also result in cryptic invasions or genetic swamping, where a single genotype becomes dominantly representative (e.g. *Phragmites australias*), although this generally arises from intercontinental movements that cause closely related taxa, without reproductive barriers, to meet anew (Hufford and Mazer, 2003)." (Vitt et al. 2010 at 19); Many of the scenarios cited as providing evidence for the detrimental consequences of assisted migration (Ricciardi and Simberloff) involve intercontinental introductions or long-range translocation of species."

[96] Hoegh-Guldberg et al. (2008), supra note 21, at 346.

[97] Ricciardi & Simberloff (2009), supra note 23.

[98] Zimmer (2007), supra note 9, at 3.

[99] *Id*. at 3.

[100] See Vitt et al. (2010), supra note 6, at 21: Species Distribution algorithms - like Maximum Entropy (MaxEnt) / BioClim (Diva-GIS) (Busby, 1991) - can be used to infer the potential niche of a species (aka "bioclimatic envelope"). MaxEnt "identifies regions with similar environmental conditions to the known occurrence localities", and is **"**particularly useful for species that are geographically or environmentally restricted." Models can be extended by using future climate scenarios to predict range shifts under climate change**.** GIS Profiles are also useful - "Determining fine-scale habitat appropriate for species introductions might entail creating a GIS-based habitat profile, including level of site protection, deaphic characteristics, hydrological characteristics, slope, and vegetation type to determine if appropriate habitat exists in the predicted future range…. if a protected habitat exists in the future range, that best matches current habitat, this will increase the collection priority from populations with a predicted match." *See also:* Svenning et al. (2009) (provides useful framework for assessing relocation site's capacity to absorb species).

scholars also recommend the use of ex situ conservation, which can serve the dual purposes: (1) temporarily holding species, and (2) facilitating additional research.[101]

4. Identifying Research Needs

As noted above, proponents and opponents both agree that more research is needed to reduce uncertainty and risk. McLachlan et al. (2007) recommend that the research agenda for assisted migration should focus on collecting data in 4 main areas: (1) estimation and monitoring of species distributions; (2) biogeographic modeling; (3) long-distance dispersal; (4) genetic diversity.[102]

Camacho (2010) identifies several other research needs, including: (1) localized effect of climate change on particular ecosystems or species populations, (2) general number of species that are likely to become endangered or extinct due to climate change; (3) number of species that are likely to become endangered / extinct without AM; (4) types of species that might be amenable to translocation.[103]

Camacho also recommends an "adaptive learning infrastructure" in which research activities occur that will help reduce uncertainties, including: (1) increased and improved localized climate data and localized climate modeling; (2) basic data collection inventorying and monitoring the current distribution and abundance of species; (3) increased and improved biogeographic range modeling; (4) development of methods for integrating non-climate factors (such as competitions, mutualisms, and dispersal capacity) into range modeling.[104]

As noted in one study, this "long list of issues that are amenable to research may suggest that we need to complete a vast research program before assisted colonization can begin."[105] Problematically, we are "unlikely to have adequate time and money for truly comprehensive research" before the most imminently threatened species are extinct.[106] In the short term, it may be useful to implement experimental pilot projects that would expand knowledge of species distribution, interaction, and adaptability; as well as our knowledge of climate change trends and impacts.

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[101] RB Primack & AJ Miller-Rushing, *The role of botanical gardens in climate change research*, 182 New Phytologist 303 (2009).

[102] Jason S. McLachlan et al., *A Framework for Debate of Assisted Migration in an Era of Climate Change*, 21 Conservation Biology 297, 300 (2007).

[103] Camacho (2010), supra note 6, at 240.

[104] *Id*. at 240.

[105] Hunter (2007), supra note 24, at 1358.

[106] *Id*. at 1358.

5. Ex-Situ Conservation

Considering the significant limitations on time, resources and information, some scholars recommend the use of ex situ conservation (i.e., off-site conservation) as a temporary holding measure before relocation for some species. Botanical gardens, seed banks, and gene banks are some examples that are particularly useful for plant species. As noted by Primack & Miller Rushing (2009), botanical gardens and other ex situ measures can preserve plant species indefinitely and are able to host important climate change research projects.[107]

Using ex situ conservation as a temporary measure would "certainly be less risky" in the short term, and may be the "only option for species living near the geographic end of climate gradients (notably polar and alpine species)."[108] Ex situ measures may also reduce the overall risk of assisted migration projects in the long term by providing a forum for research. In addition, "ex situ conservation often uses funds that are not otherwise available for conservation (e.g., gate receipts and city tax dollars) and may be far less expensive for plants than for the carnivores, great apes, and other large animals that are often in the limelight."[109]

There are nonetheless concerns about ex situ measures, especially with respect to animal populations. As noted by Hunter (2007), if the ultimate goal is free-living populations, the dismal track record of restoring species that have become extinct in the wild clearly makes this an option of last resort." [110]

A legitimate question exists as to whether the term "ex situ" or "offsite," as it is used in various international treaties and domestic policies, could encompass introduction of a species into an unconfined, non-historical habitat. Some authors have recognized "colony relocation" as one form of ex situ conservation,[111] but there is no real consensus on the issue. In practice, colony relocation is used with relative frequently to offset the effects of development projects—in the United States, this is one mitigation strategy that may be required under NEPA.[112] If activities like this would qualify as "ex situ

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[107] Primack & Miller-Rushing (2009), supra note 101, at 303.

[108] Hunter (2007), supra note 24, at 1358.

[109] *Id*. at 1358.

[110] *Id*. at 1358.

[111] Tara Leigh Strickler, *Improving Assisted Reproductive Technologies in the Endangered Black-Footed Ferret: Artificial Insemination and Sperm Cryopreservation*, Ohio State University (2010); Norman Ratcliffe et al., *Sink or swim? Viability of a black-tailed godwit population in relation to flooding*, 42 Applied Ecology 834 (2005); Yanyan Dong, *Contingent Valuation of Yangtze Finless Porpoises in Poyang Lake, China*, Leipzig University (2010).

[112] For example, a colony of Santa Cruz tarweed was discovered in the 1980s at the survey site of a proposed shopping center in California. To continue with development, the city hired scientists to remove the entire colony

conservation," then it is possible that assisted migration projects could receive funding and support under various international and domestic ex-situ provisions.[113]

E. Implementation

Island eco-systems tend to be both unique and fragile, due to their isolation. Smaller, low lying islands are mores susceptible to climate change impacts, including rising sea levels, coastal erosion, storm surges, other weather anomalies, and shifting bio-climactic climates. Thus, it is not surprising that half of the 12 most "vulnerable" biodiversity hotspots are island and archipelago regions.

In the Micronesia-Polynesia Hotspot, scientists estimate that the overall rate of endemism is over 50% including: 5300 Plants, 3074 of which are endemic (57.7%); 16 mammals, 12 are endemic (75%); 292 birds, 163 are endemic (55.8%); 64 reptiles, 31 are endemic (48.4%); 3 amphibians, 3 are endemic (100%); and 96 freshwater fish, 20 are endemic (20.8%).[114] Invertebrates in this region are numerous and not well documented, but sampling indicates high levels of diversity and endemism.[115] Many of these species are imminently threatened by human activities, rising sea levels, and changing bioclimatic conditions.

Given the high rate of endemism in the Micronesia-Polynesia hotspot, and the significant threat posed by climate change in this region, assisted migration seems like a potentially useful strategy for conserving some of the most vulnerable / threatened species. However, there are two major barriers to implementing such a strategy:

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to a near-bye location. Gary Deghi, C. Michael Hogan et al., *Final Environmental Impact Report of the Pinole Valley Shopping Center*, City of Pinole, Earth Metrics Incorporated, California Environmental Clearinghouse (1986).

[113] See Section III, page 25, for a discussion of these provisions.

[114] Conservation International Website (2011); a searchable database of endemic species is available at CI's biodiversity hotspots information page: www.biodiversityhotspots.org.

[115] Conservation International Website, supra note 114: Of the 13 major indigenous pulmonata land snail families on the Pacific Islands, 4 are endemic to the central Pacific. The Hawaiian Islands have more than 763 species, of which a staggering 748 are endemic. The Samoan Islands have 99 native species, of which 64 are endemic"); Critical Ecosystem Partnership Fund, Ecosystem Profile for Polynesia-Micronesia Biodiversity Hotspot (2007), http://www.sprep.org/att/IRC/eCOPIES/Pacific_Region/47. ("Knowledge of invertebrate diversity is very patchy, but for many groups that have been studied, it is high. Land snail diversity is particularly high with over 750 species in Hawaii alone and perhaps 4,000 species in the insular tropical Pacific").

