

**CI-GEF PROJECT AGENCY**

# **GEF Project Document**

**Safeguarding biodiversity in the Galapagos Islands by  
enhancing biosecurity and creating the enabling  
environment for the restoration of Galapagos Island  
ecosystems**

**Ecuador**

**September 2018**

PROJECT INFORMATION			
PROJECT TITLE:	Safeguarding biodiversity in the Galapagos Islands by enhancing biosecurity and creating the enabling environment for the restoration of Galapagos Island ecosystems.		
PROJECT OBJECTIVE:	To safeguard biodiversity in the Galapagos Islands by enhancing biosecurity and creating the enabling environment for the restoration of Galapagos Island ecosystems.		
PROJECT OUTCOMES:	<p><b>Outcome 1.1.:</b> The number of invasive alien species entering the Galapagos archipelago is substantially reduced</p> <p><b>Outcome 2.1.:</b> The social license is established for the protection and recovery of Floreana Island ecosystems</p> <p><b>Outcome 3.1.:</b> Ecosystem processes, particularly seed dispersal, re-initiated across Santa Fe island (2,413 ha) as the result of the translocation of giant tortoises</p> <p><b>Outcome 3.2.:</b> Production in captivity of giant tortoises for future reintroductions throughout the archipelago is significantly increased</p>		
COUNTRY(IES):	Ecuador	GEF ID:	9282
GEF AGENCY(IES):	Conservation International	CI CONTRACT ID:	
OTHER EXECUTING PARTNERS:	Island Conservation (IC), Galapagos National Park, Ministry of Environment of Ecuador	DURATION IN MONTHS:	30
GEF FOCAL AREA(S):	Biodiversity	START DATE (mm/yyyy):	
INTEGRATED APPROACH PILOT:		END DATE (mm/yyyy):	
NAME OF PARENT PROGRAM:		PRODOC SUBMISSION DATE:	
RE-SUBMISSION DATE(S):			

FUNDING SOURCE	AMOUNT (USD)
GEF PROJECT FUNDING:	3,301,472
PPG FUNDING:	120,000
TOTAL GEF GRANT:	3,421,472
CO-FINANCING 1: GALAPAGOS NATIONAL PARK DIRECTORATE	10,500,000
CO-FINANCING 2: GALAPAGOS BIOSECURITY AGENCY	4,500,000
CO-FINANCING 3: ISLAND CONSERVATION	1,400,000
CO-FINANCING 4: GALAPAGOS CONSERVANCY	1,925,000
CO-FINANCING 5: CONSERVATION INTERNATIONAL	70,000
TOTAL CO-FINANCING:	18,395,000
TOTAL PROJECT COST:	21,816,472

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## ACRONYMS & ABBREVIATIONS

ABG	Galapagos Biosecurity Agency
AZE	The Alliance for Zero Extinction
CBD	Convention on Biological Diversity
CCREG	Consejo de Gobierno del Régimen Especial de Galapagos
CDF	Charles Darwin Foundation
DERA	UK Department for Environment, Food & Rural Affairs'
DPNG	Galapagos National Park Directorate
EA	Executing Agency
EDRR	Early detection / Rapid Response
EMP	Environmental Management Plan
ESIA	Environmental and Social Impact Assessment
ESMF	Environmental and Social Management Framework
FAO	Food and Agriculture Organization
FEIG	Fund for Control of Invasive Species in the Galapagos
FPC	Floreana Parish Council
GEBs	Global Environmental Benefits
GEF	Global Environment Facility
GOE	Government of Ecuador
IA	Implementing Agency
IBAs	Important Bird Areas
IC	Island Conservation
INGALA	National Institute of the Galapagos
IUCN	International Union for the Conservation of Nature
MAE	Ministry of Environment
MAG	Ministry of Agriculture
NGO	Non-Governmental Organization
PIR	Project Implementation Report
PSC	Project Steering Committee
SEP	Stakeholder Engagement Plan
SICGAL	Galapagos Inspection and Quarantine System
UNDP	United Nations Development Program
UNESCO	United Nations Educational, Scientific and Cultural Organization

## CI-GEF PROJECT AGENCY

### Safeguarding biodiversity in the Galapagos Islands by enhancing biosecurity and creating the enabling environment for the restoration of Galapagos Island ecosystems

## PROJECT DOCUMENT

### SECTION 1: PROJECT SUMMARY

1. The greatest threat to biodiversity in the Galapagos Islands is biological invasion<sup>1</sup>. Invasive alien species are one of the most significant drivers of environmental degradation and species extinction worldwide, and are generally considered the primary cause of biodiversity loss in island ecosystems. Hundreds of invasive alien species are already well established within the Galapagos archipelago. Some of these organisms arrived with seafarers more than 100 years ago, while others have been introduced (deliberately and inadvertently) within the last decade. The impacts of invasive alien species on endemic species can have ecosystem-wide ramifications. For example, when invasive rodents feed on giant tortoise eggs and hatchlings they reduce the number of tortoises available to spread seeds (through their excrement) and 'plant' the next generation of native trees and shrubs. As canopy cover declines, so do the populations of understory plants that require shading from the harsh tropical sun. The loss of understory vegetation makes landscapes more vulnerable to soil erosion and contributes to declines in soil fertility through mineral leaching. This impairs soil fertility and undermines the capacity of landscapes to be resilient to further perturbations (e.g., extreme weather events, climate change).
2. Failure to control invasive alien species in the Galapagos archipelago will:
  - Enable the persisting invasive vertebrate species to continue to predate upon, compete with, and/or spread pathogens and parasites to the native species;
  - Allow for further degradation of sensitive marine and terrestrial habitats, thus preventing these ecosystems from being able to support the long-term viability of endemic species, and possibly human livelihoods;
  - Substantially undermine investments already made in environmental conservation, ecotourism, and sustainable agriculture; and
  - Reduce ecological and socio-economic resilience in the face of adverse impacts of climate change and other major environmental disturbances.
3. The Government of Ecuador (GoE) is well aware of the adverse impacts that invasive alien species have on biodiversity and human livelihoods, and over the last two decades, has made major accomplishments in the prevention, control, and eradication of invasive alien species. Many of the recent advances were achieved between 2002 and 2011 under the auspices of the 'Control of Invasive Species in the Galapagos Archipelago' (ECU/00/G31) project funded by the Global

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<sup>1</sup> [Watkins and Cruz 2007](#); Helmsley Charitable Trust's Galapagos Strategic Plan 2012; <https://www.worldwildlife.org/ecoregions/nt1307>

Environment Facility and executed by the Ministry of Environment (MAE)<sup>2</sup>. Major accomplishments include:

- Establishment of the Fund for Control of Invasive Species in the Galapagos (FEIG);
  - Greater management capacity of the Galapagos National Park Directorate (DPNG) and Charles Darwin Foundation (CDF);
  - Improved border protection by the Galapagos Inspection and Quarantine System (SICGAL) and advances in public policy by the *Consejo de Gobierno del Regimen Especial de Galápagos* (CCREG); and
  - A pilot goat eradication project on northern Isabela Island.
4. Despite progress, numerous challenges to minimizing the spread and impact of invasive alien species remain. The main barriers include: a) limited technical capacity to design and implement highly effective prevention, eradication and control programs, b) lack of equipment and personnel to adequately inspect the vast amount of cargo and equipment in transit, c) a decline in taxonomic capacity to identify invasive alien species once intercepted, and d) limited social license and infrastructure for eradication programs, and e) the high cost of effective biosecurity programs, eradication programs, and control programs.
  5. The GoE recognizes that international and domestic trade, travel, and transport are pathways for the introduction of invasive alien species, and that prevention is typically the most cost-effective means for minimizing the impact of invasive alien species. The GoE and many project partners have had the opportunity to learn (directly and indirectly) from previous GEF projects executed within Ecuador, as well as similarly themed projects conducted in other countries/regions. Based on these lessons learned, the present GEF 6 project was designed.
  6. The objective of the project is 'to safeguard biodiversity in the Galapagos Islands by enhancing biosecurity and creating the enabling environment for the restoration of Galapagos Island ecosystems.' This project aims to safeguard biodiversity in the Galapagos Islands by: 1) enhancing biosecurity across the Galapagos archipelago, 2) solidifying the social license and infrastructure to eradicate invasive vertebrate species from Floreana Island, and 3) translocating a previously extirpated keystone species (giant tortoises) to Santa Fe Island. The project will be carried out through three components:
    - Component 1: Furthering development of a state-of-the-art biosecurity system.
    - Component 2: Solidifying the social license and infrastructure for the protection and recovery of Floreana Island ecosystems.
    - Component 3: Advancing the recovery of island ecosystems following invasive species eradication through the re-establishment of keystone species (i.e. giant tortoises).
  7. Project success will secondarily lead to a reduction in land degradation, and improve ecotourism opportunities. Consequently, ecosystem services, agricultural production, and economic investments will be better secured on human-inhabited islands in Ecuador and beyond.

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<sup>2</sup> <http://www.hear.org/galapagos/invasives/features/gef.htm>

## SECTION 2: PROJECT CONTEXT

### A. Geographic Scope

8. The Galapagos Islands are a volcanic archipelago formed 3-5 million years ago. They are composed of 13 large islands and 100 smaller islands and islets that together comprise 7,880 km<sup>2</sup> of land. Situated just below the equator, the islands are 1,000 km off the coast of Ecuador in the Pacific Ocean. Located at the confluence of three eastern Pacific currents, the Galapagos are a 'melting pot' for a large diversity of marine life. The equatorial climate, highly varied and rugged terrain, and extreme geographic isolation of the islands have contributed to the evolution of a rich array of terrestrial plants and animals that are found nowhere else in the world.
9. The four human-inhabited islands (Santa Cruz, San Cristobal, Isabela, and Floreana) are subject to habitat destruction for township development and agricultural expansion<sup>3</sup>. A fifth island (Baltra) that hosts tourism and military infrastructure (e.g., one of three airports in the archipelago) may become the focus of further industrial development. Parts of Baltra Island are not within the bounds of the DPNG<sup>4</sup>.
10. While component one of this project focuses on the archipelago as a whole, component two focuses on Floreana Island, and component three focuses on Santa Fe Island. Floreana is a 17,253 ha island situated in the south-central reaches of the archipelago. Because it is one of the oldest islands in the archipelago, Floreana Island has a higher rate of endemism than the younger islands to the west. In addition, due to its relatively long history of human occupation, the endemic species on Floreana Island are among the most heavily threatened in the world. Floreana has a higher concentration of International Union for Conservation of Nature (IUCN) Critically Endangered species (one in every 17.2 km<sup>2</sup>) than any other major Galapagos island. The 2015 IUCN Red List included 61 plant and animal species on Floreana Island considered threatened (i.e. Vulnerable, Endangered or Critically Endangered). Since the island and its human population are smaller than other inhabited islands in the Galapagos archipelago, and the biodiversity is already well-studied, Floreana Island offers the best opportunity for the DPNG and its partners to establish effective protocols for the eradication of invasive rodents and feral cats from inhabited islands.
11. Santa Fe Island (2,413 ha) is also one of the oldest islands in the archipelago, is uninhabited and is home to a suite of island endemics. The island is fully within the Galapagos National Park, has multiple visitor sites and is popular among tourists. The island has not suffered any known extinctions, with the exception of Santa Fe giant tortoises, which were driven to extinction by seafarers in the 1800s. Giant tortoises (*Chelonoidis* spp.) function as keystone species within Galapagos ecosystems. Thus, the recovery of giant tortoises and their associated ecosystem processes, e.g. seed dispersal, are of particular importance to the restoration of Galapagos Island ecosystems, especially those on arid islands.

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<sup>3</sup> Human settlements are currently restricted to c.3% of the land area of the Galapagos archipelago in specifically zoned rural and urban areas

<sup>4</sup> The part of Baltra which are not part of the DPNG are those used by public entities to provide services, such as the airport, military base, refueling station and alternative energy facilities.



**Figure 1: Map of the Galapagos archipelago**

Red houses indicate the major towns on the four human-inhabited islands.



## B. Environmental Context and Global Significance

12. Located at the confluence of three eastern Pacific currents, the Galapagos are a 'melting pot' for a large diversity of marine life. The equatorial climate, highly varied and rugged terrain, and extreme geographic isolation of the islands have created the conditions for the evolution of a rich array of terrestrial plants and animals found nowhere else in the world.
13. Despite being relatively young in geological terms, the Galapagos Islands host a diverse biota; scientists have documented more than 1,300 species unique to the archipelago<sup>5</sup>. The exploration of deep sea communities in the archipelago continues to reveal species new to science.
14. Terrestrial taxa emblematic of the Galapagos Islands include eleven species of giant tortoise (e.g., the Galapagos tortoise, *Chelonoidis nigra* from Floreana Island) and three species of land iguanas (e.g., the Galapagos land iguana, *Conolophus subcristatus*), the most northerly species of penguin in the world (Galapagos penguin, *Spheniscus mendiculus*), flightless cormorants (*Phalacrocorax harrisi*), the Darwin's finches (family Geospizinae) and Galapagos mockingbirds (*Mimus spp.*) made famous in Darwin's publications, along with seemingly-fanciful plants (e.g., giant daisy

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<sup>4</sup>Human settlements are currently restricted to c.3% of the land area of the Galapagos archipelago in specifically zoned rural

trees, *Scalesia* spp.). The marine fauna also has an unusually high level of diversity and endemism: of 2,909 marine species identified, 18% are endemic. High-profile marine species include: sharks (e.g., whale sharks, (*Rhincodon typus*)), rays (e.g., manta rays, (*Manta birostris*)), and cetaceans (e.g., killer whales, (*Orcinus orca*)). The interactions between the terrestrial and marine biotas are exceptional; much of the island wildlife [e.g., marine iguanas (*Amblyrhynchus cristatus*) and Galapagos sea lions (*Zalophus wolfebaeki*)] is directly dependent on marine resources, while terrestrial ecosystems receive vital nutrients from marine inputs (e.g., guano from seabirds). In the Galapagos archipelago, terrestrial and marine life are inseparably linked.

15. Unlike other oceanic archipelagos, the ecological and evolutionary processes characteristic of the Galapagos Islands until recently have been minimally affected by human activities; more than 95% of species are still extant. The persistence of the rich, unique biodiversity made famous by Charles Darwin has positioned the Galapagos Islands as one of the most renowned natural sites in the world. They are one of the 'jewels' of Ecuador and a top conservation priority. All of the marine and coastal environs (13,300,000 ha) and nearly 97% of the land area (761,844 ha) in the Galapagos archipelago are under at least one form of protection.
16. GoE created the DPNG in 1959 and designated the Galapagos Marine Reserve in 1996. In acknowledgment of their global conservation value, the Galapagos Islands became the first World Heritage Site in 1978 and were designated as a United Nations Educational, Scientific and Cultural Organization (UNESCO) Man and the Biosphere Reserve in 1984. However, largely due to threats posed by invasive alien species, UNESCO listed the Galapagos Islands as a World Heritage Site in Danger in 2007.<sup>6</sup> Within the Galapagos Islands, specific sites have additional protected area status.
17. The World Wildlife Fund includes the Galapagos archipelago among the 'Global 200 Ecoregions,' thereby highlighting it as a priority for conservation.<sup>7</sup> Birdlife International has designated ten distinct Important Bird Areas (IBAs) in the Galapagos archipelago: San Cristobal Island, Española Island, two satellite islands of Floreana Island (Champion and Gardner), Floreana Island, the uplands of Santa Cruz Island, Puerto Ayora, the southern wetlands of Isabela Island, the uplands of Isabela Island, coastal areas of Fernandina Island and western Isabela Island, and the uplands of Santiago Island<sup>8</sup>. The IBA status is intended to help prioritize funds and implement urgent actions within regional priority setting schemes. IBAs have become a focal point for organizing stakeholders to meet shared conservation goals.
18. The Alliance for Zero Extinction (AZE) identifies and prioritizes places around the world where multiple species evaluated to be Endangered or Critically Endangered under IUCN-World Conservation Union criteria<sup>9</sup> are restricted to a single site. Within the Galapagos archipelago, AZE sites include: the coastal areas of Fernandina Island and western Isabela Island; Floreana Island; Floreana's satellite islands, Champion and Gardner; Española Island; and San Cristobal Island<sup>10</sup>. National Alliances for Zero Extinction, representing partnerships of government agencies and non-

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and urban areas.

<sup>5</sup> From the list of World Heritage Sites in Danger in 2010.

<sup>6</sup> Ibid.

<sup>7</sup> Olson and Dinerstein 2002

<sup>8</sup> <http://www.birdlife.org/datazone/userfiles/file/IBAs/AmCntryPDFs/Ecuador.pdf>

<sup>9</sup> <http://www.iucnredlist.org/>

<sup>10</sup> [http://www.zeroextinction.org/search\\_results\\_country.cfm](http://www.zeroextinction.org/search_results_country.cfm)

government organizations, have been initiated to accelerate the protection of AZE sites in compliance with national commitments under the Convention on Biological Diversity (CBD).

19. Despite the various protection statuses awarded to the Galapagos Islands, the archipelago remains extremely vulnerable to environmental change. Eighty of the archipelago's native species are categorized as Critically Endangered on the IUCN Red List, and a further 164 are considered threatened with extinction<sup>11</sup>. The loss of individual species has profound, cascading impacts at the ecosystem level, particularly in cases where ecosystem processes (e.g., pollination, nutrient cycling) are compromised. The gradual decline in biodiversity has an adverse effect on human livelihoods through the loss of: a) food and medicine supply (e.g., protein from fish, as well as plant medicines); b) ecosystem function and resilience (e.g., water purification, soil fertility, and storm protection), c) cultural norms (e.g., spiritual and aesthetic values), and d) income opportunities (e.g., ecotourism and artisanal fishing).

### C. Socio-Economic and Cultural Context

20. After being used by pirates and whalers for over a century, the archipelago was annexed to the Republic of Ecuador on February 12, 1832. Following annexation, Ecuador established a colony of craftsmen, and later of jailed and exiled political prisoners who settled in Floreana, San Cristobal and Isabela. In the early 1900s, scientists started arriving in the Galapagos Islands to study its wildlife. European and Ecuadorian settlers were able to successfully establish small farms, fish and hunt to survive and form permanent settlements. In the 1930s, German settlers arrived on Floreana looking for a place to settle away from civilization. After the Second World War, a small Ecuadorian military base was opened on Floreana island, bringing soldiers and their families, along with other settlers who arrived to cultivate the land.
21. Today, approximately 148 settlers live on Floreana and 26,000 residents live on the Galapagos islands as a whole<sup>12</sup>. The population of the Galapagos is young, with over 70% under age 44 for the Province as a whole, and 73% in the case of Floreana. About one-third of the population is made up of students. The population is mostly urban, concentrated around the ports in each inhabited island. Fifty-two percent of the population is male and 48% is female<sup>13</sup>.
22. The main economic activities in the Galapagos Islands are tourism, public service, commerce, fishing, and agriculture.<sup>14</sup> Tourism is on the rise in the Islands: the number of visitors has increased rapidly from 40,000 in 1990 to 145,000 in 2006<sup>15</sup> and 241,800 in 2017<sup>16</sup>. The World Bank estimates that tourism contributed 1,449 million US dollars to Ecuador's economy in 2016—the majority generated in the Galapagos Islands.<sup>17</sup> Tourism represented 7.4% of Ecuador's total exports in 2016.

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<sup>11</sup> <http://www.iucnredlist.org/>; Roque-Albelo 2007; Tye 2007

<sup>12</sup> INEC 2015 Census Data

<sup>13</sup> Kayamanta Consultores, 2017, Social, economic, productive baseline of Floreana.

<sup>14</sup> Kayamanta Consultores, 2017, Social, economic, productive baseline of Floreana.