(1) Limited funding and institutional support for such projects. Generally speaking, most investments in biodiversity from public and private sector focus on preservation, restoration, and removing invaders.

(2) Concerns about biological risk and uncertainty, particularly the potential to create invasive species, which have historically been the greatest threat to biodiversity in the region.

Policy will play an important role in overcoming these barriers, by facilitating, regulating and coordinating these projects. In particular, "careful study, risk management, and centralized implementation will be necessary to enable assisted migration as an effective conservation tool."[116] If there are too many private actors moving species and insufficient regulations, this could result in undocumented, repetitive or contradictory projects.

There are several countervailing considerations for implementing assisted migration in the Micronesia-Polynesia region. First, there is a clear need for fast action. As described in one study, the "rate of change is increasing and tipping points may soon be surpassed... now is the time to begin implementing the seed collection and banking strategy."[117] Second, there is also a clear need for caution, given the fragility of eco-systems and the uncertainty of this strategy. Third, resources are scarce, and other adaptation needs remain seriously underfunded.

Finding funding, resources or assistance for assisted migration projects will be a major threshold issue. It is important to consider who should bear the cost—government or private actors; the origin country, the host country, or the primary contributors to GHG emissions? Based on the overall structure of "burden sharing" under the UNFCCC Charter, Kyoto Protocol, and other climate change instruments, there is certainly a policy basis for asserting that the highest emitters should bear the cost of these activities. However, there is no practical guarantee that such support would be forthcoming.

Because there are significant limitations on government funding, private actors, particularly environmental NGOs, may be an important funding source. However, there could be conflicts of interest when these projects are implemented by non-governmental agents. As noted by one scholar,

> "[h]aving a species-focused group such as the Torreya Guardians (www.tooreyaguardians.org) dedicate their money and time to a translocation may be more acceptable to the conservation community than if a government agency or broad-based environmental group, such as The Nature Conservancy, does so. In the latter case many will argue that *efforts would be better allocated to conserving whole ecosystems and their connectivity*. On the other hand,

[116] Mueller and Hellmann (2008), supra note 30, at 566.

[117] Vitt et al. (2010), supra note 6, at 23.

> organizations with a broader mandate might evaluate assisted colonization in a more balanced and accountable way."[118]

One main concern is that there is not enough funding for human adaptation efforts, and thus any public funding for relocation projects should go towards relocating people. However, the benefits of human and biological adaptation are not mutually exclusive. Assisted migration projects can be coordinated with human adaption needs, potentially achieving more efficient and socio-economically acceptable results. The livelihoods of many communities on threatened islands are closely tied to use of native plants and other biological resources, so moving both people and related species together could ease the transition to a new location.[119]

There are also alternative, dedicated funding sources for the preservation of biodiversity. A number of private organizations are making significant investments to conservation efforts in the region—the key for proponents of assisted migration would be to convince those stakeholders that this is a viable, effective conservation strategy.[120] It would also be beneficial to coordinate with other conservation programs to avoid conflicts and befriend potential partners or funding sources.

1. Candidate Species

Based on a broad assessment of biodiversity in the Micronesia-Polynesia hotspot, it appears that there are a variety of potentially eligible species, particularly birds, as well as various plants, reptiles, amphibians, mollusks , crustaceans, and other animals. Conservation International provides a searchable database of endemic vertebrates in the Micronesia-Polynesia hotspot that are threatened by human impacts, including climate change.[121] Small, native birds are prime candidates, because: (1) they are particularly threatened by climate change impacts, (2) they typically pose a low risk to the new habitat, (3) successful relocation projects have already been carried out to remove bird populations from the

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[118] Hunter (2007), supra note 24, at 1357.

[119] Claudia Sobrevila, *The Role of Indigenous Peoples in Biodiversity Conservation: The Natural but Often Forgotten Partners,* (World Bank 2008) available at: http://siteresources.worldbank.org/INTBIODIVERSITY/Resources/RoleofIndigenousPeoplesinBiodiversityConservation.pdf.

[120] Critical Ecosystem Partnership Fund - Ecosystem Profile for Polynesia-Micronesia Biodiversity Hotspot (2007), at 45: provides list of current investors in conservation programs the hotspot, but all focus on preservation and removal of invasive species.

[121] Conservation International Website, "Biodiversity Hotspots" (2010), http://www.biodiversityhotspots.org/Pages/default.aspx.

threat of invasive species, and (4) birds receive substantially more public attention, which could generate more funding for such projects.[122]

Policy-makers and practitioners will need to delineate more specific criteria for identifying priority species. One additional issue to be addressed is whether it would be prudent to move more than one species together. "Individual species are not the only units of possible interest" but rather we may consider taking an "ecosystem management" approach, and possibly moving species together.[123] This could be a more effective approach, because "simply moving a species is no guarantee that it will be saved... many species depend intimately on other species for their survival."[124]

2. Candidate Sites

Finding suitable, safe habitats for species being relocated from threatened islands may be more challenging than identifying candidate species. An acceptable site would need to be: (1) biogeographically compatible, (2) physically available, and (3) feasible with respect to social, political, legal and economic constraints.

The most compatible ecosystems will probably be found on other, higher lying islands in the Micronesia-Polynesia region, perhaps situated at slightly lower latitudes than the original habitat. However, the concern about invasive impacts on fragile, already threatened eco-systems could pose a substantial barrier to inter-island relocation activities. That said, perhaps there is a hidden opportunity here—many of these islands are confined and already compromised, so they could potentially serve as experimental sites.

There are also coastal areas in the South Pacific—Australia, New Zealand, Indonesia, Thailand, and even India—that have similar climates and could be used as relocation sites, although more distant geographic locations may pose a greater risk of genetic consequences or otherwise unforeseeable results. One difficulty will be locating coastal areas that are not overly burdened by human development or subject to substantial protections against interference or introduction of a new species. Due to our lack of data regarding future sea level rise and bio-climactic shifts—especially our inability to predict the rate at which emissions will increase or decrease (or human activities in general)—it may be quite challenging to ensure that the relocation habitat will last for a substantial period of time.

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[122] Janice Wormsworth & Karl Mallon, The Global Status Report: Bird Species and Climate Change, World Wildlife Fund (2006).

[123] Camacho (2010), supra note 6, at 249.

[124] Zimmer (2007), supra note 9, at 3.

III. Legal Framework

There are very few international agreements or domestic laws that expressly regulate assisted migration as a conservation strategy. However, the scope of relocation projects will be limited by restrictions on the movement of certain species (particularly those classified as "endangered" or "threatened"), as well as protections for specific regions and interested stakeholders.

At all levels of governance, the legal framework is heavily influenced by the preservation ethic, which values a "natural" or "historical" norm. Classic methodologies under this framework include sheltering native areas and preventing the introduction of non-native species."[125] Where these types of protections are most stringent, it will probably be more difficult to implement relocation projects. That said, there is no fundamental tension between preserving biodiversity and successful assisted migration. Conservation-oriented policies and initiatives could provide financial, institutional, technical and legal support for relocation projects, if there is some level of consensus that they will preserve biodiversity.

Implementing this strategy may require new baselines in for assessing biodiversity and ecological outcomes. Whereas existing environmental laws "conserve and preserve what is there, and to a limited extent, restore the past," assisted migration would focus on protecting and enriching "the value of biodiversity at large."[126] Proponents assert that the transition to a functional baseline is a necessary part of human adaptation to climate change:

> [T]he existing regulatory framework's reliance on preservation and a human-nature dualism is outdated and unproductive in light of the pervasiveness of human interaction with what are inherently dynamic natural systems… [It] exemplifies how climate change necessitates the reinvention of natural resource management to better reflect and manage a dynamic world.[127]

Thus, protecting biodiversity in the context of rapid change requires a more active management role than merely preserving or protecting the past.[128]

The following sections describe the international and regional agreements, domestic laws, and private actions that may either create obstacles or provide support for assisted migration activities.[129]

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[125] Camacho (2010), supra note 6, at 175.

[126] Emma Marris, *Moving on Assisted Migration*, Nature Reports (August 28, 2008) at 3 (quoting Camacho).

[127] Camacho (2010), supra note 6, at 177.

[128] Emma Marris (2008), supra note 108, at 3 (quoting Camacho).

[129] See Appendices 1, 2 and 3 at 146-149, for a list of international, regional and domestic policies.

A. International Agreements

Although no major agreements explicitly discuss assisted migration as a conservation strategy, there are treaties that create related obligations and restrictions. According to the International Union for Conservation of Nature (IUCN),

> The international conservation community has long recognized the need to incorporate geopolitical boundaries into conservation policy and programs to ensure that international movement of plant and animal species does not threaten their survival or produce adverse side-effects greater than their intended conservation benefit.[130]

Unfortunately, many of these policies are poorly suited for the purposes of climate change adaptation, often creating obstacles rather than opportunities for movement. Efforts have been made to coordinate national policies and accommodate migratory needs, but the overall framework is too disjointed to ensure connectivity across national boundaries.[131]

As noted by Arie Trouwborst, a law professor at Tilburg University, "the legal instruments involved are generally inadequate when it comes to connectivity requirements and the transboundary coordination of climate change adaptation action."[132] Problematically, "the issue of active translocation is not addressed at all."[133] Trouwborst's concerns reflect those of many scientists and policy makers:

> It bodes ill that even an advanced regional nature conservation regime like the one constituted by the EU Birds and Habitats Directives demonstrates significant deficiencies in these respects... Ostensibly, the comprehensive regimes which are needed are currently not in place, whether at a global or a regional scale. In sum, international nature conservation law as it stands appears to fall short of what is required to adequately facilitate the adaptation of biodiversity to climate change. [134]

Trouwborst notes that these deficiencies are "hardly surprising, considering that the legal regimes reviewed were created at a time when the impacts of climate change on species and ecosystems were not or only barely an issue."[135]

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[130] *IUCN's Position statement on the translocation of living organisms* (IUCN, 1987); *Guidelines for re-introduction* (IUCN, 1995); Vitt et al. (2010), supra note 6, at 23.

[131] Arie Trouwborst, *International Nature Conservation Law and the Adaptation of Biodiversity to Climate Change: A Mismatch?*, 21 J. Envtl. L. 419, 436-37 (2009).

[132] Trouwborst (2009), supra note 130, at 436.

[133] *Id*. at 437.

[134] *Id*. at 437.

[135] *Id*. at 437.

There is one international instrument—the IUCN/SSC Reintroduction Specialist Group—that oversees species translocations in a limited context, but it does not impose any binding obligations on countries or other actors. There are also several major agreements, including the Convention on Biological Diversity (CBD), the International Treaty on Plant Genetic Resources for Food and Agriculture, and the Convention on International Trade in Endangered Species, which do not explicitly address assisted migration but do express policies and obligations that are relevant to the implementation of this strategy.

1. IUCN/SSC Reintroduction Specialist Group

The International Union for Conservation of Nature Species Survival Commission (IUCN/SSC) has determined that: "translocations are powerful tools for the management of the natural and man-made environment which, properly used, can bring great benefits to natural biological systems and to man." In the 1987 IUCN Position Statement on Translocation of Living Organisms, the agency describes several advantageous uses of translocation, and recommends a cautious approach to "avoid the disastrous consequences of poorly planned translocations."[136]

The IUCN /SSC appointed a special panel, the Re-introduction Specialist Group, to oversee translocation activities. The Group's stated purpose is to:

> [C]ombat the ongoing and massive loss of biodiversity by using re-introductions as a responsible tool for the management and restoration of biodiversity through actively developing and promoting sound inter-disciplinary scientific information, policy, and practice to establish viable wild populations in their natural habitats.[137]

The Group has no binding authority over any member states, but has promulgated voluntary guidelines for translocations in general, as well as specific projects undertaken by the IUCN.[138] As evinced by the statement above, the guidelines focus on restoring species to historical ranges—but there appears to be enough flexibility within the Group's mandate and framework to accommodate introductions to entirely new habitats so long as these would mimic natural range shift.

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[136] International Union for Conservation of Nature Species Survival Commission (IUCN/SSC) Reintroduction Specialist Group (2010): http://www.iucnsscrsg.org/.

[137] *Id*.

[138] IUCN/SSC RSG Policy Guidelines for Reintroductions, available at: http://www.iucnsscrsg.org/policy_guidelines.php.

2. Convention on Biological Diversity (CBD)

The Convention on Biological Diversity (CBD) is perhaps the most relevant treaty for assisted migration purposes, given its broad scope and mandate. The CBD does not directly address the issue of relocating species *outside of their historic range*. It does, however, provide guidelines and impose obligations for in-situ and ex-situ conservation, which may be conceptualized as a preliminary step for AM.[139]

Article 8, "In Situ Conservation" – this section states that each party shall, "as far as possible and as appropriate….. (c) Regulate or manage biological resources important for the conservation of biological diversity *whether within or outside protected areas*, with a view to ensuring their conservation and sustainable use; (d) Promote… the maintenance of viable populations of species in natural surroundings; (f) … promote the recovery of threatened species, inter alia, through the development and implementation of plans or other management strategies." One could argue that an assisted migration project would further these goals. However, Art. 8 also emphasizes the need to preserve and protect natural ecosystems, and to "(h) Prevent the introduction of, control or eradicate those alien species which threaten ecosystems, habitats or species."

Article 9, "Ex-situ Conservation" – this section specifies that the parties shall, "as far as possible and as appropriate, and *predominantly for the purpose of complementing in-situ measures*: (a) adopt measures for the ex-situ conservation of components of biological diversity… (b) establish and maintain facilities for ex-situ conservation of and research on plants, animals and micro- organisms, preferably in the country of origin of genetic resources… and (c) adopt measures for the recovery and rehabilitation of threatened species and for their reintroduction into their natural habitats under appropriate conditions."

Article 9 specifies that ex-situ conservation should be carried out "so as not to threaten ecosystems and in-situ populations of species," except where special temporary ex-situ measures are required for threatened species. It also has a funding provision, requiring the parties to "cooperate in providing financial and other support for ex-situ conservation… and in the establishment and maintenance of ex-situ conservation facilities in developing countries."

These provisions could potentially be used to support or even secure some funding for preliminary in-situ and ex-situ activities that would facilitate full relocation later in time. The CBD's stance on the second phase of assisted migration—actually moving a species into a new, permanent

[139] See Appendix 1 for the complete text of Articles 8 and 9. The complete text of the CBD is also available at: http://www.cbd.int/convention/text/.

habitat—is unclear. In the 2010 Global Biodiversity Outlook report, the following targets and goals were identified:

> **Target 9:** By 2020, invasive alien species are identified, prioritized and controlled or eradicated and measures are in place to control pathways for the introduction and establishment of invasive alien species.
>
> **Strategic goal C:** To improve the status of biodiversity by safeguarding ecosystems, species and genetic diversity
>
> **Target 12:** By 2020 the extinction and decline of known threatened species has been prevented and improvement in the conservation status [for at least 10% of them] has been achieved.
>
> **Target 19:** By 2020, knowledge, the science base and technologies relating to biodiversity, its values, functioning, status and trends, and the consequences of its loss, are improved, widely shared and transferred, and applied.[140]

Initiatives carried out under Target 9 could impede relocation efforts, but the more fundamental goals—safeguarding genetic diversity, preventing extinctions—could certainly encompass assisted migration activities.

The 2010 Outlook emphasizes the importance of climate change adaptation, and acknowledges that ex situ measures are a significant part of this:

> While reducing the threat of human-induced extinction requires action to address the direct and indirect drivers of change, imminent extinctions of known threatened species can in many cases be prevented by protecting the sites where such threatened species are located, by combating particular threats, and through *ex situ* conservation. Additional actions which directly focus on species include the implementation of species recovery and conservation programmes, *ex situ* conservation measures as well as the re-introduction of species to habitats from which they have been extirpated. Similar actions can be used to improve the conservation status of species more broadly.[141]

The document does not, however, address the issue of moving species into habitats that they did not historically occupy. Given the relevance of this issue with respect to climate change, it will likely become an important topic at future CBD sessions.

3. International Treaty on Plant Genetic Resources for Food and Agriculture

Another relevant agreement is the International Treaty on Plant Genetic Resources for Food and Agriculture (2006).[142] Under this treaty, the International Agricultural Research Centres (IARCs) of the Consultative Group in International Agricultural Research (CGIAR), which hold ex situ germplasm

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[140] Secretariat of the Convention on Biological Diversity, *Global Biodiversity Outlook 3* (CBO-3) (2010), available at: http://g bo3.cbd.int/.

[141] *Global Biodiversity Outlook 3* (CBO-3) (2010), supra note 120, Target 12.

[142] The full text of this treaty is available at: www.planttreaty.com.

collections, signed agreements with the Treaty Governing Body to place the collections they hold under the Treaty.[143] Over 100 countries have signed on as parties to the agreement. The treaty contains specific guidelines on collecting plant genetic resources, and also announces broad policy goals to support future ex situ conservation efforts.

Like Article 9 of the CBD, this treaty could be used to support preliminary ex-situ activities as preparation for future introduction into new habitats.