<sup>15</sup> [http://www.galapagos.gob.ec/wp-content/uploads/downloads/2015/05/Informel\\_2014.compressed.pdf](http://www.galapagos.gob.ec/wp-content/uploads/downloads/2015/05/Informel_2014.compressed.pdf)

<sup>16</sup> <http://www.observatoriogalapagos.gob.ec/arribos-anuales>

<sup>17</sup> <https://data.worldbank.org/indicator/ST.INT.RCPT.CD>

23. The basic wage is set by law to be 80% higher than on the mainland of Ecuador. However, the Galapagos consumer price index is also 80% higher than on the mainland. Given the high cost of living, on average, 1.5 household members must be employed to cover the family's basic expenses. Economic activities are diverse, and many people have two or even three jobs at once, while working more than 40 hours a week.<sup>18</sup>
24. Floreana Island, which is the focus of activities under Component 2 and, to a lesser extent, Component 1 of the project, is a parish in the Galapagos Province with 148 inhabitants.<sup>19</sup> The town is located around Puerto Velasco Ibarra. The productive zone is located about seven km up a paved, two-lane road, near a spring that supplies water. Major economic activities include tourism, public service, agriculture and a very small percentage of commercial activity.<sup>20</sup>
25. Most of Floreana inhabitants live in Puerto Velasco Ibarra. In fact, in a recent survey, only one household was found to be living in the highlands. Fifty-four per cent of the population is male, 46% is female. Eighty-five percent of households are headed by men, as shown by decision-making and asset management information within households.<sup>21</sup> Education levels average eight years with most youth staying in school at least through high school. There is one school, with four teachers who cater to all grade levels. Families must heavily invest economically to send their children to study in other islands or on the mainland.
26. Access to water resources is a key limiting factor for the inhabitants of Floreana, one which has helped people organize and maintain social cohesion. Today, fresh water is distributed to 100% of households; however, this water is untreated and rationed depending on island weather conditions. The poor water quality leads to constant gastrointestinal troubles.<sup>22</sup>

#### **D. Global Environmental Problems and Root Causes**

27. The GoE's 5<sup>th</sup> National Report to the CBD<sup>23</sup> identifies the main threats to Ecuador's terrestrial biodiversity as: the loss and degradation of habitats, invasive alien species, wildlife trafficking, unsustainable hunting, pollution, climate change (including extreme weather events), and population growth. The country's marine environments are threatened by overfishing, habitat-destructive fishing practices, physical alteration of coastal and continental shelf habitats for development and land-based sources of pollution.
28. All of the islands and associated marine ecosystems are adversely impacted by four inter-related threats: invasive alien species, climate change, population growth, and expanding tourism<sup>24</sup>. The greatest threat to biodiversity in the Galapagos Islands is biological invasion<sup>25</sup>.

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<sup>18</sup> Kayamanta Consultores, 2017, Social, economic, productive baseline of Floreana.

<sup>19</sup> Kayamanta Consultores, 2017, Social, economic, productive baseline of Floreana.

<sup>20</sup> Kayamanta Consultores, 2017, Social, economic, productive baseline of Floreana.

<sup>21</sup> Kayamanta Consultores, 2017, Social, economic, productive baseline of Floreana.

<sup>22</sup> Kayamanta Consultores, 2017, Social, economic, productive baseline of Floreana.

<sup>23</sup> Ministry of Environment 2014; <https://www.cbd.int/doc/world/ec/ec-nr-05-es.pdf>

<sup>24</sup> The World Bank estimates that tourism contributed \$1,449,000,000 to the country's economy in 2016, the majority of which was generated in the Galapagos Islands; <https://data.worldbank.org/indicator/ST.INT.RCPT.CD>

<sup>25</sup> Watkins and Cruz 2007; Helmsley Charitable Trust's Galapagos Strategic Plan 2012; <https://www.worldwildlife.org/ecoregions/nt1307>

29. Invasive alien species are one of the most significant drivers of environmental degradation and species extinction worldwide, and are generally considered the primary cause of biodiversity loss in island ecosystems<sup>26</sup>. Globalization of trade, travel, and transport is greatly increasing the number and type of invasive alien species being moved around the world, as well as the rate at which they are moving. At the same time, changes in climate and land use are rendering some habitats, even the best protected and most remote natural areas, increasingly susceptible to biological invasion<sup>27</sup>. In its 5<sup>th</sup> National Report to the CBD<sup>28</sup>, the GoE identified strategic and timely actions to mitigate the adverse impacts of invasive alien species as conservation imperatives.
30. Unfortunately, hundreds of invasive alien species are already well established within the Galapagos archipelago. Some of these organisms arrived with seafarers more than 100 years ago, while others have been introduced (deliberately and inadvertently) more recently. Despite the development of improved regulatory frameworks, the rate of non-native species introductions into the Galapagos archipelago has remained steady in recent decades<sup>29</sup>. On average, 27 species have been introduced per year for the past 40 years<sup>30</sup>. So far, 1,579 alien terrestrial and marine species have been introduced to Galapagos by humans. Of these, 1,476 have become established. Almost half of these were intentional introductions, most of which were plants. Most unintentional introductions stem from: a) arrival on plants and plant associated material, b) transport vehicles, and c) commodities (in particular fruit and vegetables). The number of alien species known to be present in Galapagos was positively and closely correlated with both the total number of residents and the number of tourists<sup>31</sup>.
31. Examples of invasive alien species that have already had substantial impacts in the Galapagos Islands include: black rats (*Rattus rattus*), house mice (*Mus musculus*), feral cats (*Felis catus*), feral goats (*Capra hircus*), feral donkeys (*Equus asinus*), fire ants (*Solenopsis geminata* and *Wasmannia auropunctata*), yellow fever mosquito (*Aedes aegypti*), Mediterranean fruit fly (*Ceratitidis capitata*), Philornis (*Philornis downsi*), blackberry (*Rubus niveus*), and grape algae (*Caulerpa racemosa*).
32. Surveys of invasive alien species in the Galapagos Islands indicate that at least:
  - Nineteen (19) species of non-native vertebrates are established (9 species of mammals, 4 species of birds, 3 species of reptiles, 1 species of fish, and 1 species of amphibian);<sup>32</sup>
  - Five hundred and forty-three (543) terrestrial invertebrate species have been introduced, of which 55 are considered harmful or potentially harmful to native biodiversity;<sup>33</sup>
  - Six hundred and forty (640) plant species have been introduced, most with unknown potential impacts,<sup>34</sup> and

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<sup>26</sup> [Sax and Gaines 2008](#); [Reaser et al. 2007](#); [Bellard et al. 2016](#)

<sup>27</sup> [McNeely et al. 2001](#); [Simberloff and Rejmanek 2011](#)

<sup>28</sup> [Ministry of Environment 2014](#)

<sup>29</sup> [ABG 2014](#)

<sup>30</sup> [Toral-Granda et al. 2017](#)

<sup>31</sup> Ibid.

<sup>32</sup> [Phillips et al. 2012](#)

<sup>33</sup> ABG 'Consolidating the system of preventing, controlling and eradicating invasive species in the Galapagos Islands' approved by National Planning Authority (2013)

<sup>34</sup> [Tye 2007](#)

- Seven (7) marine invasive alien species are now reported present (more are being identified as part of baseline studies).<sup>35</sup>
33. Invasive rodents and feral cats have had particularly pervasive impacts on endemic birds, small mammals, small reptiles, and giant tortoises. The impacts of invasive alien species on endemic species can have ecosystem-wide ramifications. For example, when invasive rodents feed on giant tortoise eggs and hatchlings they reduce the number of tortoises available to spread seeds (through their excrement) and ‘plant’ the next generation of native trees and shrubs. As canopy cover declines, so do the populations of understory plants that require shading from the harsh tropical sun. The loss of understory vegetation makes landscapes more vulnerable to soil erosion and contributes to declines in soil fertility through mineral leaching. This impairs soil fertility and undermines the capacity of landscapes to be resilient to further perturbations (e.g., extreme weather events, climate change.)
  34. Finally, the persistence of invasive species like rodents and feral cats can block opportunities to rehabilitate ecosystems. This is the case in Floreana, where ambitions to help establish a self-sustaining population of tortoises and other extirpated species cannot move forward until these predators are eradicated. In this case, eradication represents a necessary enabling condition for ecological rehabilitation via species reintroduction.

### Root Causes

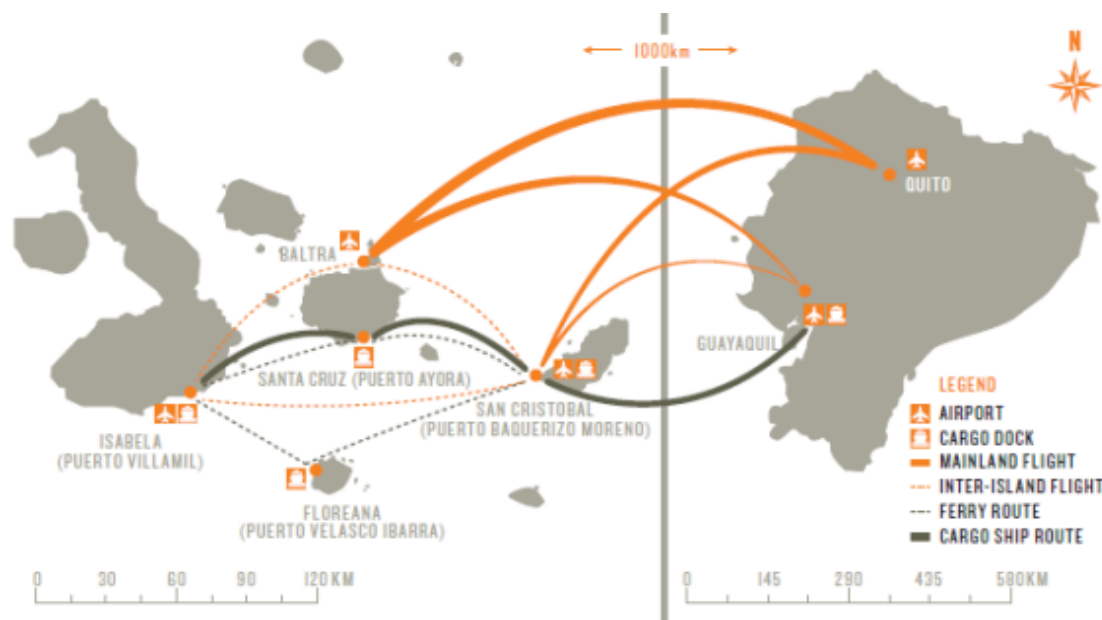
35. A number of interacting factors make the Galapagos Islands particularly vulnerable to the introduction, spread, and impacts of invasive alien species. These include:
  - Geographic isolation that necessitates inter-continental trade and transport;
  - Growth of the resident populations on the four inhabited islands;
  - Rapid economic development and resource consumption (esp., tourism growth); and
  - Extreme weather events (associated with climate change) that cause habitat disturbance.
36. With the exception of climate change-related factors, each of these root causes is directly related to what are known as the ‘Three Ts’ of biological invasions: trade, travel, and transport. Trade, travel, and transport are the biological pathways by which invasive alien species are introduced into new ecosystems where they can cause harm and further spread.
37. In recent years, the biological isolation of the Galapagos archipelago has been significantly reduced by the growing number of cargo ships, private vessels, and planes bringing people, goods, and equipment to the islands. As tourism and resident population numbers increase, so do the risks of introducing invasive alien species into the archipelago’s sensitive terrestrial and marine ecosystems. The combination of a booming tourism industry with inadequate levels of biosecurity leaves the islands extremely vulnerable to biological invasion. Of particular concern is the number of air and sea pathways through which non-native species introductions may occur. At present, 11 air and seaports act as ‘doorways’ between the islands and the mainland (see Figure 2).
38. The Galapagos Biosecurity Agency (ABG) is responsible for preventing the entry and spread of invasive species. The ABG’s effectiveness is limited by staff size and capacity, too many entry points for vessels and air traffic to enter the Galapagos archipelago without adequate inspection, a lack of advanced technologies at all ports to make screening of cargo more effective and timely, and

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<sup>35</sup> [Keith et al. 2016](#)

failure of the public/tourists to understand the importance of biosecurity and thus comply with rules and regulations

Figure 1: Map of air and sea pathways between the Galapagos, the mainland and the islands



Source: Wildaid 2013 (Quarantine chain).

## E. Barriers to Addressing the Environmental Problems and Root Causes

39. Many of the barriers that are typical of efforts to prevent, control, and eradicate invasive alien species (e.g., lack of political support; insufficient collaboration and public participation; ineffective policy, legislation, or other frameworks) have already been overcome in the Galapagos archipelago. The remaining barriers to the prevention, eradication, and control of invasive alien species are largely technical and financial in nature. Many of these barriers are particularly challenging to overcome due to a) Ecuador's socio-economic status as a developing country, b) wide dispersion of the islands, c) the islands' rugged terrain which hinders accessibility, d) the logistical difficulties inherent in securing island borders, e) the rapid increase in trade and tourism upon which the region depends, and f) the urgency and large-scale of action required to secure species that are on the brink of extinction.
40. Key remaining barriers include the following:
  - Limited technical capacity. There is limited technical capacity to design and implement highly effective prevention, eradication, or control programs. This remains a barrier for the DPNG and ABG due to limited education and training opportunities for Ecuadorians. The DPNG and ABG must increase collaborations with international partners to address this barrier.
  - Lack of equipment and personnel. The ABG lacks equipment and personnel to adequately inspect the vast amount of cargo and equipment in transit. Important entry points lack adequate inspection due to limited technologies for screening cargo. This barrier remains due to: a) lack of financial capacity to afford equipment and employ personnel and b) the lack of qualified personnel in Ecuador.



- Lack of awareness. The public/tourists do not understand the importance of biosecurity and thus do not adequately comply with rules and regulations<sup>36</sup>.
- Lack of definitive social license and infrastructure. Currently, there is no definitive social license (stakeholder acceptance) or infrastructure for eradication actions. This includes both a definitive sense of community acceptance of a final eradication plan and a lack of infrastructure to enable both the eradication process as well as the subsequent process of species reintroduction. Both are necessary to enable the government to move forward with eradicating invasive rodents and feral cats on Floreana Island and potentially on other inhabited islands.
- Insufficient taxonomic capacity. A shortage of skilled taxonomists makes it difficult to identify invasive alien species once intercepted. This represents a barrier to preventing, controlling, and eradicating invasive alien species—one that is particularly challenging for the ABG due to the lack of qualified personnel and limited access to computing equipment (thus internet access) at the ports of entry.
- Financial limitations Financial limitations, specifically the high cost of effective biosecurity programs, eradication programs, and control programs are also important barriers to preventing, controlling, and eradicating invasive alien species.

#### **F. Current Baseline (Business-as-Usual Scenario) / Future Scenarios without the Project**

41. The GoE recognizes that international trade, travel, and transport are pathways for the introduction of invasive alien species, and that prevention is typically the most cost-effective means for minimizing the impact of invasive alien species. The ABG was established in 2012 to prevent the introduction of invasive alien species into the Galapagos archipelago.
42. Despite improvements in regulatory frameworks, the rate of non-native species introductions into the Galapagos archipelago has remained steady in recent decades.<sup>37</sup> Numerous challenges to minimizing the spread and impact of invasive alien species remain to be addressed in the Galapagos archipelago<sup>38</sup>. For example, the Total Control Plan for effectively managing invasive alien species was "not fully positioned and internalized within Galapagos Institutions" and thus unable to adequately address current invasions, nor prevent additional invasive alien species from establishing in the Galapagos archipelago. Project ambition, complexity, and institutional/political stability were cited as driving factors<sup>39</sup>.
43. Absent incremental GEF funding, the GoE will remain dedicated to its ongoing efforts to protect the Galapagos Islands from the adverse impacts of invasive alien species. There is a well-established baseline of related, smaller-scale activities led by the DPNG, ABG, and their partners. However, the ABG would not be able to move toward a state-of-the-art biosecurity program in a timely manner. Failure to do so could lead to Incursions of a wide range of invasive alien species that could have otherwise been prevented through the provision of better detection technologies. Prevention is by far the most cost-effective strategy for minimizing the risks and impacts of invasive alien species.

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<sup>36</sup> [WildAid 2012](#); ABG Strategic Plan 2015-2018

<sup>37</sup> [ABG 2014](#)

<sup>38</sup> [FEIG baseline study 2010](#)

<sup>39</sup> [Coello and Sanders 2011](#)



44. Regarding the social license and infrastructure for eradication, Island Conservation (IC) undertook a study in 2012 to assess the feasibility of eradicating invasive rodents and feral cats from Floreana Island. The results of this feasibility study, published by IC in 2013<sup>40</sup>, indicated that the eradication of invasive rodents and feral cats is technically feasible. Based on the report, the DPNG identified priorities such as eradicating invasive species, repatriating endemic species, and establishing a community-based early detection/rapid response (EDRR) program. Because eradication efforts can encounter socio-cultural obstacles (e.g., beliefs that animals should not be removed or not removed via certain methods) and may present non-target risks to humans, livestock, and pets, it is imperative that both social license and infrastructure are established well before a project commences. If funding is not made available for the project described herein, global environmental benefits will not be realizable for the biodiversity or people of Floreana Island.
45. In the area of species reintroduction, under the baseline scenario, there would be slower recovery of island ecosystems following earlier removal of invasive species, due to limited capacity to breed and raise key tortoise species. In addition, the genetic diversity of the restored population would be limited.
46. Overall, under the baseline scenario, the GoE will lose, or at least delay, an important opportunity for Floreana Island to serve as a catalyst for similar eradication work on other islands of the Galapagos archipelago. Other governments will not benefit from data and well-tested protocols that would enable them to move forward with invasive vertebrate eradications on human-inhabited islands worldwide.
47. In geographic terms, the following specific outcomes are expected under the baseline scenario:

Across the Galapagos Archipelago:

- Invasive alien species across multiple taxonomic groups will continue being spread through trade and transport pathways into and within the Galapagos archipelago and beyond;
- Threats to endemic species (80 already Critically Endangered, and 164 more that are threatened) and the 788,200 hectares of terrestrial and 13,300,000 hectares of marine fragile habitats in the archipelago (96.7% terrestrial and 100% marine under protected area status) will increase;
- Ongoing, and likely more severe, impacts on native species and ecosystems, as well as human health, human livelihoods, and animal health;
- Reduced ecosystem and socio-economic resilience to climate change and other environmental disturbances;
- Further degradation of sensitive marine and terrestrial habitats, thus preventing these ecosystems from being able to support the long-term viability of endemic species, and possibly human livelihoods; and
- Undermining of investments already made in environmental conservation, ecotourism, and sustainable agriculture.

On Floreana Island:

- Persisting invasive vertebrate species will continue to predate upon, compete with, and/or spread pathogens and parasites to the native species of Floreana Island, including 61 species identified on the IUCN Red List as threatened with extinction;

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<sup>40</sup> [Island Conservation 2013](#). (English and Spanish)

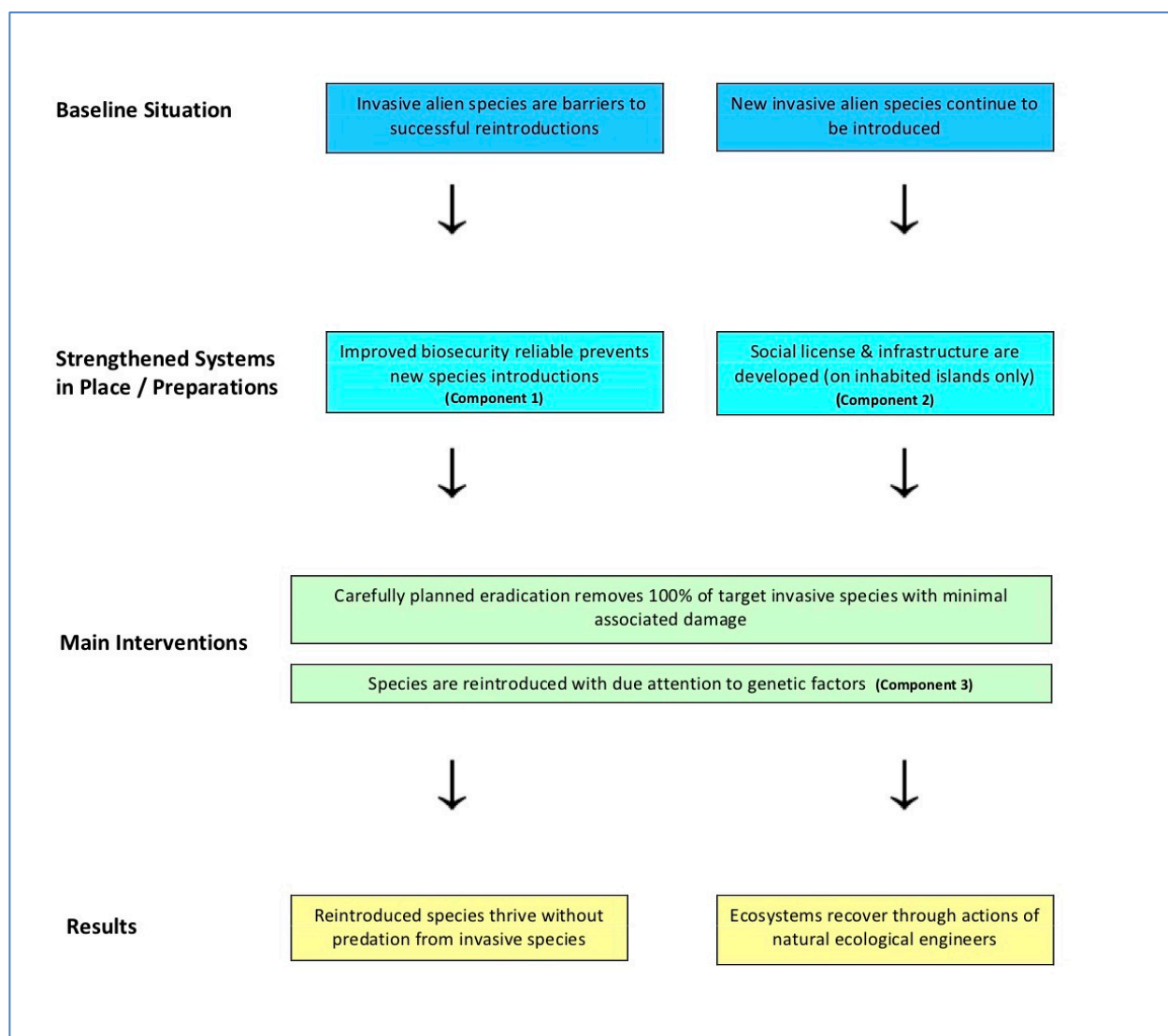
- Likely result in the continued decline in threatened species, including 6 out of 14 vertebrate species and 14 out of 14 invertebrate species
- Allow for further degradation of Floreana Island's 17,253 hectares of sensitive terrestrial habitat;
- Decrease the nutrient transfer from the marine environment to the terrestrial environment by seabirds, thereby having an adverse impact on vegetation structure and composition;
- Prevent both terrestrial and marine ecosystems from being able to support the long-term viability of native species, and possibly human livelihoods;
- Substantially undermine investments already made in environmental conservation, ecotourism, and sustainable agriculture on Floreana Island; and
- Reduce Floreana Island's ecological and socio-economic resistance to the adverse impacts of climate change and other major environmental disturbances.

On Santa Fe Island:

- Slower recovery of island ecosystems following earlier removal of invasive species, due to limited capacity to breed and raise key tortoise species.

**G. Alternatives to the Business-as-Usual Scenario**

48. Although the GoE clearly recognizes invasive alien species as the primary threat to biodiversity and sustainable livelihoods in the Galapagos archipelago, and has already invested substantial resources in invasive alien species prevention and management, more work remains to be done. This work is proceeding based on widespread agreement that in order for the Galapagos Islands' critical ecosystems and globally significant biodiversity to continue to thrive and, where degraded, be restored, a number of puzzle pieces need to be put in place across the archipelago. These include:
- Prevention: keeping invasive alien species out;
  - Eradication: eliminating already established invasive alien species, based on well-defined social license where populated areas are implicated;
  - Control: limiting the spread and impact of already established invasive alien species in cases where eradication is either physically or financially unfeasible;
  - Reintroduction and recovery: recovery of species and ecosystems becomes possible once key invasive species have been significantly reduced (control) or eliminated (eradication).
49. As seen in Figure 3 below, this larger puzzle—which is well beyond the scope and time frame of any single project—envisages: comprehensive prevention and control of alien invasive species; widespread eradication of even well entrenched alien invasive species, wherever technically and financially feasible and cost effective; reintroduction of locally extirpated species, where necessary in conjunction with captive breeding and raising programmes, and; ecosystem engineering by reintroduced and /or restored species, with effective monitoring to avoid unexpected adverse outcomes. The project approach is based on extensive experience with each of above puzzle pieces—both as they function independently and as they fit together as a whole.



**Figure 3: Theory of Change for Galapagos Archipelago, with reference to GEF project components**

50. It represents a strategic approach to use of limited financial resources, and is designed to raise and maintain momentum across the broad range of the above described areas of intervention<sup>41</sup>. In doing so, the project will enable better linkages among all of the pieces (e.g. how invasive vertebrate eradication facilitate habitat restoration), while clarifying to policy makers and others the exact nature of the individual linkages (e.g., how enhancing the biosecurity system will substantially increase pest detection and thus substantially reduce the risk of future invasions).
51. The team leading this GEF project has carefully identified activities for GEF 6 funding that are helping to fill in critical pieces of the above-described larger 'puzzle' being assembled to comprehensively combat invasive alien species in the Galapagos archipelago. Filling in these key

<sup>41</sup> Due to the size of the project budget and its relatively short duration, the eradication-related component of the project (Component 2) focuses on planning and establishment of social license, thereby creating the enabling conditions for a follow-up eradication.

pieces will help to catalyze additional investments needed to put in place other pieces of the puzzle, while strengthening the overall framework in the short- and long-term. For example, garnering the social license for the eradication of invasive rodents and cats on Floreana Island, will enable the removal of these harmful organisms, recovery of endemic species, and restoration of ecosystems. Likewise, the translocation of giant tortoises to Santa Fe Island will enable the recovery of ecological processes (e.g. seed dispersal) which will foster ecosystem restoration and, in turn, build resilience to future ecological stressors, most notably climate change.

52. Clearly, the proposed project approach is not the only alternative to the business-as-usual scenario. Other possibilities are most easily examined by considering the possibility of excluding one or more of the identified ‘puzzle pieces’, while focusing more resources on remaining pieces. For example, one alternative would have been to focus more on species reintroductions, while leaving out prevention and control (component 1). Such an approach, however, would have significantly increased the risks to the reintroduction investment by increasing the likelihood of further invasive species introductions.
53. Another possible alternative would involve leaving aside the social license element (component 2). Doing so, however, would have been both socially unjust as well as creating risks for the planned eradication work. It would also have put at risk what is expected to be a globally significant follow-up achievement, i.e. invertebrate eradication on a populated island.
54. In conclusion, given the many ‘moving parts’ associated with the puzzle described above, which are presented diagrammatically in Figure 3, the project approach emphasizes moving forward in multiple areas in multiple locations while taking on board lessons to clarify both the overall, archipelago-wide challenge and detailed aspects of constructive and cost-effective response measures.

#### H. Cost Effectiveness Analysis of Chosen Alternative

55. Table 1 below presents a qualitative analysis of the cost effectiveness of the project approach, as compared with the alternatives outlined in paras. 53-54 above.

**Table 1: Cost effectiveness analysis of alternative project approaches**

Option	Overview	Cost-effectiveness criteria		
		Risk to previous and future planned investments	Lesson learning	Sustainability of results
1 - Balanced approach to main puzzle pieces (project option)	Support to major systemic aspects underpinning biodiversity conservation and ecological restoration, and support to major species re-introduction actions	Low risk  High cost effectiveness	Lesson learning across the board, with improved systemic understanding and chance for fine-tuning of future investments	Holistic approach has best chance of long-term sustainability
2 – Excludes incremental invasive species	Business-as-usual approach to biosecurity, with incremental funds	Increased risk of invasive species (re)introductions threatens tortoise	Gaps in lesson learning	Failure to continue to improve prevention and control efforts will

Option	Overview	Cost-effectiveness criteria		
		Risk to previous and future planned investments	Lesson learning	Sustainability of results
prevention and control actions (Component 1)	shifted to social license and tortoise re-introduction work	and other native or endemic species which are recovering  Lower cost effectiveness / expected value		put reintroduction efforts, and associated investments, at risk
3 – Excludes incremental social license actions (Component 2)	Business-as-usual approach to social license actions, with incremental funds shifted to biosecurity and tortoise re-introduction work	Increased risk of social discord associated with future eradication effort  Lower social cost effectiveness	Gaps in lesson learning	Significant increased risk of losing support from Floreana community for island-wide eradication effort

### SECTION 3: PROJECT STRATEGY

#### A. Objective, Components, Expected Outcomes, Targets, and Outputs

56. The objective of the project is to safeguard biodiversity in the Galapagos Islands by enhancing biosecurity and creating the enabling environment for the restoration of Galapagos Island ecosystems.
57. The project includes three technical components, each with a single outcome and multiple outputs. The three components have been carefully identified to cover three of the four pieces in a change process aimed at reversing a downward spiral of degradation and species loss associated with invasive species introductions. Figure 3 presents a visual perspective on the components within a broader theory of change for the archipelago.
58. Outcomes and outputs will be delivered through a combination of GEF support and co-financing. Activities/items identified for GEF financial support have been chosen based on:
  - National priorities for public finances and international non-reimbursable cooperation<sup>42,43</sup>.
  - Priority needs to prevent and mitigate the impacts of invasive alien species on globally significant biodiversity in the Galapagos Islands;
  - Their ability to prevent the extinction of IUCN Critically Endangered species and facilitate ecosystem recovery region wide;

<sup>42</sup> DPNG 'Reducing vulnerability of endemic species by eradicating priority invasive species' project, approved by National Planning Authority (2012)

<sup>43</sup> ABG 'Consolidating the system of preventing, controlling and eradicating invasive species in the Galapagos Islands' approved by National Planning Authority (2013)

- The likelihood that these activities can serve as catalysts for the next phase of work in the Galapagos, as well as similar initiatives in other island systems worldwide; and
- The inability of other donor institutions and organizations to access sufficient resources (i.e. GEF funding is allowing incremental activities to occur).

### **Component 1: Furthering development of a state-of-the-art biosecurity system**

59. Biosecurity encompasses efforts to prevent harm from intentional and unintentional introductions of biological organisms—including harm to the environment, to human and animal health and the local economy<sup>44,45</sup>. Biosecurity is generally carried out at ports of entry and departure, as well as along travel pathways between destinations. In the Galapagos archipelago, biosecurity efforts are based on three quarantine barriers: 1) interception and control of invasive alien species and diseases (herein ‘pests’) and certification of treatment (e.g., fumigation) of goods and conveyances potentially infected with pests at the five marine ports and three airports that serve commercial transport and tourism industries. Outside the archipelago, marine ports in Guayaquil and airports in Quito and Guayaquil service the Galapagos Islands and serve as pre-arrival inspection points; 2) surveillance for detection; 3) rapid response to emergency that is activated when a quarantine pest is detected. Component 1 is focused mainly on strengthening the first of the three quarantine barriers.
60. Work under this component will build on past and ongoing efforts by ABG to implement and strengthen biosecurity through interception and control of invasive alien species and diseases. The benefits to biodiversity of adding new pest detection equipment, training inspectors to use the new equipment effectively, and implementing new inter-island biosecurity protocols will be substantial over the long-term and will accrue to the whole of the archipelago, as well as to continental Ecuador and Ecuador’s trading partners. Invasive alien species intercepted as a result of enhanced detection capacities will be eliminated from the pathway by which they were being mobilized, and their establishment in natural ecosystems will be prevented. To achieve this, Component 1 has one outcome and three outputs.

**Outcome 1.1.: The number of invasive alien species entering the Galapagos archipelago is substantially reduced**

**Target 1.1: A >5% increase from baseline in the number of pest interceptions and subsequent confiscations of goods due to pest risk across all ports combined.**

Output	Target <sup>46</sup>
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<sup>44</sup> [Meyerson and Reaser 2002a](#).

<sup>45</sup> [Meyerson and Reaser 2002b](#)

<sup>46</sup> The percentages shown here are by necessity estimates, given the fact that the overall magnitude of equipment purchases and nature and complexity of recommendations remain to be determined under the Action Plan. The fact that it is only a relatively small percentage of the total reflects the difference between the relatively short project duration and the longer period being covered by the Action Plan

<b>1.1.1:</b> Assessment of the biosecurity system at control points, and Action Plan	One document approved by the Project Steering Committee (PSC)
<b>1.1.2:</b> Detection equipment and consumables, as identified in the Action Plan, purchased and installed.	10% of equipment identified in the Action Plan purchased and installed
<b>1.1.3:</b> Protocols updated, and capacities built as identified in the Action Plan	20% of the recommendations implemented.

61. By furthering the development of a state-of-the-art biosecurity system, Component 1 will result in a substantial reduction in the number of invasive alien species entering the Galapagos archipelago, thereby protecting biodiversity and human livelihoods over the long-term. Achieving Component 1 will also help to secure the investments being made under Component 2 (solidifying social infrastructure), as well as the complementary work being done by project partners on invasive alien species control, endangered species recovery and ecosystem restoration.<sup>47</sup>
62. The volume of cargo inspected and the number of ‘retentions’ of goods recorded vary depending on several factors, including migratory flows, tourist arrivals, population changes, etc. In 2013, the ABG made 3,761 ‘retentions’ at the various control points. Following improvement of the prevention system, detections and retentions increased substantially: in 2017, 7,121 items were retained, and 6,350 individual invertebrates were intercepted in the 2013 – 2017 period (e.g. the Argentine ant *Linepithema humile*, which is a quarantine pest). These results demonstrate that strengthening the biosecurity system will increase the inspection effectiveness. The project intends to increase by at least 5% the number of interceptions (items retained) in the various destination control points in relation to their 2017 baseline.

**Output 1.1.1.:** Assessment of the biosecurity system at control points, and Action Plan

**Output Target:** One document approved by the Project Steering Committee (PSC)

63. The project will conduct a detailed technical assessment of the current biosecurity inspection and quarantine (including protected area quarantine). The evaluation will include factors such as: staff capacity, equipment, infrastructure, procedures and protocols.
64. The above assessment will be articulated with ABG’s Strategic Plan 2019 – 2021 and the Total Control Plan<sup>48</sup>. The Evaluation and the Strategic Plan will form the basis of an Action Plan, which will be developed by a consultant with significant inputs from the Biosecurity Specialist. The Action Plan will include details of specific steps needed to strengthen the system, including equipment needed to reinforce the control points, the protocols, equipment, staff capacity and infrastructure.

**Output 1.1.2.:** Detection equipment and consumables, as identified in the Action Plan, purchased and installed in adequate infrastructure.

<sup>47</sup> These activities are not part of the GEF 6 funding, but are being co-financed by project partners. The GEF 6 funding helps to catalyze and secure these projects.

<sup>48</sup> The Total Control Plan is the general master plan for Biosecurity in Galapagos. It gives macro-level directions across multiple entities (Ministry of Agriculture, Ministry of Health, CGREG, ABG, DPNG, etc). Within the Macro Plan, ABG has its own Three Year Strategic Plan (2019 -2021), which guides the institution’s overall technical and administrative efforts across the three-biosecurity barriers. The Evaluation and Action Plan (Result of Output 1.1.1) will be specific to interception and quarantine (Barrier 1).

**Output target:** 10% of equipment identified in the Action Plan purchased and installed

65. The action plan developed under output 1.1.1 will identify specific equipment needs at different control points across the archipelago and the mainland. GEF funding will focus on strengthening three key control points, which have been prioritized because they will help to ensure that investments being planned under component 2 (eradication of rodents and feral cats in Floreana island) will be protected from the reintroduction of these and other invasive species. The control points are: 1) Port of Guayaquil, 2) Passengers & Cargo Dock of Puerto Ayora, and 3) Port of Floreana.
66. Inspection is the fundamental tool for detecting pests and organisms that could have negative sanitary consequences; however, a thorough inspection is not always possible due to the volume of cargo and quantity of luggage, size of the means of transport, limited time, etc. This is why tools like x-ray machines are so important. At the Port of Guayaquil, x-ray equipment will be acquired and installed in order to increase the efficiency and effectiveness of review and inspection of inorganic cargo. Scales will be purchased to weigh cargo for monitoring and for determining whether fees are to be charged for inspection (charges are based upon weight). The Port of Guayaquil control point has been prioritized because 80% of the cargo that is transported to Galapagos originates at this point. The x-ray machine will be complemented by adequate sampling and identification techniques and associated equipment for the three priority control points, e.g. stainless steel inspection tables, knives, magnifying glasses, pliers, tweezers, brushes, flashlights, inspection tapes, stereoscopes, etc. Finally, in Floreana, the inspection point will be provided with better inspection materials.
67. It is expected that the increased capacity to identify pests will result in more interceptions. Many of those interceptions will be organic products or potentially hazardous materials for human or animal health and thus ABG needs to increase its ability to adequately destroy the intercepted species in a crematorium to be located in Santa Cruz. Correct disposal and destruction is the last phase of interception, to guarantee the non-dispersal of the pest. Two vehicles will be purchased to support Floreana and Santa Cruz offices in their efforts to mobilize staff to the places where inspections are needed, pests are identified and taking them to where they will be disposed of. The vehicles will also allow activation of the third barrier (rapid response to emergency).
68. Moving cargo between islands implies risks to biosecurity, especially when moving cargo to the uninhabited Galapagos Islands. To reduce the risk of moving unintended pests, the DPNG enforces quarantine on goods being transported by scientists and park rangers to remote uninhabited islands. During quarantine process, walk-in freezers are required under existing protocols in order to kill pests. The project will recondition such freezers in Santa Cruz and Floreana islands.<sup>49</sup>
69. Inspection at all control points will also be strengthened through engaging a software developing firm which, based on information developed by the Biosecurity Specialist, will develop a software to automate the inspection system of cargo and baggage by generating a barcode tag at inspection. This will save time, thereby allowing for inspection of a larger sample of goods and greater in identifying potentially hazardous items both in the port of origin (Guayaquil) and final destination (Galapagos). The end user's experience will be improved by having a faster and more transparent process. This will represent a significant improvement over the current manual system for marking inspected goods. The project will also enable ABG to purchase automation equipment and

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<sup>49</sup> This involves installing modernized cooling equipment in Floreana and Santa Cruz locations.



consumables such as bar code scanners, computers, tags, etc. Together the software and equipment will lead to increased interceptions.

**Output 1.1.3.:** Protocols updated and capacities built as identified in the Action Plan

**Output target:** 20% of the recommendations implemented<sup>50</sup>.

70. Updated protocols will establish the steps and guidelines that staff will need to follow in different situations, in order to ensure that staff exercise their responsibilities and functions correctly. The protocols will be aligned with the regulations and institutional policy. The ABG has operational protocols for inspection and quarantine, as well as surveillance in the territory. The inspection procedure protocol was updated in February 2015 and aims to: a) standardize the performance of inspectors and technical personnel, b) clarify the functions and responsibilities of the personnel, c) support the inspector's work especially in difficult situations, d) facilitate the comparative evaluation of the performance of each inspection site. This revision will maintain the same objectives but will improve the process and contents.
71. Finally, work flow charts and other materials will be developed to help implement the protocols. Staff at all control points will participate in training workshops to gain understanding of updated protocols and proper use of new equipment. Once updated, the protocols will be printed and provided to inspectors and park rangers.

## **Component 2: Solidifying the social pathway for the protection and recovery of Floreana Island ecosystems**

72. In order for invasive alien species eradication programs on inhabited islands to achieve success, the social pathway needs to be co-designed and co-constructed with the local community and other stakeholders to achieve true ownership of risks and results. A pathway needs to lead somewhere, so developing a shared vision is integral to this process. Social pathway co-design and co-construction, as we have named it, refers to the process of working collaboratively with the local community and other stakeholders to make decisions related to options and actions along the path to reaching a shared vision (which for Floreana is sustainable island health). The end goal is known once the shared vision is created but the path only unfolds as decisions are made along the way. Component two is designed to establish the requisite ecologically sustainable social infrastructure and strengthen social acceptance for the eradication of invasive rodents and feral cats from Floreana Island, as well as the commitment to recover and protect Floreana Island ecosystems. Within a sustainable development framework other initiatives (e.g. waste management, community tourism, farming practices) are being planned in ways that make them increasingly ecologically sustainable.
73. Social pathway co-design and co-construction for invasive vertebrate eradication and endemic species recovery is being undertaken as a direct response to a request for assistance from the

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<sup>50</sup> This figure reflects the fact that the Action Plan will continue beyond the conclusion of the project.

Floreana Parish Council (FPC).<sup>51</sup> The 140 residents of Floreana Island recognize the urgent need to: 1) build environmental and social resilience in the face of climate change, and 2) eradicate invasive alien species, where feasible, to achieve this island-wide resilience. This component is explicitly designed to meet the needs identified by local people, who already understand the intimate linkages among biodiversity, livelihoods, and human survival.

74. A conflict transformation<sup>52</sup> process, led by Island Conservation, has been underway on Floreana Island for the last six years, through which the concerns of the local community and partners have been actively solicited and understood. These concerns identify risks (real or perceived) associated with invasive rodent and feral cat eradication methods. Some perceived risks were alleviated through modifications of what was being proposed or through the provision of additional information, deepening the stakeholders' understanding of the issue and simultaneously collaboratively developing aspects of operational plans. For other risks, options for how to potentially avoid, minimize or mitigate the specific risk have been identified, and affected parties have selected their preferred options (there have been evolutions of thought on preferred options over time as other concerns or implications are considered). Continuing our analogy of a social pathway, conflict transformation is a suite of tools being used to help in the process of co-designing and co-constructing the path to sustainable island health.
75. IC's role has been to manage this process and assist each stakeholder in understanding the implications of each option (including causing other unacceptable risks that would result in the project being abandoned). The process has been initiated with on one-on-one engagements and dialogue with individuals, family units and institutions, and more recently has included partnership meetings to present and discuss proposals (see Appendix IX). Based on these consultations, draft risk management plans for pets, livestock, water, near-shore fisheries, children, and tourism have been developed.
76. Once the social infrastructure is in place, the eradication of invasive rodents and feral cats from Floreana Island can commence. Although these eradication measures will not be enacted under the present project, it is worth noting the profound positive ecological impact that will emerge as a secondary result of the investments in social infrastructure. Following the eventual eradication, the population status of 12 out of 14 threatened vertebrate species and 14 out of 14 threatened invertebrate species is projected to improve. Furthermore, the eradication of invasive rodents and feral cats will, ultimately, enable the reintroduction and recovery of at least six IUCN Red List threatened endemic species. These include the Floreana giant tortoise (*Chelonoidis elephantopus*), Floreana mockingbird (*Mimus trifasciatus*), Galapagos rail (*Laterallus spilonotus*), Lava gull (*Larus fuliginosus*), Galapagos racer (*Alsophis biserialis*) and Galapagos hawk (*Buteo galapagoensis*).<sup>53</sup>
77. Eradicating invasive rodents and feral cats from Floreana Island is of particular interest to the DPNG, not only because of the remarkably high endemism and vulnerability of Floreana Island's biodiversity, but also because the island has the potential to serve as a 'transformational opportunity' for the eradication of invasive alien vertebrates from other human-inhabited islands.