4. Convention on International Trade in Endangered Species (CITES)

Provisions in the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), may impose permitting and other requirements on species that are listed in the CITES Appendices.[144] The purpose of CITES is to protect species that are particularly vulnerable to exploitation through international trade by: (1) restricting import and export activities, and (2) extending the applicability of domestic environmental laws to any party involved in the transport of species across domestic borders. If an assisted migration program intends to move species into a party state, they will want to consult with the CITES appendices, as well as the domestic laws in the potential relocation country.[145]

B. Regional Multilateral and Bilateral Agreements

There are also a number of regional agreements that could provide institutional support for assisted migration activities in the South Pacific. The major instruments are described below.

1. UNEP – Regional Office for Asia and the Pacific

This regional branch of the UNEP "works with governments, local authorities, civil society, other UN entities, regional and international institutions, as well as the private sector to develop and implement cleaner and safer policies and strategies that catalyze efficient use of the region's natural

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[143] Art. 15 (2006): These agreements placed the ex situ collections of PGRFA held by those Centres (some 650,000 accessions of the world's most important crops) within the purview of the Treaty. Under these agreements, the Centres recognize the authority of the Governing Body of the Treaty to provide policy guidance relating to their ex situ collections.

[144] *See* CITES Appendices I, II and III, available at: http://www.cites.org/eng/app/appendices.shtml.

[145] Julie Lurman Joly & Nell Fuller, *Advising Noah: A Legal Analysis of Assisted Migration*, 39 Envtl. L. Rep. News & Analysis 10413, 10424-25 (2009).

assets and reduces degradation of the environment and risks to both humans and the environment."[146] The Regional Office provides support for the strengthening of regional and domestic environmental governments, as well as adaptation assistance, primarily in the form of technical and policy support.[147]

The UNEP Regional Office would be well-suited to provide policy support to South Pacific governments that would like to regulate assisted migration activities. It could also be a source of institutional and technical support for specific relocation projects.

2. Pacific Regional Environmental Program (SPREP)

The Secretariat of the Pacific Regional Environment Program (SPREP) is a regional organization, established by the governments of the South Pacific for the purpose of environmental protection and conservation.[148] SPREP serves as a "conduit for concerted environmental action at the regional level," and its dual mandates are to promote regional cooperation and to provide assistance for conservation activities. The organization consists of 21 Pacific island member countries, and 4 other countries with direct interests in the region.[149]

SPREP operates two programs: Island Ecosystems and Pacific Futures. The goal of the Island Ecosystems program is to ensure that "Pacific islands countries and territories are able to manage island resources and ocean ecosystems in a sustainable manner and that support life and livelihoods."[150] The program focuses on both capacity building,[151] as well as three ecological goals: "ecosystem conservation, the sustainable management of natural resources and the protection of priority threatened species, from the threats of human-induced impacts, invasive species and living modified organisms."[152] SPREP specifies that these issues will "require action at the local, national, regional and

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[146] "UNEP Regional Office in Asia Pacific" (2011) at: http://www.unep.org/roap/UNEPinAsiaPacific/tabid/5419/Default.aspx.

[147] "UNEP Regional Office in Asia Pacific: Climate Change" (2011) at: http://www.unep.org/roap/Activities/ClimateChange/tabid/6834/Default.aspx.

[148] SPREP, "Biodiversity in the Pacific Islands" (2011) at: http://www.sprep.org/topic/Biodiv.htm.

[149] Members include: American Samoa, Australia, Cook Islands, Federated States of Micronesia, Fiji, France, French Polynesia, Guam, Kiribati, Marshall Islands, Nauru, New Caledonia, New Zealand, Niue, Northern Mariana Islands, Palau, Papua New Guinea, Samoa, Solomon Islands, Tokelau, Tonga, Tuvalu, United States of American, Vanuatu, Wallis and Futuna.

[150] SPREP, "Island Ecosystems" (2011) at: http://www.sprep.org/programme/island_eco.htm.

[151] SPREP, "Island Ecosystems" (2011) at: http://www.sprep.org/programme/island_eco.htm.Specifically, the goal is: "developing the capacities of the peoples of the islands to equip them to sustainably manage and conserve the terrestrial, coastal and marine ecosystems of Pacific islands."

[152] SPREP, "Island Ecosystems" (2011) at: http://www.sprep.org/programme/island_eco.htm.

international levels" and therefore provides mechanisms and support for the development of bilateral and multilateral conservation agreements.

With respect to capacity building, SPREP is dedicated to building "stronger linkages" between environmental goals and community / economic livelihoods, and recognizes that managing biodiversity will "inevitably involve local communities." In particular, the Programme website specifies that:

> People and institutions, from the regional to the local community level, are critical to the success of every element of this strategic plan. Through mutually beneficial partnerships, with other multinational organisations, national institutions and government agencies, non-government organisations, community groups and the private sector, the potential to achieve all programme goals will be enhanced.[153]

SPREP provides technical and legal advice, as well as direct interventions when requested by specific countries, consistent with the priorities of any National Biodiversity Strategic Action Plans promulgated under the CBD.

Certain species of interest, primarily birds, receive special focus under the Ecosystem Programme. SPREP "aims to ensure the maintenance of viable wild populations of species of special significance by identifying and addressing their key threatening processes," particularly invasive species and habitat loss.[154] Thus, this could be a valuable tool for implementing avian relocation projects.

The second program, "Pacific Futures" aims to ensure sustainable development and the preservation of biodiversity for future generations.[155] This program also focuses on capacity building, as well as responding to climate change through mitigation and adaptation. SPREP specifies that the "Pacific Islands urgently need to adapt to climate change and adopt mitigation options and coordination, and assistance is needed to assess and implement feasible options and access funds for implementation of activities."[156] Furthermore, SPREP explicitly recognizes that relocation may be a necessary adaptation strategy.[157] There is also a strong emphasis on environmental monitoring and reporting. To facilitate this process, SPREP provides technical support and information sharing mechanisms to its members.

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[153] SPREP, "Island Ecosystems" (2011) at: http://www.sprep.org/programme/island_eco.htm.

[154] *Id*.

[155] SPREP, "Pacific Futures" (2011) at: http://www.sprep.org/programme/pacific_futu.htm.

[156] *Id*.

[157] SPREP, "Climate Change" (2011) at: http://www.sprep.org/climate_change/index.asp. *See also*: UNEP, "Pacific Region Programme Profile" (2004) at: http://www.unep.org/regionalseas//programmes/nonunep/pacific/instruments/r_profile_pac.pdf.

3. Pacific Adaptation to Climate Change Project (PACC)

PACC is a regional program, implemented with assistance from SPREP, which has secured $13.125 million in funding from the Special Climate Change Fund of the GEF for adaptation in the South Pacific. The objective of PACC is to "enhance the resilience of a number of key development sectors (food production and food security, water resources management, coastal zones, infrastructure, etc.) in the Pacific islands to the adverse effects of climate change."[158] Although the objectives of PACC are primarily related to human adaptation, certain assisted migration activities could fall within the umbrella of supporting food production and food security, especially for relocated communities, and could also potentially help with managing coastal zones and other natural resources. Thirteen Pacific Island countries are taking part in the PACC project, including the Cook Islands, Federated States of Micronesia, Fiji, Marshall Islands, Nauru, Niue, Palau, Papua New Guinea, Samoa, Solomon Islands, Tonga, Tuvalu; and Vanuatu.[159]

The SPREP notes that, at the international level, "most climate change financing has come through the GEF," and that:

> All future disbursements under the GEF will be handled under the GEF-PAS, which makes available to the region over $30 million for adaptation and $14 million for mitigation initiatives over the next 4 years. Operationally this will create greater predictability for GEF resources but it may not increase the overall funding availability. However, the possibilities for additional co-financing and leveraging of funds should not be overlooked. [160]

That said, the SPREP has also been able to secure funding from the EC to "to build capacity for Multilateral Environment Agreement", a key part of which will be the Climate Change Convention. Furthermore, it has recently submitted funding requests for adaptation projects to AusAID and is working with other UN agencies to secure additional assistance.

4. Pacific Islands Global Climate Observation System (PI-GCOS)

This program is dedicated to promoting regional climate change science activities, particularly data collection. It may be a valuable resource for anyone who is interested in designing / implementing an assisted migration program. The program also provides support for capacity-building and technical development at the national and sub-national levels. It has been described as a "major contributor to

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[158] SPREP, "Climate Change" (2011) at: http://www.sprep.org/climate_change/index.asp.

[159] *Id*. (Kiribati currently has a national adaptation project and did not wish to be part of the regional project.)