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<sup>51</sup> As elaborated in an MOU between Floreana's Parish Council and IC: 2015. Parish Council's 2015 Sustainable development integral plan (Plan Integral para el Desarrollo Sostenible de la Isla Floreana, Galápagos). The MoU prioritizes invasive rodent and feral cat eradication.

<sup>52</sup> Term attributed to John Paul Lederach's longer *The Little Book of Conflict Transformation*, 2003

<sup>53</sup> Repatriation activities would not be feasible without the GEF 6 Trust Funds being made available for the Component 2 activities described herein.

Potentially including Isabela, Santa Cruz and San Cristobal in the Galapagos alone. Globally, working effectively with island communities is critical, as 98% of threatened vertebrate species on islands are on at least one island with human inhabitants (including seasonal residents)<sup>54</sup>.

Component 2 consists of one outcome and 5 outputs, as described below.

Outcome 2.1.: The social license is established for the protection and recovery of Floreana Island ecosystems.

**Target 2.1: At least 80% of Floreana Island residents take new or improved ecologically sustainable action in areas such as: agriculture, waste management and other areas to be defined in the Floreana Parish Council Declaration**

Output	Target
<b>2.1.1:</b> Ecologically-sustainable farming practices are instituted on Floreana Island.	100% of farmers implement ecologically sustainable farming practices.
<b>2.1.2:</b> Floreana Parish Council Declaration adopted.	One declaration developed and adopted by the Floreana Parish Council.
<b>2.1.3</b> Operational Plan for eradication of invasive rodents and feral cats approved by the Project Steering Committee.	One operational plan approved by PSC
<b>2.1.4</b> Risk management plans developed in conjunction with the community and approved by the Project Steering Committee	<u>a:</u> Six risk management plans approved by PSC <u>b:</u> 100% of the male and female residents participate in the consultations
<b>2.1.5</b> Environmental and Social Impact Assessment (ESIA) completed and environmental certificate awarded.	One ESIA completed, and approved by PSC

78. Additional rounds of consultation and feedback solicitation are required to deepen the community and partnership's understanding of the proposed actions and responsibilities, and to refine details of risk management plans. Risk management and operational plans must be complementary and synergistic, as such changes in details of one plan may affect another; this requires all plans to be advanced simultaneously and considered within the context of each other. Once consultations and this process is complete, plans will be submitted to the PSC for approval. Other plans, including pesticide monitoring, wildlife monitoring, non-target species mitigation, and biosecurity are being developed simultaneously with co-financing to manage other risks and will also be approved by the PSC but are not a GEF deliverable. As a last step, all plans will be included within an ESIA, the development of which will include additional stakeholder engagement and considerations for gender mainstreaming.

**Output 2.1.1:** Ecologically-sustainable farming practices are instituted on Floreana Island.

**Output target:** 100% of farmers implement ecologically sustainable farming practices.

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<sup>54</sup> The Threatened Island Biodiversity Database <http://tib.islandconservation.org/>

79. A number of actions have been identified that will contribute to the safety and effectiveness of the eradication process, while also laying the groundwork for long-term sustainable development and restoration of Floreana ecosystems, including species re-introductions. To this end, a whole-farm approach is being taken, including improvements in animal management, pastures, cropping, drip irrigation, the composting of animal and crop wastes for organic fertilizer, use of troughs for watering livestock rather than directly from water sources and other practices to reduce reliance on chemical herbicides and pesticides.
80. While co-financing will support work related to sustainable pig and cattle facilities, GEF funds will support the transformation of chicken raising, with a number of benefits related to the planned eradication work and beyond. Chicken coops of appropriate design and materials will have the following benefits:
- avoid chickens consuming toxic bait during the eradication campaign;
  - avoid contamination of the human food chain;
  - improve poultry production and manage disease (important for poultry production and also locally extinct bird reintroductions<sup>55</sup>);
  - mitigate farmer-wildlife conflict with short-eared owls (*Asio flammeus galapagoensis*), which currently prey on farmers' chickens;
  - avoid future farmer-wildlife conflict for the proposed reintroduction of Galapagos hawks, which historically preyed on farmers' chickens and for that reason were hunted to local extinction on Floreana, Baltra, Santa Cruz and San Cristobal Islands.
81. Architectural plans for chicken coops (each housing 50 to 100 chickens) have been developed, incorporating Food and Agriculture Organization's (FAO) recommendations<sup>56</sup> and with farmers' and government partners' inputs. Based on these plans, two chicken coops were constructed by IC on Floreana during the PPG phase to act as pilots. Construction is currently underway on five more. During the full project, eight additional chicken coops will be constructed<sup>57</sup>.

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<sup>55</sup> Deem, S. L., Cruz, M. B., Higashiguchi, J. M. & Parker, P. G. (2012) Diseases of poultry and endemic birds in Galapagos: implications for the reintroduction of native species. *Animal Conservation* 15(1): 73-82.

<sup>56</sup> [http://www.fao.org/ag/againfo/themes/en/poultry/AP\\_management.html](http://www.fao.org/ag/againfo/themes/en/poultry/AP_management.html)

<sup>57</sup> Construction of coops and farm operations for less than 1000 adult chickens falls into the lowest environmental category (Category 1. Registro Ambiental) in Ecuador, requiring that each farm is registered. Traditional pig farming systems with less than 20 adult pig units are unregulated. Construction and operation of traditional pig farming systems with 20-100 adult pig units are considered category 2 and require a Ficha Ambiental. Cattle farm infrastructure and operations with less than 50 head are unregulated. Cattle farm infrastructure and operations for 50-200 head are considered category 2 and require a Ficha Ambiental. Farming operations and construction shall comply with these environmental and other Ecuadorian regulations.

**Output 2.1.2:** Floreana Parish Council Declaration adopted.

**Output target: One declaration developed and adopted by the Floreana Parish Council.**

82. The FPC is composed of five elected representatives of the Floreana community. In 2015, the FPC finalized its *Integral plan for the sustainable development of Floreana Island*, which includes invasive rodent and feral cat eradication as a priority. As a further demonstration of community support, the FPC will develop and adopt a declaration supporting biosecurity, invasive rodent and feral cat eradication, appropriate waste management, ecologically sustainable farming practices and reintroduction of locally extinct Floreana species

**Output 2.1.3.:** Operational Plan for eradication of invasive rodents and feral cats approved by the Project Steering Committee.

**Output target: One operational plan approved by PSC**

83. The invasive rodents and feral cat eradication operational plan package (including safety, residential site management, rodent bait logistics, bulk bait loading and operations plans) will be developed, and submitted for PSC approval.

**Output 2.1.4:** Risk management plans developed in conjunction with the community and approved by the Project Steering Committee

**Output target a: Six risk management plans approved by PSC**

**Output target b: 100% of the male and female residents participate in the consultations**

84. As discussed above, risk management plans for pets, livestock, water, near-shore fisheries, children, and tourism have been developed by Island Conservation with community and project partner consultation and input. Additional rounds of consultation and feedback solicitation are required to deepen the community and partners' understanding of the proposed actions and respective responsibilities, and to refine details of each plan with their input. Once finalized, risk management plans will be submitted to the PSC as a package which shall include operational plans; these will be key documents for the consultants developing the ESIA (see following output). Presentations will be developed for each plan.

**Output 2.1.5:** Environmental and Social Impact Assessment (ESIA) completed and environmental certificate awarded.

**Output target: One ESIA completed, and approved by PSC**

85. The ESIA will bring together the suite of operational, risk management and other plans developed for the project into a single document that: identifies and assesses the potential environmental and social impacts of the proposed invasive rodent and feral cat eradication; evaluates alternatives; and incorporates appropriate mitigation, management and monitoring measures. A third-party consultancy company registered to undertake ESIA's with Ecuador's Ministry of Environment will be contracted to develop an ESIA that meets both Ecuador's and the CI-GEF Implementing Agency's process and content requirements. IC and DPNG staff will provide technical support and oversight to the consultancy team. The final ESIA will be available in both Spanish and English. Once completed, the ESIA will be submitted to the PSC for approval. The Ministry of Environment has determined that due to the characteristics of the project an environmental certificate, in the

category of “scientific research and development services” is required, rather than an environmental license (i.e. if an ESIA was required) according to the regulations of Ecuador. In other words, an ESIA is not required by Ecuador for the invasive rodent and cat eradication project. However, the ESIA will be conducted in order to fulfil relevant safeguards in case GEF or other multilateral funds are secured for use in the implementation phase of the invasive rodent and feral cat eradication project.

**Component 3: Advancing the recovery of island ecosystems following invasive species eradication through the establishment of keystone species (i.e. giant tortoises)**

86. Although invasive rodents and feral cats have not yet been removed from Floreana Island, invasive vertebrates have been removed from Santa Fe (goats) and other Galapagos islands. These islands are now candidates for the recovery of endangered species and associated ecological processes. Giant tortoises are a case in point because these icons of Galapagos act as “engineers” of Galapagos ecosystems, yet have been lost from several of the main islands of Galapagos. Although it is not feasible to resurrect extinct species, saddleback tortoise species characteristic of the arid zones that comprise most of Galapagos are similar enough in ecological role to enable the recovery of ecological processes through the translocation of closely related species—so-called ‘ecological replacements’. The DPNG’s Tortoise Breeding Centers have been conducting giant tortoise breeding, head-starting, and translocation activities as part of island-specific recovery efforts for over five decades, resulting in remarkable conservation success stories like the Española Island tortoise. On Española, historical tortoise harvesting resulted in a population of just 15 individuals, only three of which were males. A five-decade-long population restoration program involving captive breeding, head-starting and the reintroduction of more than 1,500 individuals saved the species and effectively re-established the island’s ecosystem engineer<sup>58</sup>.
87. As part of the Giant Tortoise Restoration Initiative<sup>59</sup>, Española tortoises, as the closest genetic relative and of the same saddleback morphology, will be used as ecological analogs for the extinct Santa Fe tortoise to re-initiate ecosystem processes on Santa Fe Island. Since 2015, a total of 396 Española (*Chelonoidis hoodensis*) tortoises have been released on Santa Fe. Additional efforts will be required in coming years to build capacity and restore the island with approximately 4,000 tortoises, the abundance predicted by habitat suitability models to have been present originally<sup>60</sup>. Work will proceed in accordance with guidelines developed by IUCN to direct conservation-oriented translocations in an ecologically sound manner.<sup>61</sup>
88. Component 3 consists of two outcomes and 5 outputs, as described below.

**Outcome 3.1.: Ecosystem processes, particularly seed dispersal, re-initiated across Santa Fe island (2,413 ha) as the result of the translocation of giant tortoises.**

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<sup>58</sup> [Gibbs et al. 2014](#)

<sup>59</sup> A collaborative 15-year project (2014-2028) implemented by the DPNG and Galapagos Conservancy, with support from visiting scientists from around the world. <https://www.galapagos.org/conservation/our-work/tortoise-restoration/>

<sup>60</sup> Tapia et al. 2015. Plan para la Reintroducción de las Tortugas Gigantes a la isla Santa Fe como Estrategia para su Restauración Ecológica.

<sup>61</sup> <http://www.iucn-whsg.org/node/1471>

**Target 3.1: At least 506 giant tortoises of the species *Chelonoidis hoodensis* are dispersing seeds on approximately 50% (1,206 ha) of the area of Santa Fe Island**

Output	Target
3.1.1: Giant tortoises ( <i>Chelonoidis hoodensis</i> ) translocated to Santa Fe Island	<p>a. On average, at least 40 juvenile giant tortoises (<i>C. hoodensis</i>) are translocated annually</p> <p>b. At least 30 sub-adult giant tortoises (<i>C. hoodensis</i>) are translocated</p>
3.1.2: Monitoring and evaluation protocols for assessing the role of giant tortoises as ecosystem engineers, including seed dispersal, are tested and optimized	One monitoring and evaluation protocol

89. As of December 2017, those surviving among the 396 giant tortoises of the species *C. hoodensis* released were dispersing seeds near their release site in the central part of Santa Fe Island, on approximately 10% of the island's area, or 240 ha. Following translocation activities, these figures will be increased as per the above target.

**Output 3.1.1.: Giant tortoises (*Chelonoidis hoodensis*) translocated to Santa Fe Island**

**Output target a. On average, at least 40 juvenile giant tortoises (*C. hoodensis*) are translocated annually**

**Output target b. At least 30 sub-adult giant tortoises (*C. hoodensis*) are translocated**

90. This output seeks to enhance the process of populating Santa Fe Island with Española tortoises (*C. hoodensis*) by:
- translocating juvenile tortoises from the Santa Cruz breeding center to Santa Fe (target 3.1.1.a), and
  - translocating sub-adult tortoises from Española to Santa Fe (3.1.1.b).
91. In order to achieve Target 3.1.1.a., juvenile giant tortoises, approximately five years in age, will be translocated from the Santa Cruz Island tortoise-breeding center, where they were hatched and raised, to Santa Fe Island. Prior to being translocated, they will be subject to a quarantine process and equipped with subdermal microchips (transponders) to enable individual identification where re-encountered. These tortoises will be transported via the DPNG 'Sierra Negra' research vessel and will be carried by DPNG rangers from the ship to selected sites on Santa Fe Island for release. At least 40 juvenile giant tortoises will be translocated annually during the course of the project, i.e. at least 80 juvenile giant tortoises in total.
92. To achieve Target 3.1.1.b., the project will bring older, sub-adult giant tortoises, which will soon begin breeding (at 18 – 20 years of age), from Española Island to Santa Fe Island to accelerate the natural breeding process, an intervention demonstrated via population viability modeling to not affect likelihood of population persistence. The sub-adult tortoises targeted for translocation from Española were originally incubated in the breeding center on Santa Cruz Island and then released on Española at around age five. Over the years, as they were maturing, Santa Fe Island has been

with “goat-free”; as a result, the island is now a suitable destination for these sub-adults, which will likely commence breeding shortly after being translocated. The advantage of bringing sub-adult tortoises to Santa Fe—as opposed to only bringing juveniles—is jumpstart the population restoration process by some 15 years (as compared with waiting until the 5-year old juveniles turn 20 and are able to reproduce).

93. The translocation process will begin with a trip by scientists and park rangers to Española Island to locate sub-adult tortoises suitable for translocation. Before traveling to Española Island, people, equipment and provisions will undergo a thorough quarantine process, as per protocols being developed in component 1. Search groups will be divided into 10 camps throughout Española Island. Once the search groups locate suitable sub-adult Española tortoises, they will be marked with telemetry equipment until they are ready to be airlifted. At that point, helicopters will transfer the tortoises from remote locations on Española Island to the Sierra Negra vessel<sup>62</sup>, which will bring them to the breeding center on Santa Cruz Island for at least a three month quarantine.
94. Following the quarantine process, the tortoises will be airlifted back to the Sierra Negra ship, which will move with the tortoises to Santa Fe Island, where they will be transported via helicopter to carefully selected locations throughout the island. A portion of the costs of the expedition will be covered by GEF and the remainder through co-financing from GC and DPNG.

**Output 3.1.2.:** Monitoring and evaluation protocols for assessing the role of giant tortoises as ecosystem engineers, including seed dispersal, are tested and optimized

#### **Output target: One monitoring and evaluation protocol**

95. Tortoises released under Output 3.1.1 will be equipped with microchips (subdermal transponders) to aid monitoring. A standard protocol will be developed and tested in the field to evaluate the health and status of individual tortoises repatriated, tortoise population growth and dispersal, and interactions of tortoises with other species, particular the plant community. The protocol will be updated as additional knowledge is generated. This among the first experience in the world of repopulating an island with “ecological analog” giant tortoises, thus the importance of carefully developing a protocol based on ongoing experience gained and lessons learned. The protocol will be made available for use by, *inter alia*, the DPNG and its partners to start and manage the repopulation of adult tortoises on other islands, such as Floreana.
96. Monitoring will be undertaken in accordance with the above protocol. In biannual monitoring, survival rates, body condition, growth rates, habitat use and dispersal will be measured through mark-recapture methods. Interactions with other species, including seed dispersal and habitat change attributable to tortoises, will be measured via studies of diet (inferred from fecal samples) and foraging ecology of tortoises (observational studies) as well as vegetation response and habitat use by other animals inside and outside of areas from which tortoises are excluded. *Opuntia* cactus represents a keystone species for the entire vertebrate community on Santa Fe Island, and a major focus of both tortoise and terrestrial iguana foraging: demographic studies of *Opuntia* across a gradient of tortoise density will enable tracking *Opuntia* response to tortoise re-establishment.

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<sup>62</sup> Without a helicopter, it may require up to two to three days to transport these very heavy animals overland over very difficult terrain, with associated risks for both tortoises and people.



Outcome 3.2.: Production in captivity of giant tortoises for future translocation throughout the archipelago is significantly increased along with associated capacities.

Outcome target 3.2: In the breeding centers, an enhanced and expanded breeding stock and associated husbandry capacities contribute to the following numbers of giant tortoises reaching the age of one year:

- In the Santa Cruz Island breeding center in Puerto Ayora, at least 180 tortoises annually from the populations of Española, Santiago, Floreana, Pinzón and Eastern Santa Cruz;
- In Isabela Island breeding center in Puerto Villamil, an average of 140 tortoises annually from the populations of the Sierra Negra and Cerro Azul volcanoes.

Output	Output targets
<b>3.2.1:</b> Giant tortoise breeding centers on Santa Cruz and Isabela Islands are modernized and expanded	<b>3.2.1.</b> Two centers modernized and expanded
<b>3.2.2:</b> Giant tortoise breeding stock with partial ancestry of <i>C. niger</i> are selected, located and transferred to the Santa Cruz breeding center	<b>3.2.2.:</b> At least 5 breeders with partial ancestry of Floreana ( <i>C. niger</i> ) selected, located and transferred to the breeding centers.
<b>3.2.3</b> Scientific and technical findings reported in the professional and popular literature.	<b>3.2.3:</b> 1 peer reviewed article and 2 popular articles produced

97. Taking full advantage of the ongoing expansion of suitable habitat for giant tortoise reintroduction—itsself a function of previously planned and carefully executed invasive species eradications—will require a significant increase in the capacity of giant tortoise breeding facilities from baseline levels. Increases in the number of tortoises reaching one year of age at the captive breeding centers of Santa Cruz and Isabela will be the indicator used to measure this outcome, which will be enabled by expansion of breeding centers (Output 3.2.1). In addition, the genetic quality of the juvenile population will be improved through the acquisition of enhanced breeding stock with partial ancestry of *C. niger* for the repopulation of Floreana Island (Output 3.2.2). Finally, the findings will be shared with both scientific and lay audiences (Output 3.2.3).

**Output 3.2.1.:** Giant tortoise breeding centers on Santa Cruz and Isabela Islands are modified and expanded

**Output target: 3.2.1. Two centers modified and expanded**

98. The process of producing 320 tortoises from the Española, Santiago, Floreana, Pinzon, Eastern Santa Cruz, Sierra Negra and Cerro Azul lineages begins with collection of eggs. For some species, breeders are kept in captivity at the breeding center and their eggs harvest from nesting areas at the Breeding Center. For others species, eggs are collected in the wild. In both cases, eggs are incubated in the Breeding Center under controlled conditions to improve the hatching percentage. Young tortoises are kept in the Centers until they reach five years of age, which generates a huge

increase in survival rates (typically 90% of eggs reach juvenile stage) versus in the wild (estimated at just 5%), with major ramifications for tortoise population growth rates.

99. To strengthen the role of captive breeding in restoration of wild populations, GEF funding will be used to renovate and expand the giant tortoise breeding centers on Santa Cruz and Isabela Islands. Improvements will include construction<sup>63</sup> of at least two new breeding pens, a quarantine pen, a pre-adaptation pen, and ten pens for hatchling tortoises. These augment the recent installation of 8 state-of-the-art tortoise egg incubators. i. A competitive bidding process will be used to select and hire a general contractor for construction of the pens.
100. Within the improved breeding centers, breeders will be kept in captivity and eggs will be incubated<sup>64</sup>. Newly hatched tortoises will be cared for in secure, covered pens until they are a year old, including daily feeding and provisioning of water, ensuring adequate barriers to prevent predation by rats, and health monitoring. Beyond the life of this project, the tortoises will be transferred to pre-adaptation pens where they will remain until they are five years old. Here, they will adapt to the terrain and temperature extremes that they will face in the wild. Finally, the tortoises will be subject to a quarantine period, which aims to ensure that they are healthy and also have been purged of seeds in their digestive tracts, before being released in the wild in their respective species' ranges<sup>65</sup>.

**Output 3.2.2:** Giant tortoise breeding stock with partial ancestry of *C. niger* are selected, located and transferred to the Santa Cruz breeding center to enable eventual repopulation of Floreana Island

**Output target: At least five giant tortoises located and transferred (20% increase in captive population of Floreana breeders)**

101. Beginning in the late 1990s and continuing through 2014, a series of systematic scientific expeditions took place to Wolf Volcano, located at the northern end of Isabela Island, to inventory the tortoise population there. In 2008, scientists tagged and collected blood samples from some 1,600 tortoises, 89 of which turned out to be partly related to the extinct Floreana Giant Tortoise (*C. niger*). Another 17 were found to be related to Pinta Island tortoises. Their presence on Wolf, as much as 100 miles from their place of origin, was explained by the fact that, over a century ago, sailors left many saddlebacked tortoises, initially collected from other islands in the Galapagos, at neighboring Banks Bay (a major stopping over place for whalers and other sailors to repair their ships). Some of these tortoises interbred with the local domed tortoises (*C. becki*), enabling the *C. niger* genome to persist in the resulting hybrid offspring. To date, over 200 tortoises have been identified as having partial Floreana ancestry. In November 2015, an expedition to Wolf Volcano selected 17 individuals from this group, which were transported to the Santa Cruz Breeding Center to begin the current *C. niger* breeding program.

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<sup>63</sup> Tortoise pens are open air enclosures of natural terrain, delineated by rock walls. They are not buildings.

<sup>64</sup> (In the wild 10% of the eggs hatch and make it to 5 years of age. In breeding center >90% of eggs hatch and reach 5 years of age).

<sup>65</sup> This captive breeding program uses the data and learning that DPNG and its partners have learned in the last 50 years, each time improving the hatching and survival rates

102. As elaborated in Section 3v above, it was concluded that the Floreana repopulation program would be significantly enhanced by expanding the pool of breeders with additional, carefully selected giant tortoises with Floreana ancestry from Wolf Volcano. The project will therefore support a ten-day expedition to Wolf Volcano to search for and remove at least five tortoises with partial *C. niger* ancestry. The selected tortoises will be added to the breeders' stock to provide a critically needed increase in genetic diversity and Floreana tortoise genome capture; in addition, their removal from the endemic *C. becki* will improve that species' genetic status.
103. Before the field trip, a laboratory analysis of the genetic identity of previously identified collected blood samples will be performed, using molecular techniques to identify the set priority individuals<sup>66</sup> to be re-located on Wolf Volcano. All previously sampled tortoises with Floreana tortoise-like morphology whose blood will be analyzed had subdermal transponders (PIT tags) added, enable us to identify them with very high confidence when re-encountered on Wolf Volcano. To find the selected tortoises, ten groups of four people each will be deployed across the very rugged terrain in Wolf Volcano. A helicopter will provide logistical support—including ferrying water and food—to the teams and remove the priority tortoises once they have been located. The DPNG's Sierra Negra vessel will remain on the coast at Banks Bay as a base of operations for the helicopter and the search groups. Importantly, the helicopter is critical to move by cargo net priority tortoises re-located in the field back to the ship (tortoises are generally too heavy to be moved by people over long distances and rough terrain). Veterinarians will be on board to receive the tortoises and to take samples to ensure the health of selected individuals. The GEF funding will support helicopter time, genetic analysis to support identification of the best individuals, field equipment (tents, sleeping bags, GPS, etc.) and protection (clothing, boots, helmets, etc.) for park rangers and scientists, as well as planning of the field work.
104. The selected tortoises will be brought by the Sierra Negra vessel to the breeding facility at Santa Cruz Island. These tortoises will be integrated into the existing breeding stock and provide expanded genetic variation to the program and greater capture of the Floreana tortoise genome, thereby improving the fitness of the offspring and helping to ensure the future success of the tortoise population restoration on Floreana Island. The addition of these five breeders represents a 20% increase in the size of what is at present a small core breeding population to restore tortoises to Floreana Island. Given that lifetime female production of offspring, reaching breeding age is likely 2-3 in the wild over the ca. 100-year life span of a female giant tortoise, captive rearing intervention can increase her production to some 250-300 offspring reaching breeding age (a factor of 100x). Therefore, the gains of adding this seemingly modest number of 5 individuals to the core breeding stock plus head-starting in the long-term represents a substantial contribution to population recovery on Floreana Island. Keeping the number of additional breeders to this modest level also recognizes the very significant financial burden that hosting these additional new breeders for the rest of their lifespan (many decades) in captivity plus the costs rearing all their offspring and releasing them to the wild.

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<sup>66</sup> Priority individuals for selection will be those with the highest % of *C. niger* genes, greatest heterozygosity and most "outbred" relative to the current breeders.

**Output 3.2.3:** Scientific and technical findings reported in the professional and popular literature

**Output target:** 1 peer reviewed article and 2 popular articles produced.

105. This output seeks to share the project's scientific findings regarding tortoise relocation and habitat restoration with global audiences and especially with the population of Galapagos. First, a scientific article will be produced which will be submitted for publication to a respected, peer-reviewed science periodical.<sup>67</sup>
106. Second, at the local level, it is also important to share knowledge with decision makers and the public. A popular diffusion article will be produced and submitted for publication in the Galapagos Report, a report published every year with articles about key policies, conservation programmes and summaries of key science reports. This annual publication aims to provide decision makers with key information in terms of key development in conservation and social policy. It is also a very useful resource for students and investigators, by compiling in one place this kind of information. Printed copies are distributed to key decision makers, while PDF copies can be downloaded for free.
107. The third product will be a poster to be presented at the Galapagos National Park Symposium, which is organized every year and is open to the public. Attendance at the Symposium includes other investigators (both visiting and resident scientists), guides, students and members of the public.

**B. Associated Baseline Projects**

108. The investments by the GoE, its technical partners, and donors (including the GEF) to secure the unique species and ecosystems of the Galapagos Islands are substantial, especially considering the country's budgetary limitations and numerous socio-economic needs. Numerous organizations, both within and outside of the Galapagos archipelago, have already made strong commitments to regional conservation and pledged their support to future activities. Examples of financial expenditures made in 2017 by institutions that will take a lead in this GEF 6 project include (US\$): (US\$): ABG (\$5,887,477)<sup>68</sup>, DPNG (\$2,760,451)<sup>69</sup>, IC (\$710,919), for a total of \$8,648,639. Table 2 provides an overview of baseline projects in the Galapagos archipelago that will complement the GEF 6 project proposed here. These investment projects prioritize and aim to direct public and non-reimbursable international cooperation to national priorities.

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<sup>67</sup> Depending on the editorial process of the different journals to which it will be submitted, the article might not be published by the time of project closing.

<sup>68</sup> <http://bioseguridadgalapagos.gob.ec/content/uploads/2018/02/presentacionrendiciondecuentasabg2017.pdf>

<sup>69</sup> FEIG contributions are included within the ABG and DPNG amounts.

**Table 2: Baseline Projects that Address Invasive Alien Species in the Galapagos Archipelago**

PROJECT NAME	YEARS (Start-End)	BUDGET (USD)	DONOR(S)	OBJECTIVES/BRIEF DESCRIPTION OF HOW IT IS LINKED TO THIS GEF PROJECT
<b>DPNG's annual operations related to invasive alien species and habitat management</b>	Annual through 2017	\$6,420,000 / year (using 2014 as a reference)	GoE (DPNG)	The DPNG manages invasive alien species within Park and Marine Reserve boundaries and implements habitat restoration strategies within the Park to protect biodiversity. Activities include invasive alien plant, invertebrate and vertebrate control, monitoring and identification of invasive alien species in the Marine Reserve, replanting native forest after controlling invasive plants, repatriating tortoises and mangrove finches, species monitoring and censuses, and conduct public outreach and education.
<b>ABG's annual operations</b>	2012-2017	\$5,000,000 / year (using 2014 as reference)	GoE (ABG), WildAid, Island Conservation, Galapagos Conservancy	The ABG aims to prevent invasive alien species arriving to and establishing within the Galapagos archipelago. They do this by inspecting cargo, luggage, boats and planes prior to departure for and upon arrival to the islands, control and where feasible eradicate non-native species in areas outside the National Park, monitor livestock for disease, conduct public outreach and education, and create and enforce regulations.
<b>MAG's Bio-agriculture project for Galapagos (2014) and MAG's annual operations</b>	2014-2017	\$600,000 / year (using 2014 as reference)	GoE (MAG)	The Galapagos bio-agriculture Plan will increase the quantity and quality of local agricultural production, shorten supply chains and promote consumption of fresh local produce. This will reduce importations of organic products and therefore reduce risks of importing invasive alien species.
<b>FEIG</b>	2012-2015	Approx. \$600,000 / year	GoE, UNDP (GEF), KfW, Galapagos Conservancy, Conservation International	The FEIG provides incremental funds to implement invasive alien species projects in the archipelago. FEIG funds support the overall strategies to effectively manage invasive alien species, as such future investments will be made depending upon regional priorities.
<b>Component 2 preparations</b>	2014-2017	\$600,000 / year	Island Conservation	IC has provided technical assistance to project partners in planning and preparations, implementing the stakeholder community engagement strategy, and assisting in developing the invasive rodent and feral cat eradication operational plan for Floreana Island.
<b>DPNG's Enhancing Electronic Monitoring</b>	2010-2017	\$870,000 in 2010-12 by Sea	GoE (DPNG, Ecuadorian Navy), World	Systems have been established to allow for all vessels to be tracked remotely, and incorporates radars, and long range video cameras, which

PROJECT NAME	YEARS (Start-End)	BUDGET (USD)	DONOR(S)	OBJECTIVES/BRIEF DESCRIPTION OF HOW IT IS LINKED TO THIS GEF PROJECT
<b>Capacity of Vessels in the Galapagos Marine Reserve</b>		Shepherd, and \$100,000/year for operating	Wide Fund for Nature, Sea Shepherd, WildAid, Conservation International	reduces the need for large costly oceanic patrol vessels. Although designed primarily for managing fishing and tourism vessels the system also supports Component 1, allowing identification and enforcement of illegal landings or entry to the marine reserve by boats that have not passed through or are attempting to evade biosecurity filters.
<b>‘Galapagos Marine Invasive Species: Prevention, Detection and Management’ by University of Southampton and Charles Darwin Foundation</b>	2012-2017	\$500,000	GoE (ABG, DPNG, Ecuadorian Navy, Oceanography Institute), Galapagos Conservancy, UK Department for Environment, Food & Rural Affairs’ (DEFRA) Darwin Initiative	This project has established baselines for invasive marine species, introduced risk assessment tools and rapid response protocols for invasive marine species control/eradication, conducted community outreach, established an invasive marine species detection program, and built capacity in ABG/DPNG staff and local students. These activities complement project components but are not part of them, they have largely been completed.

109. All aspects of this project are already underpinned by existing technical, operational, and/or financial capacity. Relationships among the project partners have, in many cases, been long established and benefit from a history of past successes. Coordination in the archipelago can be challenging due to its geographic spread and distance from GoE ministries in Quito. However, the project team members are familiar with these conditions and have developed operating procedures that cost-effectively meet communication and collaboration needs.

110. The GoE is not only committed to minimizing the impact and spread of invasive alien species, but is also determined to set a global example in an iconic archipelago, thus inspiring and empowering other countries to more effectively conserve their biodiversity. Ecuadorian agencies, in collaboration with their partners in the Galapagos Islands and beyond, have been strategically advancing the work initiated under the previous GEF 3 project. Since 2011, examples of tangible successes have included:

- Creation of a separate institution under the MAE to exclusively manage biosecurity of the Galapagos archipelago. The Galapagos Biosecurity Agency (Agencia de Regulación y Control para la Bioseguridad y Cuarentena de Galápagos; ABG) was formed in 2012, and has since assimilated a range of responsibilities from other government institutions into a single agency;
- Eradication of introduced rodents from Pinzón, Rábida, and ten smaller islands (over 2,300 ha total) and improved capacity to implement larger, more complex rodent eradication projects; and

- Operationalization of the FEIG, which has been disbursing funds to support invasive alien species projects within the archipelago.

### **C. Incremental Cost Reasoning**

111. GEF 6 incremental funding for this project will build upon the baseline by:

- Advancing a state-of-the-art biosecurity system;
- Solidifying the social infrastructure for the protection and recovery of Floreana Island ecosystems;
- Enacting sustainable-farming practices on Floreana Island as the cultural norm; and
- Translocating giant tortoises to Santa Fe Island;

112. The above changes will enable the following:

- Functionally protect the Galapagos Islands protected area network;
- Strengthen protection of 244 threatened species throughout the Galapagos archipelago's terrestrial and marine habitats;
- Enable the eradication of invasive rodents and feral cats on Floreana Island;
- Facilitate the recovery of critical ecological processes on Santa Fe Island;

113. And these latter changes will in turn lead to the following results:

- Facilitate recovery of native vegetation, thus reducing forest degradation;
- Enable the recovery of as many as 55 threatened species on Floreana Island;
- Allow for the reintroduction of at least 6 threatened vertebrate species on Floreana Island (including Floreana giant tortoises), and as many as 7 other Galapagos endemic species;
- Reduce the risks of disease transmission to wildlife, livestock, and people;
- Enhance ecosystem resilience to climate change and other disturbances; and
- Facilitate a thriving tourist economy to support the local peoples of the Galapagos Islands and Ecuador.

114. While the benefits to biodiversity of adding new pest detection equipment, training for inspectors to effectively use the new equipment, and the implementation of inter-island biosecurity protocols are incremental, they will be substantial over the long-term and benefit the whole of the archipelago, as well as continental Ecuador and Ecuador's trading partners.

### **D. Global Environmental Benefits**

115. By further advancing pest surveillance capacity at Galapagos ports of entry and departure points on mainland Ecuador, this project is anticipated to decrease the entry of pests by at least 5%, thereby facilitating the recovery and long-term protection of biodiversity across the archipelago's 788,200 ha of terrestrial habitats and 13,300,000 ha of marine reserve. Since invasive alien species do not respect jurisdictional boundaries, this project will also help to ensure that the Galapagos Islands' protected area system (96.7% of the land area, plus the marine reserve) is protected in actuality, not just concept.

116. The eradication of invasive rodents and feral cats from the 17,253 ha of Floreana Island requires establishment of a social license prior to the initiation of the eradication work. The eradication of

invasive vertebrates from human-inhabited islands is the “next great frontier” for conservation success in the Galapagos. Outcomes of the process related to securing social license will be carefully evaluated and principles and case-studies made available for use on human-inhabited islands in the Galapagos archipelago and beyond.

117. In addition, the project will contribute directly to the restoration of 1,206 ha of Santa Fe Island through the actions of an increased and increasingly diverse (genetically) population of giant tortoises.
118. The island’s native flora and fauna will experience direct and immediate benefits across terrestrial, freshwater, and marine ecosystems. Of particular importance is the opportunity to recover populations of 61 endemic plant and animal species that are currently threatened with extinction. Once the invasive predators are removed, which will not happen during the lifetime of this project, populations of at least five IUCN Red List threatened endemic species and eight other species can be repatriated to Floreana Island and their populations secured, including, the Floreana giant tortoise (*Chelonoidis elephantopus*), Floreana mockingbird (*Mimus trifasciatus*), Galapagos rail (*Laterallus spilonotus*), Lava gull (*Larus fuliginosus*), and Galapagos hawk (*Buteo galapagoensis*).<sup>70</sup>
119. The adoption of ecologically-sustainable farming practices (e.g. livestock and poultry containment) by Floreana residents will be achieved through a conflict transformation process that is currently underway and for which there is significant enthusiasm. By adopting these farming practices, current human-wildlife conflicts will be resolved and future conflicts avoided. This will translate into new opportunities for species recovery and ecosystem restoration. For example, the current losses of young poultry to short-eared owls (*Asio flammeus galapagoensis*) will cease once chicken coops are being utilized, thus breaking a cycle that includes the persecution of owls by poultry farmers. The adoption of cooping practices will also establish the necessary conditions for the reintroduction of Galapagos hawks (*Buteo galapagoensis*) to Floreana Island.
120. Although Biodiversity is the primary GEF Focal Area addressed by this project, successfully preventing future introductions of invasive alien species in the Galapagos archipelago and the recovery of endemic species, as well as their associated ecological processes, will provide benefits to other GEF Focal Areas, including: Land Degradation (by facilitating the recovery of vegetation and thus reducing erosion), Climate Change Mitigation (by securing carbon stocks and fostering ecosystem resilience), international waters (by functionally protecting 13,300,000 ha of marine reserve and minimizing potential future impacts of invasive species), and Sustainable Forest Management/REDD+ (by promoting better management of livestock, pets, and pests that adversely impact forest health).

## **E. Socio-Economic Benefits**

121. Tourism is on the rise in the Galapagos Islands, despite the economic downfall in many parts of the world; the number of visitors increased from 40,000 in 1990 to 145,000 in 2006 to 145,000 in 2006<sup>71</sup> and 241,800 in 2017<sup>72</sup>. The World Bank estimates that tourism contributed \$1,449,000,000

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<sup>70</sup> Repatriation activities to Floreana will not be feasible without the GEF 6 Trust Funds being made available for the Program 4 activities described herein, and implementation of invasive rodent and feral cat eradication.

<sup>71</sup> [http://www.galapagos.gob.ec/wp-content/uploads/downloads/2015/05/Informe\\_2014.compressed.pdf](http://www.galapagos.gob.ec/wp-content/uploads/downloads/2015/05/Informe_2014.compressed.pdf)

<sup>72</sup> [http://www.galapagos.gob.ec/wp-content/uploads/downloads/2015/05/Informe\\_2014.compressed.pdf](http://www.galapagos.gob.ec/wp-content/uploads/downloads/2015/05/Informe_2014.compressed.pdf)



to Ecuador's economy in 2016, the majority of which was generated in the Galapagos Islands.<sup>73</sup> The recovery of Santa Fe and Floreana Island ecosystems (particularly the recovery of endemic species) has the potential to increase ecotourism income to the benefit of Galapagos residents and commercial enterprise operators, as well as the mainland economy.

122. A state of the art biosecurity system will reduce the likelihood of imports of and establishment of invasive species. This will protect Galapagos communities from the harmful effects of invasive species to human health, infrastructure, agriculture, animal health, natural systems that provide ecosystem services such as clean water, and tourism to name a few. Ultimately, investments in effective biosecurity protect the sustainability of livelihoods.
123. Adoption of sustainable farming practices will maintain Floreana's agricultural lands' soils fertile and productive, sustaining yields and improving food security into the future. Improved livestock management will sustain production in the long-term, and when meshed with sustainable farming practices that provide improved pasture and animal feeds the complete farm system becomes highly productive, sustainable, and enriching for farmers. This sustained farming economy and its products will provide locally produced fresh foods for the local community and tourism markets. This reduces reliance on and the need for imported food, reducing amounts of cargo at highest risk of containing invasive species, ultimately resulting in increased food and economic security over the long-term. Decreased imports also reduces the community's carbon footprint. Disease vectors (e.g. rats carrying leptospirosis and feral cats carrying toxoplasmosis) that impact human and animal health will be removed, improving human and livestock health.
124. An expected future result that is facilitated by component 2 is the eradication of invasive rodents and feral cats from Floreana Island. This future action will improve farm yields of maize, yuca and other crops in the field and safeguard stored produce from the impacts of invasive rodents. Poultry, their chicks and eggs will no longer be negatively impacted by invasive rats and feral cats. Inter-tidal marine resources such as chiton that is harvested by the community will increase in the absence of predation by rodents.

## **F. Risk Assessment and Mitigation**

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<sup>73</sup> <https://data.worldbank.org/indicator/ST.INT.RCPT.CD>

126. Table 3 provides an overview of the managerial, technical, and environmental risks that have the potential to prevent the project team from achieving the project's objectives and outputs. The table also provides a brief overview of measures that will be employed to avoid, minimize or mitigate these risks, the majority of which are already being employed as institutionalized policies and practices in Ecuador.