[160] *Id*.

cooperation and partnership for climate change work particularly in taking stock of, and supporting, the technical and scientific needs for climate information and applications."[161]

5. Conservation and Environmental Protection Programme (CEPP)

Under an agreement between the Federated States of Micronesia and the Micronesia Conservation Trust (MCT), the European Development Fund (EDF9) provided 9.4 million Euros to FSM, 719,000 Euros were used to create the CEPP.[162] The CEPP is administered and implemented by MCT, which provides funding and technical assistance to the FSM, Marshall Islands, and Palau. Most of the activities undertaken by the CEPP consist of traditional conservation strategies (such as the establishment of Nationwide Protected Areas Network) and capacity-building, but it is possible that funds could be used for assisted migration projects.

C. Domestic Policy, Law and Regulations

Few domestic laws specifically endorse or prohibit assisted migration activities, but many environmental regulations—such as protections on species or areas—restrict who can move what and where. There also a number of policy initiatives, especially in the South Pacific, that emphasize the pressing need for climate change adaptation as a strategy to protect biodiversity. Although many of these initiatives only articulate soft goals, and lack funds to fully sponsor large conservation activities, they may nonetheless facilitate assisted migration projects within and between countries.

In the South Pacific, several domestic governments (Australia, New Zealand, Cook Islands) have already implemented relocation projects to protect native birds from predators. These policies are discussed below. Additionally, some of the most threatened island states are considering the importation of non-native species as an adaptation measure. For example, members of the Tuvalu Climate Action Network are considering acquiring species from other countries to help deal with coastal erosion and food security.[163]

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[161] SPREP, "Climate Change" (2011) at: http://www.sprep.org/climate_change/index.asp.

[162] Government of the Federated States of Micronesia, "FSM and MCT sign historic Agreement for Conservation," (Ma 4, 2007), available at: http://www.fsmgov.org/press/pr05040a.htm.

[163] Bruce Burson, *Climate Change and Migration: South Pacific Perspective,* Institute of Policy Studies, Victory University of Wellington (2010), available at at: http://www.pacificdisaster.net/pdnadmin/data/original/Barnet_2011_migration_cca.pdf. "In Tuvalu, members of the Tuvalu Climate Action Network are starting to look at climate adaptation initiatives to address issues such as coastal erosion and food security… [quoting a member of the Network]: 'With our root crops like pulaka [taro], it takes years to be harvested. But with the current sea surges, the salty water gets in the pulaka pits, which makes it

Generally speaking, the notion of "relocating" either animals or species has become quite common place in the South Pacific and other vulnerable area, especially since human relocation activities have already commenced. There is a good chance that most governments in the Polynesia-Micronesia hotspot would support assisted migration, if projects were implemented with additional funding. However, these countries will probably be less supportive if it appears that assisted migration would divert funds from human adaptation needs.

1. Cook Islands

In the Cook Islands, relocation projects have already been successfully implemented on a small-scale. As described in a Press Release for the SPREP:

> Part of the small population of Kakerori, or Rarotongan flycatcher, was moved to Atiu as insurance against the effects of climate change. This small bird had only been found in a small area of the island, and although a protected area was put in place, there was concern about things like severe cyclones wiping them out, says Tiraa.[164]

The Press Release also noted the connection between human needs and species relocation:

> [P]lants and animals act as natural protection against climate change in the first place, so their decline is doubly worrisome. When the average global temperatures rise, animal and plant life start to suffer as they can't always adapt fast enough. Protected areas like reserves lose their functions and rising sea levels affect reefs and fisheries. In addition, invasive species like the mynah bird can become more prevalent when the environment suffers from climate change. This impacts directly on people's livelihoods because the Pacific islands have a high reliance on forests, watersheds, reefs and fisheries. [165]

Ana Tiraa-Passfield, the Cook Island biodiversity officer for the Secretariat of the Pacific Regional Environment Progamme, emphasized the connection between biological and human needs, noting that: "another aspect of the effects on biodiversity is people losing traditional knowledge with the loss of some species."[166] The loss is both cultural and scientific—traditional knowledge has long been used to fill the gaps in conventional science, especially with respect to contextual environmental issues.

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harder to grow. We're looking at getting species from other countries to help with this…. Our coconut trees on the coast fall down because of erosion.' Also, the Food and Agriculture Organization of the United Nations has released a major study on food security and climate in the Pacific with detailed case studies on Vanuatu, the Marshall Islands, and the Cook Islands. The study documents how, without adaptation measures, damage to the food sector by 2050 could represent 2–3% of Fiji's and 17–18% of Kiribati's 2002 gross domestic product."

[164] Melissa Finucane, "Climate change prompts Kakerori relocation in Cook Islands," Secretariat of the Pacific Regional Environment Programme (SPREP) Press Release (Oct. 23 2008), available at: http://www.pacificrisa.org/cms/index.php?view=article&id=179%3Aclimate-change-prompts-kakerori-relocation-in-cook-islands-&option=com_content&Itemid=161.

[165] *Id*.

[166] Finucane (2008), supra note 16.

Tiraa also explained the functional role that certain species play in human adaptation, a role that should be emphasized in assisted migration policy, so as to improve the design and socio-economic acceptability of relocation projects projects:

> Tiraa says all too often people build things like seawalls, moving away from using nature-based adaptation measures. She says many of our ancestors used excellent resource protection methods. One example is how they would plant certain trees on beach sections to protect them. Another example is the raui (marine reserve area) which we are now using again because of the replenishment benefits it has on the area.[167]

Based on the experience of the Cook Islands, Tiraa recommends adopting a "'whole of island' development plan," which would involve "undertaking inter-island translocation for some species (like the Kakerori), halting logging, creating native forests, and removing other environmental stresses like pollution can all go a long way toward lessening the impacts of climate change."[168]

2. United States

In the United States, "assisted migration appears to be legally permissible in narrow but clear circumstances."[169] The legality depends on three factors: (1) type of species, and whether it is listed as endangered/threatened/etc., (2) type of party doing the project, (3) type of site and ownership. Practitioners would need to evaluate the compatibility of any assisted migration project with restrictions in the Endangered Species Act, which prohibits the "taking" (including movement) of listed species without a special permit; the Lacey Act, which regulates 'the interstate and international shipment of wildlife;"[170] as well as other federal, state and local regulations. It would also be illegal to relocate non-native species into many protected wildlife and park areas. As noted by Camacho, the quantity and heterogeneity of existing domestic policies may potentially hinder attempts to implement assisted migration, and thus a centralized regulatory framework would be preferable. [171]

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[167] Finucane (2008), supra note 16.

[168] *Id*.

[169] Camacho (2010), supra note 6, at 188.

[170] Julie Lurman Joly & Nell Fuller, *Advising Noah: A Legal Analysis of Assisted Migration*, 39 Envtl. L. Rep. News & Analysis 10413, 10424-25 (2009). Specifically, the Lacey Act makes it unlawful to 'import, export, transport, sell, receive, acquire, or purchase any fish or wildlife or plant' that was 'taken, possessed, transported, or sold' in violation of any federal, state, or Indian tribal law, or in violation of any treaty to which the United States is a party. It is therefore necessary for those involved in assisted migration programs that intend to cross either state or national borders to make sure that all laws are met, including those of the state from which the species are taken and the state to which the species are brought."

[171] Camacho (2010), supra note 6, at 188.

There have been some government-sponsored relocation projects in the U.S. to protect endangered species. For example, a private group of conservationists coordinated with the U.S. Fish and Wildlife Service (FWS) to relocate the Laysan Duck, which was listed under the original ESA because of its small population, limited distribution, and fragile island habitat.[172] In 2005, approximately 40 of these ducks were transported to the Midway Atoll National Wildlife Refuge, with the goal of establishing a second population, and as part of a joint effort between the FWS and the U.S. Geological Survey. This relocation demonstrates how, with government approval, assisted migration is a viable option for species that are listed under the ESA. Shortly after the initial relocation project, it appeared that the Ducks were successfully reproducing in their new habitat.[173]

3. Australia

Australia is another large, developed country that has expressly endorsed assisted migration.. There are no statutory or regulatory provisions that are exactly on point, but the AU Department of Environment and Conservation (DEC) has already begun to implement small-scale relocation programs—moving species out of Australia to protect them from predators. For example, the DEC assisted a project to relocate two locally extinct bird species from Barrow Island to the Montebello Islands, where they would be free from the predators that had driven them to extinction in the wild.[174]

In a recent workshop on managed relocation, Australian researchers discussed the need for and viability of assisted management strategies.[175] They identified characteristics of sites that may be suitable for such projects, particularly "those with new or impending niche gaps and sites where MR would be culturally acceptable."[176] Based on historical data and predictions from models, the group concluded that:

> The best potential sites were... those planned for ecological restoration, along existing or intended migration corridors and those not currently used for conservation (such as aesthetic

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[172] "Pacific Region Recovery Leader: Laysan Duck Midway Translocation Team" (2011), available at: http://www.fws.gov/pacific/ecoservices/endangered/recovery/LaysanDuckTeam.htm.