**Table 3: Risk Assessment and Mitigation Planning**

Project Outcome	Risks	Rating	Risk Mitigation Measures
Outcome 1.1, 2.1, 3.1, 3.2	Inadequate consultation with, and engagement by, key stakeholders, including residents of Floreana Island	Low	<p>The project includes a Stakeholder Engagement Plan (see Appendix IX). Overall, the project has been designed to build on the GoE's, and its conservation partners', commitment to working together through inclusive, transparent, participatory processes. These partners have a strong history of consultation and collaboration with the people of the Galapagos archipelago, as well as visiting tourists. Participatory processes and methods are explicitly reflected in the protected areas management plan (2013), and in the day-to-day management of the Galapagos Marine Reserve.</p> <p>In the case of Component 2, a number of consultations have already taken place, both before and during the PPG Phase, with the inhabitants of Floreana Island (see Appendix IX, Tables 1 and 2). Further consultations are planned for the full project (see Appendix IX, Table 5). These will include consultations regarding key activities, such as: sustainable farming practices; a Floreana Parish Council (FPC) Declaration, and; an operational plan for eradication of invasive rodents and feral cats, and associated risk management plans.</p> <p>Regarding participation, the solidification of social license for invasive vertebrate eradication and endemic species recovery (Component 2) is being undertaken as a direct response to a request for assistance from the FPC. The 140 residents of Floreana Island recognize the urgent need to: 1) build environmental and social resilience in the face of climate change and 2) eradicate invasive alien species, where feasible, to achieve this island-wide resilience. This project has been explicitly designed to meet the needs identified by local people who already understand the intimate linkages between biodiversity, livelihoods, and human survival. This should help to ensure ongoing engagement and commitment to the project.</p>
Outcome 1.1, 2.1, 3.1, 3.2	Weak governmental coordination and management capacity	Medium	The large scale of GEF projects can create substantial challenges for government agencies that lack the human capacity to manage them effectively. Poor coordination has been cited in numerous GEF mid-term and terminal reviews as a barrier to project success. The GoE has garnered substantial experience in GEF project management across multiple agencies and in cooperation with a large number of non-governmental partner institutions. The project design incorporates the lessons learned from previous projects in ensuring that the GoE is prepared to dedicate the highly-qualified staff needed to ensure project success. Customized institutional arrangements will provide mechanisms for the government to effectively collaborate with other partners in project implementation.
Outcome 1.1, 2.1, 3.1, 3.2	Government turnover leading to changes in priority	Medium	The Terminal Reviewers for Ecuador's GEF 3 project, 'Control of Invasive Species in the Galapagos Archipelago' (ECU/00/G31), cited institutional/ political instability as one of the reasons the activity did not fully achieve its intended outcomes. The stability currently seen in Ecuador is possibly the greatest it has ever been in recent history. The previous Ecuadorian

Project Outcome	Risks	Rating	Risk Mitigation Measures
			<p>president, Rafael Correa, was in power for 10 years. This provided significant stability at all levels of government and allowed longer-term policies to be enacted. This stability has continued with the election of Ecuador's new president Lenin Moreno in 2017. Presidential elections occur next in 2021. The project will be nearing completion before the next elections when any new incoming government would take power (approximately May 2021), i.e. the nearly all of the project will occur during a single presidential cycle. Finally, the project executing agency is well versed in executing projects in a less-stable environment.</p>
Outcome 3.1, 3.2	Various biological risks associated with tortoise translocation, including vectoring plant seeds among islands, disease risk, invasion risk, etc.	Medium	<p>In light of the several risks associated with tortoise translocation, during the PPG, an Environmental Management Plan (EMP) was developed (see Appendix VI). The EMP makes careful consideration of key issues associated with work under the component; ensures that it is in line with various policies and safeguards; assesses potential impacts and risks; describes detailed mitigation measures and; presents a detailed monitoring plan. Together, the elements of the EMP provide an effective set of risk mitigation measures for Component 3 activities.</p>

## G. Sustainability

127. The GoE has a proven track record of conservation investment in the Galapagos archipelago. Effective partnerships with international organizations, non-governmental organizations, academic institutions, and local communities are already well-established and making substantial achievements in the conservation of biodiversity at individual-island and archipelago-wide scales. This GEF 6 project is designed to strategically focus on a small number of priorities ('critical pieces of the puzzle') and will be carried out within a period of expected political stability, such as that which Ecuador has experienced in recent years.
128. Through this GEF 6 project, further investments will be made in the local institutions and communities that have the desire and need to ensure the sustainability of the project outcomes. This will be accomplished through, for example: 1) building institutional, programmatic, and personnel capacity to enable superior project management in the near- and long-term; 2) advancing a state-of-the-art biosecurity system; 3) training inspection personnel to be highly effective at detecting pests arriving at and departing from ports of entry, 4) building the capacity of Floreana farmers to operate more productively and sustainably over the near- and long-term; and 5) developing increased capacity to captive breed and head-start giant tortoises for translocation to other islands.
129. The activities under Component 1 reflect the priorities set forth in the ABG's 2015-2018 Strategic Plan. It is the ABG's intent to continue institutionalizing the capacities required to prevent the further introduction of invasive alien species, this includes securing the funding and training necessary to support infrastructure and staff development over the long-term.

130. The biosecurity activities being conducted under Component 1 will reduce the likelihood of further invasions throughout the Galapagos Islands and surrounding waters. These capacities will be further built upon and will be critical in protecting investments made in eradicating invasive species from Galapagos Islands.
131. Both national and international Non-governmental organizations (NGOs) have made substantial investments in biodiversity conservation in Ecuador. It is anticipated that NGOs will continue to provide technical and financial assistance in order to help the GoE meet its conservation goals in the Galapagos archipelago. IC has, for example, established an office in the Galapagos Islands in order to be as well positioned as possible to assist with invasive vertebrate eradications into the foreseeable future.
132. Success of this project will help reinforce the GNP's UNESCO World Heritage Site status and enable Ecuador to contribute to the effort by the IUCN to set global standards for protected areas management in relation to invasive alien species; the Galapagos Islands will be functionally protected from the impacts of biological invaders.
133. Sustainability of project outcomes will also be ensured through ongoing, larger-scale approaches to tourism at the national level. These efforts, which are not part of the present project, are nevertheless important to the sustainability of project outcomes. For example, the GoE is currently conducting an analysis regarding assessing a higher Galapagos tourist entry fee (currently US\$120 per international visitor), with \$320 and other scenarios being considered. This is still at the project stage. All the benchmarking and willingness to pay studies have been conducted, and an analysis of the potential (unintended) negative consequences is underway. If approved, this may be a potential funding mechanism for future natural resource management.
134. Another source of funding is ABG inspection fees. In 2017, fees were updated to reflect increased costs of inspection activities. In 2017, inspection fees added up to approximately US\$ 500,000 (in 2013 they were \$300,000). The revised Galapagos Especial Regime Law pre-assigned 5% of the fee that tourists pay to enter the Galapagos Archipelago to be awarded to ABG in order to support biosecurity. Thus, the revenue earned from inspections could also increase if tourist fees increase.
135. The Government of Ecuador is also making significant investments in developing an agricultural sector within the Galapagos that can meet the demands of the community and tourism industry. Improving local agricultural production to meet this demand will decrease the importation of fruits and vegetables, which carry some of the highest risks of invasive species introduction. This is part of a multi-pronged approach to decrease the likelihood of invasive species arriving to and establishing within the Galapagos archipelago.

## **H. Innovativeness**

136. Technology innovations are improving the capacity for pest detection and identification, as well as the rapid response to pests, at ports of entry. This project will make emerging technologies and the requisite training for use available to port inspectors contextually feasible.
137. Approximately 50% of IUCN Critically Endangered and Endangered island-based mammals, reptiles, and amphibians exist on islands that also have human populations greater than 10,000 people<sup>74</sup>.

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<sup>74</sup> <http://tib.islandconservation.org/>

There is a clear and immediate need to advance innovative approaches and tools to establish social license to be able to eradicate invasive alien vertebrates on human-inhabited islands<sup>75</sup>. By achieving social license for the eradication of invasive rodents and feral cats through this project, the GoE and its partners enable Floreana Island to become the first large, inhabited island globally from which all invasive alien mammals have been eradicated. This will protect and facilitate recovery of 61 IUCN Red List threatened species. It will also make it feasible to re-establish viable populations of at least five IUCN Red List threatened endemic species via repatriation to Floreana Island, specifically, the Floreana giant tortoise (*Chelonoidis elephantopus*), Floreana mockingbird (*Mimus trifasciatus*), Galapagos rail (*Laterallus spilonotus*), Lava gull (*Larus fuliginosus*), and Galapagos hawk (*Buteo galapagoensis*).<sup>76</sup> Success of the project proposed herein will, therefore, enable a global precedent: the establishment of conservation projects on hundreds of human-inhabited islands in Ecuador and across the world.

138. Recovering giant tortoise populations is vital to restoration of Galapagos ecosystem structure and function. The Giant Tortoise Restoration Initiative by DPNG, GC and other partners are using advanced genetic approaches, analyses, and modelling to determine optimal captive breeding strategies and incorporate adaptive data-driven management approaches into population restoration strategies. For example, Yale University geneticists have used the specimen fragments of Santa Fe tortoises available in museums to determine that the Española tortoise is the species most closely related to the extinct Santa Fe tortoise. Española tortoises reared in the Santa Cruz Tortoise Center are thus being used to reestablish a tortoise population on Santa Fe. The first 201 juvenile Española tortoises were released in June 2015. In addition to population-level criteria for the translocated species, ecosystem-level criteria are now also being used for determining the success of tortoise reintroduction efforts<sup>77</sup>. The scientific, technical, and infrastructure investments made for the translocation of tortoises to Santa Fe will enable tortoise recovery projects on other Galapagos Islands. Advanced genetic techniques and predictive modelling are also facilitating the Floreana giant tortoise recovery program. Models are being used to determine which individual tortoises should be selected from wild populations on Wolf Volcano for use in the captive breeding program (Output 3.2, including determining which individuals should be bred together to provide offspring and a population with high genetic diversity<sup>78</sup>. Over the long-term, the re-establishment of tortoises is likely to increase tourist experience and thus tourist dollars.

## I. Replicability and Potential for Scaling Up

139. At national and international levels, the Galapagos Islands are regarded as a biodiversity icon. Their high profile will undoubtedly help to facilitate the transfer and adoption of project outcomes, including information, technology, and implementation process models. The GEF 6 project is explicitly designed to serve as a catalyst for future conservation projects in the Galapagos archipelago and other island contexts by:

- Transferring technologies (e.g., biosecurity scanning equipment and inspection capacity);

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<sup>75</sup> [Glen et al. 2013](#)

<sup>76</sup> Repatriation activities (Component 3) will be fully supported by co-financing. They would not be feasible, however, without the GEF 6 Trust Funds being made available for the Program 4 activities described herein.

<sup>77</sup> [Gibbs et al. 2014](#)

<sup>78</sup> [Miller et al. 2017](#); [Miller et al. 2018](#)

- Empowering local people to take pride in and constructively resolve conflicts over natural resource use in order to protect biodiversity and human livelihoods;
- Serving as a model and inspiration for restoring island ecosystems, including the recovery of historically impacted endemic species' populations; and
- Creating the enabling environment for the next phase of substantial conservation actions (e.g. eradication of invasive rodents and feral cats from and the reintroduction of Floreana giant tortoise and Galapagos hawks to Floreana Island).

140. The ABG will soon be poised to reciprocate the biosecurity capacities gained through guidance from other countries by sharing lessons learned from the addition of new technologies. Ecuador will provide 'peer' support to other developing countries (esp. Spanish speaking countries) through South-South cooperation and other platforms. In this regard, the GoE has already signed an agreement with Chile for information exchange.

141. Once the requisite social license is secured, Floreana Island has the potential to serve as a 'transformative opportunity' for invasive alien vertebrate eradication on human inhabited islands. Similarly intended eradication projects have not been able to get through the feasibility analysis stage due to lack of community buy in. The knowledge gained from processes to solidify social license to be undertaken in this project will be applied to the three other inhabited islands in the Galapagos archipelago. It is also intended to benefit other islands which are being considered for similar actions, such as the Juan Fernandez Islands, Chile; Fernando de Noronha Islands, Brazil; Guadalupe and Tres Marias Islands, Mexico; Lord Howe and Christmas Islands, Australia; Stewart and Great Barrier Islands, New Zealand; Kaho'olawe Island, Hawaii; and Mona Island, Puerto Rico; amongst others. IC and other practitioners involved in these projects share through informal networks, publications and presentations at 'trade conferences' and through conducting peer review of feasibility assessments and plans by groups like Island Conservation's Eradication Advisory Team.

## **J. Consistency with National Priorities, Plans, Policies and Legal Frameworks**

142. Ecuador's *National Biodiversity Strategy and Action Plans 2015 - 2030*<sup>79</sup> (NBSAP) originates from the national planning framework defining 4 strategic objectives and 20 results. The proposed project directly contributes to objectives 2 and 3<sup>80</sup> of the NBSAP by: 1) protecting and restoring native ecosystems, and 2) securing the livelihoods of the people who depend on them. Also the project directly contributes to the following Expected Results of the NBSAP:

- Result 11a. Ecuador has executed the plan to eradicate invasive alien species from the Galapagos and the monitoring system offers data that ensures a process of restoration of the affected ecological systems.

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<sup>79</sup> Ministerio del Ambiente del Ecuador. "Estrategia Nacional de Biodiversidad 2015-2030, Primera edición." Noviembre de 2016, Quito-Ecuador.

<sup>80</sup> NSBAP Objective #2) To reduce pressures and inappropriate use of biodiversity to levels that ensure their conservation. NSBAP 3) To fairly and equitably distribute the benefits of biodiversity and associated ecosystem services, considering gender and intercultural specificities.

- Result 11b. Ecuador has developed and put in place prevention, control, eradication and monitoring mechanisms for invasive species in continental Ecuador and that have been prioritized by the MAE.
  - Result 14. Ecuador implements comprehensive measures to prevent the extinction of wildlife and cultivated species considered a priority.
  - Result # 16. Ecuador restores degraded habitats in order to increase the resilience of ecosystems and their capacity to provide essential goods and services for the good living of the population and the change of productive matrix.
143. Furthermore, by advancing biosecurity technologies, Component 1 will provide conservation benefits throughout Ecuador and with Ecuador's neighbors and trading partners. Although the target location for solidifying social license for rodent and feral cat eradication (Component 2) is a single island (Floreana) in the Galapagos, we intend up-scale the project as additional funding becomes available to transfer 'current practices'<sup>81</sup> to other human-inhabited islands in Ecuador (e.g., Santa Cruz, San Cristobal, Isabela, Santay Islands) and beyond. Not only will this GEF 6 project serve to support the objectives of Ecuador's first NBSAP, it will enable other governments to advance NBSAP objectives as well.
144. Ecuador recently submitted its 5<sup>th</sup> *National Report* to the CBD<sup>82</sup>, describing the country's current and future progress towards achieving the Aichi Biodiversity Targets in conjunction with the Strategic Plan for Biodiversity 2011-2020. Invasive alien species were recognized as one of the top threats to biodiversity in terrestrial, aquatic, and marine ecosystems. The GoE also noted that invasive alien species is a cross-cutting issue; the spread and impact of invasive alien species is intimately linked to habitat degradation, pollution, and climate change, for example. Invasive alien species prevention, eradication, and control are thus important aspects of any agenda to curtail other substantial threats to biodiversity and, ultimately, to build ecosystem resilience. Invasive alien species were recognized as an issue of particular concern for the Galapagos archipelago.
145. The GoE released a report on its activities to implement the *CBD Programme of Work on Protected Areas* in 2012 ('Plan de Acción para la Implementación del Programa de Trabajo sobre Áreas Protegidas de la Convención sobre la Diversidad Biológica').<sup>83</sup> Ecuador has a strong commitment to not only establishing protected areas, but ensuring that they do, in fact, convey long-term protection to biodiversity and the people who rely on natural resources for their livelihoods and well-being.
146. Approximately 1/3 (32%) of Ecuador's terrestrial and marine environments have been afforded legal protection status; 47 of these are described in the report to the CBD, including the Galapagos Islands. This project will support implementation of Ecuador's protected areas plan by: a) helping to ensure that the biodiversity of the DPNG and Marine Reserve is protected in accordance with the multiple protected area designations held by the Galapagos Islands, b) integrating local peoples into protected area planning and implementation, and c) building the capacity of protected area

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<sup>81</sup> We intentionally use 'current practices' rather than the more common 'best practices,' because we believe that practices should continue to evolve as more information and experience becomes available. 'Best practices' suggests the availability of perfect knowledge and a static context, neither of which are realistic in the context of invasive alien species eradications.

<sup>82</sup> <http://www.cbd.int/doc/world/ec/ec-nr-05-es.pdf>

<sup>83</sup> <https://www.cbd.int/doc/world/ec/ec-nbsap-powpa-es.pdf>



managers and local people on other Ecuadorian islands (e.g., Isla de la Plata) to achieve conservation through the removal of invasive alien species and recovery of threatened species.

147. In addition to furthering Ecuador's commitments to the CBD, this GEF 6 project explicitly advances more than a dozen *national- and sectorial-level plans and strategies*. Examples are listed in Table 4.

**Table 4: Consistency with National Priorities, Plans, and Policies**

National Priorities	Project Consistency
Galapagos Biosecurity Agency (ABG) Strategic Plan 2015-2018	Sets out priorities for the ABG and partners for the next three years. The GEF 6 project proposed herein will implement priorities to advance detection technologies, raise staff capacity, create a pest interception database, and automate data entry to better ensure timely and accurate pest intercept reporting.
Management Plan for the Protected Areas on Galapagos for a Good Standard of Living (2013)	Secures and expands eco-tourism opportunities in association with the Galapagos National Park and the Galapagos Marine Reserve. Helps maintain the World Heritage Site status which facilitates tourist interest in the Galapagos archipelago.
Galapagos Biosecurity Agency's 'Consolidating the system of preventing, controlling and eradicating invasive species in the Galapagos Islands' approved by National Planning Authority (2013)	Explicitly implements major capital investments required to increase the efficacy of biosecurity for the Galapagos archipelago.
National Climate Change Plan (2013)	Supports the plan's call for ecosystem-based approaches to climate mitigation.
Galapagos National Park's 'Reducing vulnerability of endemic species by eradicating priority invasive species' project, approved by National Planning Authority (2012)	Explicitly implements invasive rodent and feral cat eradication activities in order to protect and restore populations of threatened endemic species.
Ecuador's 2020 Strategic Plan for Sustainable Tourism Development (2012)	Helps secure current levels of eco-tourism and facilitates opportunities for increasing eco-tourism by securing the endemic species of flora and fauna that are of particular interest to tourists (e.g., giant tortoises).
Floreana Parish Council's Strategic Plan (2011)	Protects and enhances natural resources that the community relies upon, such as fresh water and wildlife that enhances the ecotourism experience.
Plan for Total Control of Introduced Species (2007)	Furtheres the 'Total Control Plan' by advancing biosecurity and the eradication high priority invasive alien species from Floreana Island.

## K. Consistency with GEF Focal Area and/or Fund(s) Strategies

148. The proposed project explicitly supports Program 4 (Prevention, Control, and Management of Invasive Alien Species) of the Biodiversity focal area (BD2). Successful implementation of the Program 4 activities will make it feasible to conduct future work (with other funding) to support Biodiversity Program 3 (Preventing the Extinction of Known Threatened Species). Once social license is obtained through the project described herein, the eradication of invasive rodents and feral cats from Floreana Island will have secondary benefits that support other GEF program areas. For example, invasive vertebrate eradication will enable habitat recovery across the 17,258 ha of Floreana Island's diverse landscape, thus creating an enabling environment for reduced land degradation and improved carbon storage and climate change resilience. The translocation of giant tortoises and recovery of their associated ecosystem processes on Santa Fe Island will have similar cascading benefits.
149. Although Biodiversity is the primary GEF Focal Area addressed by this project, successfully preventing future introductions of invasive alien species in the Galapagos archipelago, establishing sustainable farming practices on Floreana Island, and recovering giant tortoises on Santa Fe Island will provide benefits to other GEF Focal Areas, including: Land Degradation (by facilitating the recovery of vegetation and thus reducing erosion), Climate Change Mitigation (by securing carbon stocks and fostering ecosystem resilience), International Waters (by functionally protecting 13,300,000 ha of marine reserve from threats by marine invasive species), and Sustainable Forest Management/REDD+ (by promoting better management of livestock, pets, and pests that adversely impact forest health).

## L. Linkages with other GEF Projects and Relevant Initiatives

150. Other relevant projects and initiatives, and associated linkages and coordination, are summarized in Table 5 below.

**Table 5: Other Relevant Projects and Initiatives**

GEF Projects Other Projects/Initiatives	Linkages and Coordination
<b>MAG's Bio-agriculture project for Galapagos (2014) and MAG's annual operations</b> <b>Annual until 2019</b> <b>GoE (MAG)</b>	The Galapagos bio-agriculture project will increase the quantity and quality of local agricultural production, shorten supply chains and promote consumption of fresh local produce. This will reduce importations of organic products and therefore reduce risks of importing invasive alien species.
<b>Action Plan to Reduce Invasion Risk of Marine Species in the Galapagos Marine Reserve</b> <b>2015 onwards</b>	Ongoing research and strengthening biosecurity as a result of the <a href="#">1<sup>st</sup> Tropical Island Marine Bioinvasions Workshop</a> held in Galapagos in February 2015.

## **M. Consistency and Alignment with CI Institutional Priorities**

151. The project is aligned with Conservation International geographic and thematic priorities. More particularly, this project contributes to CI's institutional priorities in conserving biodiversity and managing essential ecosystems as well as ensuring long-term provision of ecosystem services. CI works through innovation based on field experiences and expertise for conserving natural capital and improving governance. Following the same approach, working closely with local stakeholders and key governmental partners, the project sets the foundation for invasive species eradication as means for long term conservation.
152. In addition, this project will work in one of the priority areas for CI in Latin America: the Eastern Tropical Pacific Seascape (ETPS). The ETPS has a strategic plan to guide the work in the area, closely aligned with the Ocean Centre and CI field priorities. Conservation International has supported the governments of Costa Rica, Panama, Colombia and Ecuador in managing the marine protected areas that are part of the ETPS, including in Galapagos. This project also aligns well with the sustainable landscapes and seascapes approach of CI.

## **N. Communications and Knowledge Management**

153. Model transfer is an explicit aspect of project Component 3, as well as the general standards of practice for the EA and IA. The publication of scientific and technical results and lessons learnt will share knowledge accumulated by DPNG and GC with other land managers and conservation practitioners regionally and internationally.
154. Throughout the course of this project, the Project Steering Committee will work to ensure that the scientific information, technology development, and implementation processes are carefully tracked and reported on in a manner that enables this project to serve as a catalyst for future conservation projects in the Galapagos archipelago, as well as in other island contexts. We anticipate contributing: 1) data for scientific analysis to the TIB<sup>84</sup> and DIISE<sup>85</sup>, 2) improved technological capacity (e.g., biosecurity scanning equipment and inspection capacity), 3) cost-effective protocols (e.g., information on effective eradication methodologies), 4) scientific and technical findings presented through peer-reviewed publications and scientific conferences, and 5) greater local capacity to limit the further spread of invasive alien species through priority pathways (thus reducing risks of biological invasion to trade partners and through the tourism pathway). At the national and international level, the Galapagos Islands are regarded as a biodiversity icon and leader in invasive alien species management. Their high profile will undoubtedly help facilitate the transfer and adoption of project outcomes, including information, technology, and the implementation process as a procedural model.
155. The GoE has already developed significant biosecurity capacities through international cooperation and the adoption of lessons learned from Chile, Australia, New Zealand, the USA, and elsewhere. The ABG will soon be poised to reciprocate with lessons learned from the addition of new technologies and inspector capacities. Ecuador will be able to provide 'peer' support to other developing countries (esp. Spanish speaking countries) through South-South cooperation and other platforms. The GoE has already signed an agreement with Chile for relevant information exchange.

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<sup>84</sup> <http://tib.islandconservation.org/>

<sup>85</sup> <http://diise.islandconservation.org>

## **O. Lessons Learned During the PPG Phase and from other Relevant GEF Projects**

156. The GoE and many of the project partners have had the opportunity to learn (directly and indirectly) from previous GEF projects executed within Ecuador, as well as similarly themed projects conducted in other countries/regions. Every effort will be made to strategically incorporate the scientific, technical, and managerial lessons learned from these activities into the design and execution of this GEF 6 project.
157. The Terminal Reviewers for Ecuador's GEF 3 project, 'Control of Invasive Species in the Galapagos Archipelago' (ECU/00/G31), cited project ambition and complexity as two of the reasons the activity did not fully achieve its outcomes. The project proposed herein reflects the lessons learned during GEF 3 project execution. Rather than being used to 'pepper' the Galapagos archipelago with numerous new activities, the GEF 6 funds will be employed to fill a small number of key technical and funding gaps ('critical pieces of the puzzle'), as well as create needed linkages within an already existing framework of strategic, regional conservation activity.
158. This GEF 6 project has also benefited from some of the lessons learned during the Mid-term and Terminal Evaluations of the Mitigating the Threats of Invasive Alien Species in the Insular Caribbean project, the PAS: Prevention, Control and Management of Invasive Alien Species in the Pacific Islands project, and the Removing Barriers to Invasive Species Management in Production and Protection Forests in SE Asia project. Lessons learned from these projects include the need to a) focus on a limited number of catalytic activities, b) invest in highly motivated project coordination staff, c) fully engage local peoples in eradication/control activities, d) make improvements in biosecurity a priority, e) institutionalize project leadership and outputs, and f) evaluate the feasibility of field-based activities prior to project initiation.

## **SECTION 4: COMPLIANCE WITH CI-GEF PROJECT AGENCY'S ENVIRONMENTAL AND SOCIAL MANAGEMENT FRAMEWORK (ESMF)**

### **A. Safeguards Screening Results and Categorization**

159. On December 13, 2017, the CI-GEF Project Agency conducted a safeguard screening of the project based on the PIF. The initial assessment has been revised through discussions among CI, DPNG and IC. The full results are presented in Appendix V.
160. As shown in Table 5 below, the following four safeguards were triggered by the safeguard screening analysis:
- Natural Habitats;
  - Grievance Mechanism;
  - Gender Mainstreaming;
  - Stakeholder Engagement.
161. To ensure that the project meets CI-GEF Project Agency's policies, the project has prepared four plans (See Appendix VI, VII, VIII, IX, below), one for each topic triggered in the review.

### **Natural Habitats**

162. To ensure that the project meets CI-GEF Project Agency's "Natural Habitat Policy #2", the Executing Agency is required to prepare an Environmental Management Plan (EMP), specifically for the activity relating to the translocation of giant tortoises on Santa Fe Island. The EMP is a document that identifies a set of mitigation, management, monitoring, and institutional actions to be implemented. The EMP should incorporate the IUCN guidelines for conservation-oriented translocations. The EMP must also be disclosed to stakeholders, in a language, manner and means that best suits the local context, for their review and feedback. As part of the EMP, the Executing Agency is required to monitor and report on the following minimum indicator:

- Number of Hectares of natural and/or critical natural habitats loss or degraded

#### **Grievance Mechanism**

163. To ensure that the project meets CI-GEF Project Agency's "Accountability and Grievance Mechanism Policy #7", the Executing Agency is required to develop an Accountability and Grievance Mechanism that will ensure people affected by the project are able to bring their grievances to the Executing Agency for consideration and redress. The mechanism must be in place before the start of project activities, and disclosed to all stakeholders in a language, manner and means that best suits the local context. As part of the Accountability and Grievance Mechanism, the Executing Agency is required to monitor and report on the following minimum indicators:

- Number of conflict and complaint cases reported to the project's Accountability and Grievance Mechanism; and
- Percentage of conflict and complaint cases reported to the project's Accountability and Grievance Mechanism that have been addressed.

#### **Gender Mainstreaming**

164. To ensure that the project meets CI-GEF Project Agency's "Gender Mainstreaming Policy #8", the Executing Agency is required to prepare a Gender Mainstreaming Plan (GMP). As part of the GMP, the Executing Agency is required to monitor and report on the following minimum indicators:

- Number of men and women that participated in project activities (e.g. meetings, workshops, consultations);
- Number of men and women that received benefits (e.g. employment, income generating activities, training, access to natural resources, land tenure or resource rights, equipment, leadership roles) from the project; and if relevant
- Number of strategies, plans (e.g. management plans and land use plans) and policies derived from the project that include gender considerations.

#### **Stakeholder Engagement**

165. To ensure that the project meets CI-GEF Project Agency's "Stakeholders' Engagement Policy #9", the Executing Agency is required to develop a Stakeholder Engagement Plan (SEP). As part of the SEP, the Executing Agency is required to monitor and report on the following minimum indicators:

- Number of government agencies, civil society organizations, private sector, indigenous peoples and other stakeholder groups that have been involved in the project implementation phase on an annual basis;
- Number persons (sex disaggregated) that have been involved in project implementation phase (on an annual basis); and

- Number of engagement (e.g. meeting, workshops, consultations) with stakeholders during the project implementation phase (on an annual basis)

**Table 6: Safeguard Screening Results**

Policy/Best Practice	Triggered (Yes/No)	Justification
<b>Environmental and Social Impact Assessment Policy</b>	No	<i>No significant adverse environmental and social impacts that are sensitive, diverse, or unprecedented is anticipated</i>
<b>Protection of Natural Habitats Policy</b>	Yes	<i>The project is proposing restoration of a critical natural habitat (translocation of giant tortoises to Santa Fe Island)</i>
<b>Involuntary Resettlement Policy</b>	No	<i>The project is not proposing involuntary resettlement or restriction of access/use of natural resources.</i>
<b>Indigenous Peoples Policy</b>	No	<i>The project does not plan to work in lands or territories traditionally owned, customarily used, or occupied by indigenous peoples</i>
<b>Pest Management Policy</b>	No	<i>There are no proposed activities related to pest management</i>
<b>Physical Cultural Resources Policy</b>	No	<i>There are no proposed activities related to physical and cultural resources</i>
<b>Stakeholder Engagement</b>	Yes	<i>The project is required to engage stakeholders</i>
<b>Gender mainstreaming</b>	Yes	<i>The project is required to mainstream gender at all levels</i>
<b>Accountability and Grievance Mechanisms</b>	Yes	<i>As a publicly funded GEF project, a Grievance Mechanism is required.</i>

166. The CI-GEF Project Agency concluded the overall project category to be “Category B” as a result of the safeguard screening process.

**Table 7: Safeguard Categorization**

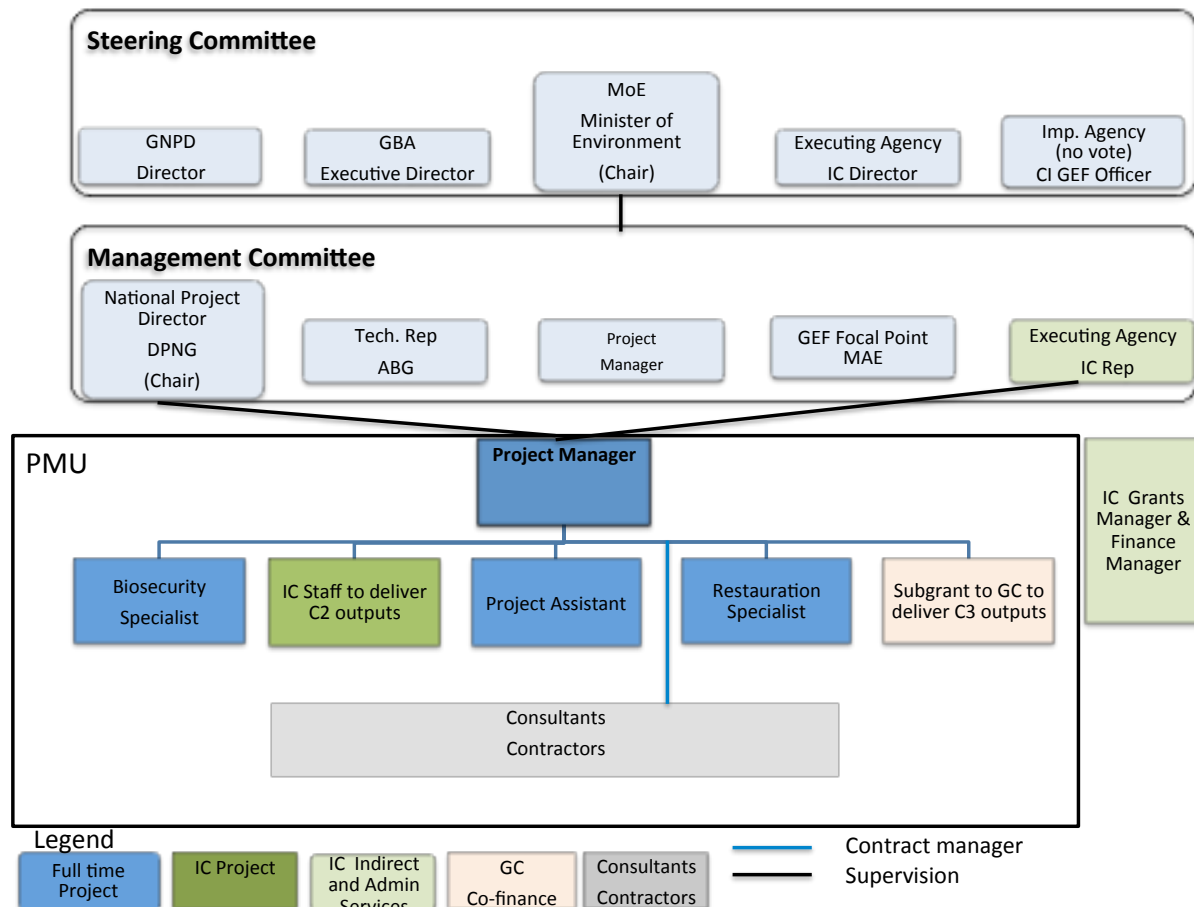
PROJECT CATEGORY	Category A	Category B	Category C
		X	
<i>Justification:</i> <i>The proposed project activities, specifically the translocation of giant tortoises, may have adverse environmental impacts on Santa Fe and this increases the risk threshold for the project. However, these impacts are site-specific, may be irreversible, and mitigation measures can be designed more readily than for Category A projects.</i>			

## **B. Compliance with Safeguard Recommendations**

167. Safeguard plans are presented in Appendix VI-IX.

## SECTION 5: IMPLEMENTATION AND EXECUTION ARRANGEMENTS FOR PROJECT MANAGEMENT

### A. Project Execution Organizational Chart



### B. Execution Arrangements and Partners

#### Implementation Agency

168. The GEF implementing agency will be Conservation International GEF Project Agency (CI-GEF). CI-GEF will support the project implementation by maintaining oversight of all technical and financial management aspects, which includes oversight of project execution to ensure that the project is being carried out in accordance with GEF standards and requirements. CI-GEF will monitor the project's implementation and achievement of project outputs, ensure proper use of GEF funds, review and approve procurement plans, budgets and workplans. CI-GEF will approve quarterly technical and financial reports and, furthermore, the annual Project Implementation Reports (PIRs) prior to GEF submission. Finally, CI-GEF will make recommendations to optimize project performance, and will arbitrate and ensure resolution of any execution conflicts.

## Executing Agency

169. The co-executing agencies will be Island Conservation (IC) with the DPNG. The project builds upon the long- term working collaboration between DPNG and IC.
170. The project will be implemented over a period of 30 months.
171. The DPNG will be responsible at the highest level for ensuring project implementation and management, including the monitoring and evaluation of project interventions, achieving project outcomes (both funded by GEF and through co-financing), and the effective use of GEF resources.
172. MAE, in coordination with DPNG, has requested that IC is responsible for executing technical, administrative and financial actions. For this purpose, MAE will sign a letter of agreement with IC prior to project implementation.
173. As co-executing agency, IC receives project-specific GEF funding from CI-GEF implementing agency based on the approved ProDoc and annual workplans/budgets. Thus, IC undertakes the execution of the project, which implies the ability to manage and administer the day-to-day activities. This includes managing the timely delivery of project outcomes and outputs and for appropriate use of funds, for procurement and contracting of goods and services. CI-GEF will supervise the proper use of funding and compliance with GEF rules and CI-GEF procurement policy.
174. Galapagos Conservancy (GC) will act as executing partner. For this purpose, IC will sign a sub-grant with GC for the delivery of Outputs listed in Component 3. As such, GC will be responsible for delivery of Component 3 outputs and will be accountable for proper use of funds. This sub-grant will reflect the terms of IC's contract provisions as an executing agency under contract to the CI-GEF implementing agency.
175. The project organization structure has a Project Steering Committee (PSC), a Project Management Committee (PMC), and a Project Management Unit (PMU).

## Project Steering Committee

176. The Project Steering Committee (PSC) is responsible for making decisions at highest level. The Project Manager will be the PSC Secretary, preparing meeting minutes, and maintain the Committee's records.
177. The Project Steering Committee will:
- Ensure that the project is aligned with the PRODOC;
  - Provide overall strategic guidance;
  - Approve of the Annual Project Implementation Report (PIR), the Annual Operating Plan (AOP) and Budget and the financial audit reports<sup>86</sup>;
  - Make high-level decisions regarding project structure, coordination and implementation;

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<sup>86</sup> The Project Manager prepares PIR and AOP with inputs from the Specialists. These documents are then submitted for technical clearance by the PMC. CI-GEF gives technical clearance after the approval of the PMC. PSC gives the formal final approval.



- Approve major changes to the project strategy, such as moving funds between components<sup>87</sup>;
- Evaluate project performance, including analysis of the project's mid-term review and ensuring that its recommendations are implemented.

178. The PSC comprises the following members: Minister of Environment or his/her high level representative (who presides the PSC), Galapagos National Park Director or his/her representative, the Executive Director of ABG or his/her representative, the Galapagos Program Director of IC or his/her representative and a CI-GEF representative. The PSC will make decisions by consensus. In case a consensus cannot be reached, the final decision shall rest with the Minister of Environment. The PSC will have in-person or virtual meetings at least twice per year. The chairperson at members' request may convene additional committee meetings.

### **Project Management Committee**

179. A Project Management Committee (PMC) will operate to facilitate execution and coordination of the project.

180. The PMC will:

- Make recommendations to the PSC in order to ensure that the project to ensure: i) alignment with the PRODOC; ii) prompt implementation of activities; and iii) achievement of the targets, outputs and outcomes.
- Ensure effective, efficient use of the financial resources according to the approved Annual Budget and Workplan.
- Provide technical clearance to the draft AOP, Budget and PIR before submission to CI-GEF (for technical clearance) and the PSC (for final approval).
- Approve the Annual Procurement Plan before submitting to CI-GEF for approval
- Provide Technical clearance for requests to change the Annual Procurement Plan above \$25,000, before the request to CI-GEF is sent.<sup>88</sup>
- Prepare recommendations for PSC consideration to improve project performance or revisions that might be necessary.
- Ensure effective coordination among project partners.

This committee will comprise the following members: National Project Director (who presides the Committee), a Senior Technical representative of the ABG, the GEF Operational Focal Point from MAE, a Senior Technical staff member of IC, and the Project Manager who will prepare the agenda, documents to be discussed, meeting minutes, and maintain the Committee's records. This Committee will meet quarterly and will be convened by the NPD. The NPD will invite other strategic partners to PMC meetings, as required according to the topics to be discussed.

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<sup>87</sup> In accordance to CI-GEF rules.

<sup>88</sup> As per CI GEF policies and conditions.

## **National Project Director**

181. The project will be under the overall leadership of a National Project Director (NPD), who will be appointed by the Director of the Galapagos National Park. The NPD's responsibilities will include:

- Ensuring project alignment with Government policy and priorities;
- Provides technical clearance of quarterly reports, before submission to CI-GEF.
- Review AOP and Budget, PIR and Annual Procurement Plan before submission to the PMC;
- Provides technical clearance to requests to Annual Procurement Plan above \$5000 and below \$25,000 before submission to CI-GEF<sup>89</sup>.
- Ensuring the technical, logistical, administrative and financial effectiveness of IC, as executing partner, and GC as a collaborator, in fulfilling their roles;
- Securing coordination and support to project activities within DPNG, including preparing co-funding reports as what was offered by the government entities in the PRODOC;
- Maintaining regular communication and securing support with MAE and ABG as well as maintaining a smooth communication and collaboration with other institutions related to project execution (e.g., Ministry of Agriculture, Ministry of Health, Floreana Parish Council, among others);
- Call upon the advice of strategic partners as required;
- Provide guidance to the project team;
- Provide technical assistance to PMC on topics related to the project components.
- Has oversight over all project expenses, and has the following tools to aid this process:
  - a. provides technical clearance to the AOP, Annual Procurement Plan and the quarterly reports, before they are sent to CI GEF;
  - b. provides technical clearance to requests to change the Annual Procurement Plan for procurements of \$5000 - \$25,000, before they are sent to CI GEF
  - c. presides the PMC which is charged with clearing requests to change the Annual Procurement Plan for procurements above \$25,000 before they are sent to CI-GEF;
  - d. participates in Selection Committees for all procurement processes above \$25,000.

## **The Procurement Selection Committee**

182. The Procurements Selection Committee will comply with all CI-GEF policies and is composed of the NPD, IC Galapagos Director and the Project Manager. For procurements related to component 1, the ABG will be invited to participate in the Procurements Selection Committee.