[173] US Geological Survey (USGS) (2006a): Second generation of the nation's rarest ducks hatch after translocation (News Release, May 16); US Geological Survey (USGS) (2006b): Midway Atoll national Wildlife Refuge welcomes second generation of nation's rarest ducks (News release, May 23).

[174] "Barrow Island Birds relocated to Montebello Islands," Australia News Online (June 8, 2010) at: http://www.news.com.au/barrow-island-birds-relocated-to-montebello-islands/story-e6frg12c-1225876963636?from=public_rss.

[175] Terrestrial Biodiversity Adaptation Research Network, Managed Relocation Workshop (Nov. 2010), at: http://hosting2.arcs.org.au/terrestrialbiodiversity/index.php/General/managed-relocation-workshop.html.

[176] *Id*.

> and amenity sites, e.g. golf courses, public gardens etc.). Maximising climatic buffering and heterogeneity, bioregional similarity and tenure security, and minimising opportunities for hybridization and the potential for invasiveness should also play in to the decision process of selecting sites.[177]

The workshop also noted that protocols "already exist both internationally (IUCN/SSC Reintroduction Specialist Group) and nationally for animals (Natural Resource Management Ministerial Council) and plants (Australian Network for Plant Conservation Require)," which require the preparation of an independent, contextual "translocation proposal." [178]

In addition, the workshop asserted that adapting to climate change would inevitably require an assessment of social values, and identified some pertinent ethical questions:

> [A]daptation to climate change is not value-free, but is an ongoing social process. There is a need to recognise that there will be both winners and losers, economically and geographically. The MR strategies adopted will depend on the value society accords biodiversity, with the value of a species often being related to where it is found. Before MR should take place, four principles of sustainability ethics should be answered in the affirmative: that the proposed MR preserves what would otherwise become extinct and does not cause great pain and suffering to other species (interspecies ethics), that MR allows future generations to see extant species and to benefit from the ecological functions provided by (intergenerational ethics), that MR helps to maintain current levels of biological diversity and ecosystem integrity but not at the expense of deploying clean, safe, renewable energy sources (intergenerational equity), and that action is justified despite the uncertainty – extant is better than extinct and that the many 'irreversibles' that arise from MR can be ignored (precautionary principle).[179]

The Workshop document is a particularly valuable document for any entities that are considering assisted migration, both for its content and for its contact information.

Australia has released an official National Conservation Strategy for 2010-2030, which recognizes the importance of climate change adaptation, ex-situ conservation, and the need to actively manage natural resources and biodiversity.[180] Specifically, the Strategy notes that: "[a]lthough it is a last resort, for some species ex situ conservation may be the only means of survival in the short to medium term." [181] It also identifies "building ecosystem resilience in a changing climate" as a priority for action:

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[177] Terrestrial Biodiversity Adaptation Research Network, Managed Relocation Workshop (Nov. 2010), at: http://hosting2.arcs.org.au/terrestrialbiodiversity/index.php/General/managed-relocation-workshop.html.

[178] *Id*.

[179] *Id*.

[180] Australia National Conservation Strategy 2010-2030, available at: http://www.environment.gov.au/biodiversity/publications/strategy-2010-30/pubs/biodiversity-strategy-2010.pdf.

[181] *Id*.

> Building resilience in our ecosystems means enhancing their capacity to adapt to, survive and recover from changes and disturbances… building resilience will help Australia's biodiversity to persist under existing threats and as our climate changes.[182]

The strategy describes a number of mechanisms for protecting biodiversity that are compatible with assisted migration. These include: "creating nature reserves or conservation management agreements on public and private land" and "implementing targeted species-specific conservation."[183] Both methods are described below:

> *Creating Nature Reserves and Conservation Management Agreements:* A variety of conservation tenure arrangements can be used on public and private land to protect diversity in perpetuity, including (but not limited to) additions to the NRS and the Australian system of MPAs. Governments are also creating new mechanisms to support the establishment and long-term management of conservation areas in partnership with landholders, non-profit conservation organisations and Indigenous communities.
>
> Support is also being provided for maintaining or improving biodiversity conservation on private land in order to complement other land uses. Protecting diversity will require whole-of-ecosystem efforts across landscapes and seascapes, in both public and private ownership. Governments need to work closely with and support private land managers and users to build landscape and seascape-scale approaches to conservation. These efforts should include managing multiple-use landscapes and seascapes in ways that integrate biodiversity and production outcomes through complementary management practices.
>
> *Targeted Species:* Some species, such as those that are threatened with extinction, will require targeted species-specific efforts to complement those at the ecosystem level.
>
> These should focus on improving the conservation status of threatened species and ecological communities. In many situations, protecting gene stocks and genetic diversity will also be a priority, particularly as species and ecosystems shift in response to climate change. Protecting and enhancing genetic diversity will be an increasingly important consideration in management decisions for long-term ecological resilience and adaptation.
>
> Ex situ conservation mechanisms, including botanic gardens, zoos, seed banks and gene banks, will be increasingly important as a way of conserving diversity when species are at high risk of extinction in the wild. [184]

The use of assisted migration to protect species that are imminently threatened by climate change appears to fall well within this framework, so long as it does not interfere with other environmental objectives—such as preventing the introduction of dangerous invasive species into protected habitats.

Australia also has a number of laws that are similar to the U.S. and other developed countries, including an Environment Protection and Biodiversity Conservation Act (1999) which specifies that

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[182] Australia National Conservation Strategy (2010-2030), supra note 180.

[183] *Id*.

[184] *Id*.

moving a “threatened species” within Australia constitutes a “taking”. The Act requires similar permitting / mitigation requirements for projects that will have a net positive impact on biodiversity.[185] The Natural Resource Management Ministerial Council has also promulgated specific protocols for translocations, and the Department of Conservation and Management recently released Policy Statement No. 29: Translocation of Threatened Flora and Fauna, which expresses support for translocating threatened flora / fauna "when warranted" by environmental factors, and discusses translocations that have already occurred in Western Australia.[186] There are also sub-national programs, such as the New South Wales - Office of Environment and Heritage, which has issued a Policy for the translocation of threatened fauna in NSW. This policy identifies translocation, including moving species into an area where it has not previously been found, as a potentially effective strategy for Australia and the rest the world. It also promulgates guidelines for safe species relocations in the area.[187]

4. New Zealand

New Zealand has similar laws, although the focus of domestic regulations is perhaps more protective of native species and the framework for assisted migration and relocation more limited. In particular, the NZ Conservation Act (1987) imposes various permitting restrictions on the movement of wildlife within, into, or out of New Zealand, similar to the ESA or the EPBCA.[188] There have been some carefully planned relocation projects within New Zealand, primarily involving small populations of threatened birds (robins and saddlebacks).[189]

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[185] Environmental Protection and Biodiversity Conservation Act of 1999, full text available at: http://www.comlaw.gov.au/Details/C2011C00014.

[186] Department of Conservation and Land Management, Policy Statement No. 29: Translocation of Threatened Flora and Fauna (July 1995), available at: http://www.dec.wa.gov.au/component/option,com_docman/Itemid,1/gid,3083/task,doc_download/.

[187] NSW Office of Environment and Heritage, Translocation of Threatened Fauna in NSW, available at: http://www.environment.nsw.gov.au/policiesandguidelines/FaunaTranslocationPolicy.

[188] New Zealand Conservation Act (1987), available at: http://www.legislation.govt.nz/act/public/1987/0065/latest/DLM103610.html.

[189] *E.g.* AD.P. Armstrong & I.G. McLean, 1995. *New Zealand translocations: theory and practice*, 2 Pacific Conservation Biology 39 (1995); S. S. Taylor et al., 2005. *Successful island reintroductions of New Zealand robins and saddlebacks with small numbers of founders*, 8 Animal Conservation 415 (2005); W.J. Dimond & D.P. Armstrong, *Adaptive harvesting of source populations for translocation: A case study with New Zealand robins*, 21 Conservation Biology 114 (2007).

D. Non-Governmental Actors

Non-governmental organizations (NGOs), including broad conservation organizations and species-focused groups, have already implemented relocation projects to protect species. Some of these projects have been enacted with little or no government involvement. For example, a private conservation group in Florida—Torreya Guardians— have been distributing seeds outside of Torreya Pine's historic range to save the tree from extinction.[190] The Torreya Pine is a federally listed endangered species, but the ESA does not prohibit seed distribution; thus, the Guardians were able to move the tree "over 600 km without a single state or federal permit, and they were completely within their legal rights to do so."[191] Another example of a largely unregulated project in the U.S. was the relocation of Sea Turtles from the gulf coast following the 2010 Oil Spill.[192]

The relative ease with which the Guardians and other private actors can implement relocation projects is of concern to many scientists.[193] Dov Sax, an ecologist at Brown University, sees the moral justification for these activities but is nervous "to think that any group could move any species they wanted. This would occasionally lead to some nasty ecological consequences."[194] Haymen et al. (2009) stress the need for thorough scientific evaluation of each potential project—a mandate which can only be accomplished through regulation.[195] Such regulation might increase the short-term cost of these projects, but there would be long-term efficiency gains from reductions in risk and uncertainty.[196]

In light of these concerns, some scholars assert that even without regulation, it "is ethically mandatory that the parties proposing to move species not only seek legal authority to collect individuals and deposit them into new habitats, but also must notify all parties that may be affected."[197] Additionally, McLachlan et al. (2007) recommends that legal mechanisms be established

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[190] Torreya Guardians official website: http://www.torreyaguardians.org/guardians.html.

[191] Vitt et al. (2010), supra note 6, at 474.

[192] Jacoba Charles, "Alabama's Sea Turtles Relocated with 23,000 Others in Massive Rescue," (Aug. 17, 2010), at: http://solveclimate.com/news/20100817/alabamas-sea-turtle-eggs-relocated-23000-others-massive-rescue

[193] *E.g.* Havens et al. (2009), supra note 26, at 474: "One of us… disagreed with Torreya Guardians (in 2005 and today) that the Florida torreya (Torreya taxifolia) should be translocated beyond its current range boundary….This action raises an important point: although managed relocation has potential risks and some ecologists might disagree with it in principle, it must be scientifically evaluated."

[194] Stone (2010), supra note 46, at 1594. Quoting Dov Sax.

[195] Havens et al. (2009), supra note 26, at 474.

[196] *Id*. at 473-474.

[197] McLachlan et al. (2007), supra note 102, at 299.

"to protect assisted-migration agents from litigation and to compensate recipient regions for damages."[198]

Fortunately, most relocation projects are coordinated with governmental agencies. There are often incentives to coordinate, such as technical and financial support, use of government land, and assurances of future protections at relocation sites. Such incentives, with conditions attached, might be preferable to strict regulations if the primary goal is to encourage assisted migration—but if the goal is to reduce risk, incentives will not ensure that *every* project was subject to the same standard of evaluation.

A number of non-governmental actors have expressed political support and promulgated guidelines for translocation projects. For example, the Ecological Society of Australia endorsed assisted migration "when appropriate" in its Climate Change: Position Statement (2009). Another domestic organization, The Australian Network for Plant Conservation, has issued Guidelines for the Translocation of Threatened Plants.[199]

The Pacific Island Climate Change Cooperative (PICCC) is a regional coalition of private (and some state) actors, committed to: (1) developing adaptation strategies to preserve biodiversity; (2) mapping potential ranges of native species and invasive species under future temperature and precipitation projections; (3) publishing vulnerability assessments for rare species, native ecosystems, and keystone species; (4) identifying future corridors linking present and future habitat; (5) recommending conservation and acquisition priorities based on future climate and sea level.[200] Although the PICCC Fact Sheet and other official documents do not explicitly mention the manual relocation of species, the coalition's framework appears to implicitly support assisted migration measures.

There is also a broad support network for ex situ conservation and seed banking programs. The largest international program, the Millennium Seed Bank Project (MSBP) of the Royal Botanical Gardens, Kew, "leads the way in terms of conserving the taxonomic breadth of the global flora." [201] Specifically, the MSBP hopes to collect and bank seeds from 35% of the world's plant species, and has "forged

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[198] McLachlan et al. (2007), supra note 102, at 299.

[199] Australian Network for Plant Conservation, Guidelines for the Translocation of Threatened Plants, available at: http://www.bgci.org/congress/congress_1998_cape/html/mill.htm.

[200] Pacific Island Climate Change Cooperative (PICCC), Fact Sheet (December 2010), available at: http://hawaiiconservation.org/files/content/activities/pacific_island_climate_change_cooperative/piccc_fact_sheet_12_10.pdf.

[201] Vitt et al. (2010), supra note 6, at 20.

partnerships in *key biodiversity hotspots*, such as Australia and Madagascar, to ensure this outcome." [202] Like other programs, the MSBP recognizes the importance of capacity building:

> Each partnership requires on-the-ground local participants who conduct the fieldwork. MSBP also works to build local capacity in the storage of seeds, and acts as the global repository for both primary and redundant storage of wild-collected native plant seed.[203]

Another major seed-banking program is the European Native Seed Conservation Network (ENSCONET), which "consists of 24 partners in 17 countries and is focused on increasing the effectiveness of European seed conservation research, practice, and policy."[204]

There are also national programs, such as the Australian Network for Plant Conservation, which has "produced national guidelines for seed banking and storage (ANPC, 1997) and translocation activities that are being utilized by a diversity of stakeholders, from farmers to nongovernmental organizations, as well as local and national governmental agencies."[205] In the United States, "a coalition of botanic gardens and zoos [have] joined with the Plant Conservation Alliance and the Bureau of Land Management to undertake the Seeds of Success Program." [206] The Program facilitates seed collection and banking, to be "undertaken in a decentralized, but networked, manner, for restoration use and as an insurance policy against local extinction." [207]

E. Future Regulations

Although there is still a robust debate on assisted migration, the use of strategy is becoming increasingly probable. Lawmakers and regulatory agencies will need to assess the benefits and risks of this strategy and regulate its components accordingly. Indeed, many authors emphasize the need for "robust protocols" to ensure that these projects are properly coordinated and safely implemented. The current situation is problematic, because there are no regulations that explicitly regulate assisted migration, but some groups have already begun to move species.[208] Given the potential risk and

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[202] Vitt et al. (2010), supra note 6, at 20.

[203] *Id*. at 20.

[204] *Id*. at 20.

[205] *Id*. at 20.

[206] *Id*. at 20.

[207] *Id*. at 20.

[208] McLachlan et al. (2007), supra note 102; Mueller & Hellmann (2008), supra note 30, at 565-566.

uncertainty of this strategy, “policy should limit unsupervised translocations and should require thorough risk analysis and impact evaluation on a case-by-case basis."[209]

McLachlan et al. (2007) identify three potential "policy options" / scenarios that illustrate potential pathways for regulation:

> (1) Aggressive Assisted Migration- time is short, "opportunity to develop specific predictions and models for all the species that require assistance is lacking" … management strategies may include "extensive translocation of species well beyond their native ranges and restoration-style establishment programs.”
>
> (2) Avoidance of Assisted Migration- authors argue that this is a bad idea, "rejecting assisted migration will greatly increase the threat of climate-driven extinction."
>
> (3) Constrained Assisted Migration - although there are "obvious costs to constraining assisted migration projects,” this balance between the benefits and risks of AM is appropriate... some narrow framework/specifications for potential AM projects... under this framework, "proposals for AM may require evidence of imminent threat, a quantitative model of predicted outcome of assisted migration, and an assisted migration management plan.”[210]

The authors assert that the best option is constrained assisted migration, but the “only policy options [that they] categorically reject (1 and 2) are the two that are currently being implemented."[211] Constrained migration would require government regulation and international cooperation.

There is broad consensus that assisted migration programs, if adopted, should be regulated and centralized.[212] Camacho (2010) notes that assisted migration projects would be "incongruous with existing decentralized management" in the U.S., and a coordinated framework would be much safer and more effective.[213] Specifically, he recommends a “comprehensive adaptive management and governance framework that seeks to cope with the inevitable uncertainty that comes from managing resources in light of limited data and shifting conditions."[214]

Vitt et al. (2010) also recommend a comprehensive regulatory framework, which would recognize the many interests involved in assisted migration:

> Given that local, regional and national governments, as well as NGOs and agencies, are all stakeholders, it is appropriate that an umbrella program at a national or even continental level

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[209] Mueller & Hellmann (2008), supra note 30, at 565-566.

[210] McLachlan et al. (2007), supra note 102, at 298-299.

[211] *Id*. at 299.

[212] Mueller & Hellmann (2008), supra note 30, at 565-566. Camacho (2010), supra note 6: “centralized implementation will be necessary to enable AM as an effective conservation tool."

[213] Camacho (2010), supra note 6, at 207.

[214] *Id*. at 241.

> be responsible for overall coordination of a comprehensive seed banking strategy, while coordinating with regional groups who are responsible for local implementation.[215]

Such a program would be necessary to address concerns about unregulated private actions, like the Torreya Guardians. Ideally, the program would also be integrated with traditional preservation methods, to avoid unnecessary relocations and to complement other conservation activities. [216]

Perhaps the most important consideration, at this point, is the need for international discussion and cooperation on this issue. A comprehensive, safe and effective framework for assisted migration will require more than domestic regulations, especially in the context of smaller countries like threatened island nations.

IV. Conclusion

Assisted migration is still a controversial strategy, but it may be the only option for species that are facing habitat loss and imminent extinction due to climate change. In the Micronesia-Polynesia region and across the globe, relocation projects have already been implemented on a small scale, but have not been explicitly regulated. Safely and effectively implementing this strategy will require careful project design, as well as additional research on biological and climactic processes. This can best be achieved through a well-coordinated regulatory framework that involves governmental actors at the international, regional, national, and sub-national levels, as well as private stakeholders.

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[215] Vitt et al. (2010), supra note 6, at 20.

[216] Scott Loss, Lauren Terwilliger & Anna Peterson, *Assisted Colonization: Integrating conservation strategies in the face of climate change*, 144 Biological Conservation 92 (2010).

Appendix 1: International Agreements and Instruments

Agreement	Date	Parties	Provision(s)	Text / Relevance
IUCN / SSC Reintroduction Specialist Group	1988	200+ individual members (technical experts in relocation)	N/A	IUCN / SSC RSG primarily promotes the reintroduction of viable populations of animals and plants back to their natural ecosystems, by providing technical and institutional support to parties that undertake relocation projects.
Convention on International Trade in Endangered Species of Wild Flora and Fauna (CITES)	1975	175 participating countries	N/A	Imposes permitting requirements and other restrictions on the international "trade" including export and import of specific species, as listed in the CITES Appendices at: http://www.cites.org/eng/app/index.shtml
Convention on Biological Diversity	1992	193 parties, including RMI, Australia, New Zealand, Indonesia	Art. 9 - Ex-situ conservation	Each contracting party shall, as far as possible and as appropriate, and predominantly for the purpose of complementing in-situ measures: (a) adopt measures for the ex-situ conservation of components of biological diversity, preferably in the country of origin of such components (b) establish and maintain facilities for ex-situ conservation of and research on plants, animals and micro-organisms (c) adopt measures for the recovery and rehabilitation of threatened species and for their reintroduction into their natural habitats under appropriate conditions (d) regulate and manage collection of biological resources from natural habitats so as not to threaten ecosystems and in-situ populations of species, except where special temporary ex-situ measures are required under subparagraph (c) above (e) Cooperate in providing financial and other support for ex-situ conservation outlined in subparagraphs (a) to (d) above and in the establishment and maintenance of ex-situ conservation facilities in developing countries.

Convention on Biological Diversity	1992	193 parties, including RMI, Australia, New Zealand, Indonesia	Art. 8 - In-situ conservation	Each contracting party shall... (a) Establish a system of protected areas or areas where special measures need to be taken to conserve biological diversity; (b) Develop... guidelines for the selection, establishment and management of protected areas or areas where special measures need to be taken to conserve biological diversity; (c) Regulate or manage biological resources important for the conservation of biological diversity whether within or outside protected areas... (d) Promote the protection of ecosystems, natural habitats and the maintenance of viable populations of species in natural surroundings; (f) Rehabilitate and restore degraded ecosystems and promote the recovery of threatened species, inter alia, through the development and implementation of plans or other management strategies; (h) Prevent the introduction of, control or eradicate those alien species which threaten ecosystems, habitats or species; (i) Endeavour to provide the conditions needed for compatibility between present uses and the conservation of biological diversity and the sustainable use of its components; (j) Subject to its national legislation, respect, preserve and maintain knowledge, innovations and practices of indigenous and local communities embodying traditional lifestyles relevant for the conservation and sustainable use of biological diversity and promote their wider application with the approval and involvement of the holders of such knowledge, innovations and practices and encourage the equitable sharing of the benefits arising from the utilization of such knowledge, innovations and practices; (k) Develop or maintain necessary legislation and/or other regulatory provisions for the protection of threatened species and populations; (l) Where a significant adverse effect on biological diversity has been determined pursuant to Article 7, regulate or manage the relevant processes and categories of activities
International Treaty on Plant Genetic Resources for Food and Agriculture	2006	127 Countries	Article 15	"On 16 October 2006, 11 International Agricultural Research Centres (IARCs) of the CGIAR which hold ex situ germplasm collections signed agreements with the Governing Body of the International Treaty on Plant Genetic Resources for Food and Agriculture placing the collections they hold under the Treaty. (Article 15). These agreements placed the ex situ collections of PGRFA held by those Centres (some 650,000 accessions of the world's most important crops) within the purview of the Treaty. Under these agreements, the Centres recognize the authority of the Governing Body of the Treaty to provide policy guidance relating to their ex situ collections."

Appendix 2: Regional Agreements and Instruments

Agreement	Date	Parties	Text / Relevance
Conservation and Environmental Protection Programme (CEPP)	2007	Federated States of Micronesia, Micronesia Conservation Trust, European Development Fund	Under an agreement between the Federated States of Micronesia and the Micronesia Conservation Trust (MCT), the European Development Fund (EDF9) provided 9.4 million Euros to FSM, 719,000 Euros were used to create the CEPP. CEPP is administered and implemented by MCT, which provides funding and technical assistance to the FSM, Marshall Islands, and Palau. Most of the activities undertaken by the CEPP consist of traditional conservation strategies (such as the establishment of Nationwide Protected Areas Network) and capacity-building, but it is possible that funds could be used for assisted migration projects.
Pacific Adaptation to Climate Change Project (PACC)	2009	13 Pacific Island countries	Implemented in partnership with SPREP and funded by the GEF, the PACC provides adaptation funding to Pacific Island States, primarily for human adaptation purposes, but also for environmental and ecological projects that will compliment these purposes.
Pacific Regional Environment Program (SPREP)	1982	21 Pacific Island States and 4 developed countries with direct interests in the region	SPREP is an intergovernmental organization that promotes cooperation and provides support for environmental conservation efforts in the South Pacific. SPREP has focused much of its attention in the recent past towards climate change adaptation strategies, which is reflected in specific targetes and strategies under both of its primary programs: "Island Ecosystems" and "Pacific Futures."
Pacific Islands Global Climate Observation System (PI-GCOS)	2000	Same as SPREP membership	Implemented in response to a SPREP workshop in 2000, for the purposes of improving technical capacity and availability of data on climate change impacts in the South Pacific.
UNEP – Regional Office for Asia and the Pacific	2000	Region consists of 47 countries, including 17 South Pacific states	ROAP works with governments, local authorities as well as industry to develop and implement cleaner and safer policies and strategies that encourages efficient use of natural resources and reduces risks for humans and the environment.

Appendix 3: Domestic Laws, Regulations and Policies

Country	Law / Policy	Agency	Text / Relevance
Australia	Environment Protection and Biodiversity Conservation Act (1999)		Moving a "threatened species" within Australia would constitute a taking under the act (to "move" the species), but relocation projects may apply for a permit with a showing of ecological sustainability / net positive impact. Also imposes permitting requirements on importation of species, and creates guidelines for forming bilateral conservation agreements with other countries.
Australia	Protocols for Translocations (section 7.19) (2004)	Natural Resource Management Ministerial Council	Provides guidance for relocations to/from/within Australia; revises the 1997 ANPC Guidance.
Australia, New Zealand	Guidelines for the Translocation of Threatened Plants (in Australia) (1997)	The Australian Network for Plant Conservation	Guidelines have been supported by the Australia and New Zealand Environment and Conservation Ministerial Councils.
Australia	Policy Statement No. 29: Translocation of Threatened Flora and Fauna	Department of Conservation and Management	Expresses support for translocating threatened flora / fauna "when warranted" by environmental factors; discusses translocations that have already occurred in Western Australia.
Australia	Policy for the translocation of threatened fauna in NSW	New South Wales - Office of Environment and Heritage	Identifies translocation, including moving species into an area where it has not previously been found, as a potentially effective strategy for Australia and the rest the world. Announces guidelines for safe species relocations.
New Zealand	Conservation Act (1987)	Ministry for the Environment	Imposes various permitting restrictions on the movement of wildlife within, into or out of New Zealand.
United States	Endangered Species Act (1973)	U.S. Fish and Wildlife Services (FWS)	Imposes restrictions on the "taking" (including movement) of federally listed species.