183. IC and DPNG will work closely for all purchases in this project to ensure that the goods and services procured are of good quality and respond to the specific needs of the DPNG. If services, products or consultancies to be purchased (as detailed in the Annual Procurement Plan) are above \$25,000, the process is the following:

- Project Manager will develop Terms of Reference (ToR) in conjunction with component technical specialists, the ABG and/or DPNG.
- NPD provides clearance of ToR before sending to CI-GEF. Criteria for evaluating proposals

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<sup>89</sup> As per CI GEF policies and conditions.

will be included in the ToR<sup>90</sup>.

- Project Manager develops procurement package in conjunction with component technical specialists. The Procurement Package will be submitted to the Procurement Selection Committee for approval. The Procurement Package is the same that will be later sent to IC and CI-GEF and will include ToR, quotes and evaluation criteria in accordance with CI\_GEF Procurement Policy.
- Once approved by Procurements Selection Committee, Procurement Package is submitted to the established procurement authorization channels:
  - IC internal policy and checks
  - CI GEF policy and checks
- Procurement Process will continue as per CI GEF rules.

184. The Project Manager will be selected through the Procurement Selection Committee. In this case the Procurement Selection Committee will be conformed by the NPD and the IC Galapagos Director. IC will draft the ToR (including criteria for evaluation) for approval by the NPD and CI-GEF.

### **Project Management Unit**

185. The Project Management Unit (PMU) will be based within DPNG offices in Puerto Ayora, Galapagos. Component 1 technical specialist will spend a significant amount of their time in the ABG offices in Puerto Ayora, Galapagos. GC staff involved in this project will have offices in Santa Cruz and visit DPNG offices regularly to ensure good coordination of activities, however they will not be based in the DPNG offices.

186. The Project Manager's annual activity will be directed by the PSC, PMC and NPD through approvals of the **Annual Operating Plan (AOP)** and its revisions. The Project Manager is supervised by, and reports to, the NPD in coordination with the IC Galapagos Program Director and is co-managed by the NPD and IC Galapagos Program Director.

187. The Project Manager supervises PMU staff. GC and IC staff who deliver products will report to the Project Manager regarding delivery of project outputs. IC core staff, the financial manager and grants manager, will provide support to the PMU.

188. The **Project Manager** will lead the day-to-day operation of the PMU. This will include (i) preparation of project reports, work plans, budgets and accounting records, (ii) maintaining smooth communication and coordination with project partners and key stakeholders, (iii) acting as secretary of the PSC and PMC, and (iv) preparing co-financing reports. The Project Manager function will end when the project completion report, and other documentation required by the GEF has been completed and submitted to CI-GEF (including operational closure of the project).

189. The Project Manager will oversee project activity implementation and will oversee work tasks produced by the five thematic specialists and the Project Technical and Administrative Assistant:

- i. **Biosecurity Specialist.** This person will lead on overall execution for Component 1. This person is project-specific full-time new hire.

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<sup>90</sup> CI-GEF provides final approval ToRs of PMU staff

- ii. **Eradication Specialist 1.** This person will be directly responsible for guiding and managing Component 2 and will be responsible for the Operational Plan (Output 2.1.3) and will provide inputs to the E.I.A. (Output 2.1.5). This person is an Island Conservation staff member and will be covered partly with project funding and partly with co-financing from IC.
  - iii. **Eradication Specialist 2.** This specialist will develop the 6 Risk Plans (Output 2.1.4.), support the development of the Operational Plan (Output 2.1.3) and will provide input for the E.I.A. (Output 2.1.5) and relationship with the community (Outputs 2.1.1 and 2.1.2). This specialist will supervise the contractors for Output 2.1.1. This person is an Island Conservation staff member and will be covered partly with project funding and partly with co-financing from IC.
  - iv. **Community Engagement Specialist.** This specialist will lead Output 2.1.2 and 2.1.5 supervising and managing the consultants. This person will lead the implementation of the following Safeguard Plans: Stakeholder Engagement Plan, Accountability and Grievance Mechanisms and Gender Mainstreaming Plan. This person will be engaged by Island Conservation as part of its contract for the project. Will be covered partly with project funding and partly with co-financing.
  - v. **Island Restoration Specialist** This specialist will support technical aspects of Components 2 and 3, drafting terms of reference for services, supplies and materials required for all outputs. They will assist with coordinating field activities, logistics, inter-island biosecurity procedures, in-field activities, and other activity related to implementation of Components 2 and 3. This person is a project-specific full-time new hire
  - vi. **Project Technical and Administrative Assistant.** This person will keep the required records, prepare financial and operational information, consolidate monitoring and evaluation information, and will provide direct administration, logistics, procurement and finance support to the activities of the project.
190. All members of the PMU will contribute to the monitoring and evaluation plan, and will have direct responsibilities that are detailed in Appendix III.

## SECTION 6: MONITORING AND EVALUATION PLAN

191. Project monitoring and evaluation will be conducted in accordance with established Conservation International and GEF procedures by the project team and the CI-GEF Project Agency. The project's M&E plan will be presented and finalized at the project inception workshop, including a review of indicators, means of verification, and the full definition of project staff M&E responsibilities.

### A. Monitoring and Evaluation Roles and Responsibilities

192. The Project Management Unit on the ground will be responsible for initiating and organizing key monitoring and evaluation tasks. This includes the project inception workshop and report, quarterly progress reporting, annual progress and implementation reporting, documentation of

lessons learned, and support for and cooperation with the independent external evaluation exercises.

193. The project Executing Agency is responsible for ensuring the monitoring and evaluation activities are carried out in a timely and comprehensive manner, and for initiating key monitoring and evaluation activities, such as the independent evaluation exercises.
194. Key project executing partners are responsible for providing any and all required information and data necessary for timely and comprehensive project reporting, including results and financial data, as necessary and appropriate.
195. The Project Steering Committee plays a key oversight role for the project, with regular meetings to receive updates on project implementation progress and approve annual workplans. The Project Steering Committee also provides continuous ad-hoc oversight and feedback on project activities, responding to inquiries or requests for approval from the Project Management Unit or Executing Agency.
196. The CI-GEF Project Agency plays an overall assurance, backstopping, and oversight role with respect to monitoring and evaluation activities.
197. The CI Internal Audit function is responsible for contracting and oversight of the planned independent external evaluation exercises at the mid-point and end of the project.

## **B. Monitoring and Evaluation Components and Activities**

198. The Project M&E Plan should include the following components (see M&E table 8 for details):

a. **Inception workshop**

Project inception workshop will be held within the first six months of project start with the project stakeholders. An overarching objective of the inception workshop is to assist the project team in understanding and taking ownership of the project's objectives and outcomes. The inception workshop will be used to detail the roles, support services and complementary responsibilities of the CI-GEF Project Agency and the Executing Agency.

b. **Inception workshop Report**

The Executing Agency should produce an inception report documenting all changes and decisions made during the inception workshop to the project planned activities, budget, results framework, and any other key aspects of the project. The inception report should be produced within one month of the inception workshop, as it will serve as a key input to the timely planning and execution of project start-up and activities.

c. **Project Results Monitoring Plan** (Objective, Outcomes, and Outputs)

A Project Results Monitoring Plan will be developed by the Executing Agency, which will include objective, outcome and output indicators, metrics to be collected for each indicator, methodology for data collection and analysis, baseline information, location of data gathering, frequency of data collection, responsible parties, and indicative resources needed to complete the plan. Appendix IV provides the Project Results Monitoring Plan table that will help complete this M&E component.

In addition to the objective, outcome, and output indicators, the Project Results Monitoring Plan table will also include all indicators identified in the Safeguard Plans prepared for the project, thus they will be consistently and timely monitored.

The monitoring of these indicators throughout the life of the project will be necessary to assess if the project has successfully achieved its expected results.

Baseline Establishment: in the case that all necessary baseline data has not been collected during the PPG phase, it will be collected and documented by the relevant project partners *within the first year* of project implementation.

d. **GEF Core Indicators**

These are presented in Appendix IV. Achievement of the indicators will be monitored: i) at CEO Endorsement, ii) at the time of the mid-term review, and iii) at the time of the terminal evaluation.

e. **Project Steering Committee Meetings**

PSC meetings will be held, semi-annually, as appropriate. Meetings shall be held to review and approve project annual budget and work plans, discuss implementation issues and identify solutions, and to increase coordination and communication between key project partners. The meetings held by the PSC will be monitored and results adequately reported.

f. **CI-GEF Project Agency Field Supervision Missions**

The CI-GEF PA will conduct annual visits to the project country and potentially to project field sites based on the agreed schedule in the project's Inception Report/Annual Work Plan to assess first hand project progress. Oversight visits will most likely be conducted to coincide with the timing of PSC meetings. Other members of the PSC may also join field visits. A Field Visit Report will be prepared by the CI-GEF PA staff participating in the oversight mission, and will be circulated to the project team and PSC members within one month of the visit.

g. **Quarterly Progress Reporting**

The Executing Agency will submit quarterly progress reports to the CI-GEF Project Agency, including a budget follow-up and requests for disbursement to cover expected quarterly expenditures.

h. **Annual Project Implementation Report (PIR)**

The Executing Agency will prepare an annual PIR to monitor progress made since project start and in particular for the reporting period (July 1<sup>st</sup> to June 30<sup>th</sup>). The PIR will summarize the annual project result and progress. A summary of the report will be shared with the Project Steering Committee.

i. **Final Project Report**

The Executing Agency will draft a final report at the end of the project.

j. **Independent External Mid-term Review**

The project will undergo an independent Mid-term Review within 30 days of the mid-point of the grant term. The Mid-term Review will determine progress being made toward the achievement of outcomes and will identify course correction if needed. The Mid-term Review will highlight issues requiring decisions and actions, and will present initial lessons learned about project design, implementation and management. Findings and recommendations of the Mid-term Review will be incorporated to secure maximum project results and sustainability during the second half of project implementation.

k. **Independent Terminal Evaluation**

An independent Terminal Evaluation will take place within six months after project completion and will be undertaken in accordance with CI and GEF guidance. The terminal

evaluation will focus on the delivery of the project's results as initially planned (and as corrected after the mid-term evaluation, if any such correction took place). The Executing Agency in collaboration with the PSC will provide a formal management answer to the findings and recommendations of the terminal evaluation.

**l. Lessons Learned and Knowledge Generation**

Results from the project will be disseminated within and beyond the project intervention area through existing information sharing networks and forums. The project will identify and participate, as relevant, appropriate and within budget constraints, in scientific, policy-based and/or any other networks, which may be of benefit to project implementation through lessons learned. The project will identify, analyze, and share lessons learned that might be beneficial in the design and implementation of similar future projects. There will be a two-way flow of information between this project and other projects of a similar focus.

**m. Financial Statements Audit**

Annual Financial reports submitted by the Executing Agency will be audited annually by external auditors appointed by the Executing Agency.

199. The Terms of Reference for the evaluations will be drafted by the CI-GEF PA in accordance with GEF requirements. The procurement and contracting for the independent evaluations will be handled by CI's General Counsel's Office. The funding for the evaluations will come from the project budget, as indicated at project approval.

**Table 8: M&E Plan Summary**

Type of M&E	Reporting Frequency	Responsible Parties	Indicative Budget from GEF (USD)
<b>a. Inception workshop and Report</b>	Within three months of signing of CI Grant Agreement for GEF Projects	<ul style="list-style-type: none"> <li>• Project Team</li> <li>• Executing Agency</li> <li>• CI-GEF PA</li> </ul>	12,500
<b>b. Inception workshop Report</b>	Within one month of inception workshop	<ul style="list-style-type: none"> <li>• Project Team</li> <li>• CI-GEF PA</li> </ul>	5,000
<b>c. Project Results Monitoring Plan (Objective, Outcomes and Outputs)</b>	Annually (data on indicators will be gathered according to monitoring plan schedule shown on Appendix IV)	<ul style="list-style-type: none"> <li>• Project Team</li> <li>• CI-GEF PA</li> </ul>	65,000
<b>d. GEF Core Indicators</b>	i) Project development phase; ii) prior to project mid-	<ul style="list-style-type: none"> <li>• Project Team</li> <li>• Executing Agency</li> <li>• CI-GEF PA</li> </ul>	5,000

	term evaluation; and iii) project completion		
<b><i>e. Project Steering Committee Meetings</i></b>	Annually	<ul style="list-style-type: none"> <li>• Project Team</li> <li>• Executing Agency</li> <li>• CI-GEF PA</li> </ul>	<i>12,500</i>
<b><i>f. CI-GEF Project Agency Field Supervision Missions</i></b>	Approximately annual visits	<ul style="list-style-type: none"> <li>• CI-GEF PA</li> </ul>	<i>10,000</i>
<b><i>g. Quarterly Progress Reporting</i></b>	Quarterly	<ul style="list-style-type: none"> <li>• Project Team</li> <li>• Executing Agency</li> </ul>	<i>15,000</i>
<b><i>h. Annual Project Implementation Report (PIR)</i></b>	Annually for year ending June 30	<ul style="list-style-type: none"> <li>• Project Team</li> <li>• Executing Agency</li> <li>• CI-GEF PA</li> </ul>	<i>15,000</i>
<b><i>i. Project Completion Report</i></b>	Upon project operational closure	<ul style="list-style-type: none"> <li>• Project Team</li> <li>• Executing Agency</li> </ul>	<i>12,500</i>
<b><i>j. Independent External Mid-term Review</i></b>	CI Evaluation Office Project Team CI-GEF PA	<ul style="list-style-type: none"> <li>• Approximate mid-point of project implementation period</li> </ul>	<i>30,000</i>
<b><i>k. Independent Terminal Evaluation</i></b>	CI Evaluation Office Project Team CI-GEF PA	<ul style="list-style-type: none"> <li>• Evaluation field mission within three months prior to project completion.</li> </ul>	<i>30,000</i>
<b><i>l. Lessons Learned and Knowledge Generation</i></b>	Project Team Executing Agency CI-GEF PA	<ul style="list-style-type: none"> <li>• At least annually</li> </ul>	<i>10,000</i>
<b><i>m. Financial Statements Audit</i></b>	Executing Agency CI-GEF PA	<ul style="list-style-type: none"> <li>• Annually</li> </ul>	<i>45,000</i>



## SECTION 7: PROJECT BUDGET AND FINANCING

### A. Overall Project Budget

200. The project will be financed by a full size GEF grant of US\$ 3,301,472 with co-financing from government of Ecuador (DNPG and ABG from Ministry of Environment), Island Conservation, Galapagos Conservancy and Conservation International. A summary of the project costs and the co-financing contributions is given in the two tables below. The project budget may be subject to revision during implementation. The detailed Project Budget is provided in Appendix VII.

**Table 9: Planned Project Budget by Component**

	Project budget by component (in USD)				
	Component 1	Component 2	Component 3	PMC	Total budget
<i>Personnel Salaries and benefits</i>	\$342,235	\$529,072	\$219,763	\$112,212	\$1,203,282
<i>Contractual services</i>	\$105,000	\$153,405	\$30,000	\$45,000	\$333,405
<i>Travels and accommodations</i>	\$46,040	\$72,761	\$12,900	\$0	\$131,701
<i>Grants &amp; Agreements</i>	\$342,394	\$210,000	\$580,006	\$0	\$1,132,400
<i>Equipment</i>	\$0	\$0	\$0	\$0	\$0
<i>Other Direct Costs</i>	\$164,331	\$179,022	\$157,331	\$0	\$500,684
<b>TOTAL GEF FUNDED PROJECT</b>	<b>\$1,000,000</b>	<b>\$1,144,260</b>	<b>\$1,000,000</b>	<b>\$157,212</b>	<b>\$3,301,472</b>

**Table 10: Planned Project Budget by Year**

	Project budget by component (in USD)			
	Year 1	Year 2	Year 3	Total budget
<i>Personnel Salaries and benefits</i>	\$447,266	\$504,009	\$252,008	\$1,203,282
<i>Contractual services</i>	\$126,703	\$155,703	\$51,000	\$333,405
<i>Travels and accommodations</i>	\$43,221	\$59,261	\$29,120	\$131,601
<i>Grants &amp; Agreements</i>	\$469,834	\$659,066	\$3,500	\$1,132,400
<i>Equipment</i>	\$0	\$0	\$0	\$0
<i>Other Direct Costs</i>	\$200,445	\$197,367	\$102,972	\$500,784
<b>TOTAL GEF FUNDED PROJECT</b>	<b>\$1,287,467</b>	<b>\$1,575,405</b>	<b>\$438,600</b>	<b>\$3,301,472</b>

## B. Overall Project Co-financing

**Table 11: Committed Cash and In-Kind Co-financing (USD)**

Sources of Co-financing	Name of Co-financier	Type of Co-financing	Amount
Government	DNPG	In-Kind	10,500,000
Government	ABG	In-Kind	4,500,000
NGO	Island Conservation	In-Kind	1,400,000
NGO	Galapagos Conservancy	In-Kind	1,925,000
GEF Agency	CI-GEF	In Kind	70,000
<b>TOTAL CO-FINANCING</b>			<b>18,395,000</b>

## APPENDIX I: Project Results Framework

<b>Objective:</b>	To safeguard the biodiversity of Galapagos islands by enhancing biosecurity and creating the enabling environment for the restoration of Galapagos Island Ecosystems		
<b>Indicator(s):</b>	Each stage of a comprehensive strategy of ecosystem restoration—including enhanced biosecurity, social license for eradication of alien species and the subsequent reintroduction of an endemic species—has been carefully demonstrated, monitored and evaluated, thereby: (i) achieving a state of readiness for future eradication and restoration activities on Floreana Island, and (ii) creating a model process for replication on other key islands in the Galapagos Archipelago.  <i>Target: Successful demonstration of all stages and documentation of lessons learned.</i>		
<b>Project Outcomes and Indicators</b>	<b>Baseline</b>	<b>Target at the end of the project</b>	<b>Outputs and Indicators</b>
<b>Component 1: Furthering development of a state-of-the-art biosecurity system</b>			
<b>Outcome 1.1.:</b> The number of invasive alien species entering the Galapagos archipelago is substantially reduced  <b>Indicator 1.1.:</b> Number of invasive alien species intercepted at control points	<b>Baseline 1.1.:</b> In 2014 7,034 confiscations were made across all categories of pest-risk goods at all ports <sup>91</sup>	<b>Target 1.1.:</b> A >5% increase from baseline in the number of pest interceptions and subsequent confiscations of goods due to pest risk across all ports combined	<b>Output 1.1.1.:</b> Assessment of the biosecurity system at control points, and Action Plan <b>Indicator 1.1.1.:</b> Action Plan accepted by the Project Steering Committee (PSC) <b>Target 1.1.1.:</b> one document approved by the Project Steering Committee (PSC) <b>Output 1.1.2.:</b> Detection equipment and consumables, as identified in the Action Plan, purchased and installed in adequate infrastructure <b>Indicator 1.1.2.:</b> % of detection equipment identified in the Action Plan purchased and installed in adequate infrastructure <b>Target 1.1.2.:</b> 10% of equipment identified in the Action Plan purchased and installed

			<p><b>Output 1.1.3.:</b> Protocols updated and capacities built as identified in the Action Plan</p> <p><i>% of Action Plan recommendations regarding capacity building targets implemented</i></p> <p><b>Target 1.1.3.:</b> 20% of the recommendations implemented</p>
<b>Component 2: Solidifying the social infrastructure for the protection and recovery of Floreana Island ecosystems.</b>			
<p><b>Outcome 2.1.:</b> The social license is established for the protection and recovery of Floreana Island ecosystems.</p> <p><b>Indicator 2.1.:</b> The % of residents of Floreana Island who take action for the protection and recovery of Floreana Island ecosystems</p> <p><b>Indicator 2.2.:</b> The level of participation and support from Floreana Island residents and strategic project partners for the plans to eradicate invasive rodents and feral cats, and for the concept of reintroduction of endemic species previously extirpated by invasive species.</p>	<p><b>Baseline 2.1.:</b> To be defined in the Project Inception Phase</p>	<p><b>Target 2.1.:</b> At least 80% of Floreana Island residents take new or improved ecologically sustainable action in areas such as: agriculture, waste management and other areas defined in the Floreana Parish Council Declaration to be defined</p> <p><b>Target 2.2.:</b> 100% of Floreana Island residents and strategic project partners participate and demonstrate support for the plans to eradicate rodents and feral cats, and for the concept of reintroduction of endemic species previously extirpated by invasive species</p>	<p><b>Output 2.1.1.:</b> Ecologically- sustainable farming practices instituted.</p> <p><b>Indicator 2.1.1.:</b> The % of male and female of farmers that implement ecologically sustainable farming practices</p> <p><b>Target 2.1.1.:</b> 100 % of farmers implement ecologically sustainable farming practices</p> <p><b>Output 2.1.2.:</b> Floreana Parish Council Declaration adopted</p> <p><b>Indicator 2.1.2.:</b> Declaration approved by the Floreana Parish Council.</p> <p><b>Target 2.1.2</b> One declaration developed and adopted by the Floreana Parish Council.</p> <p><b>Output 2.1.3:</b> Operational Plan for eradication of invasive rodents and feral cats approved by the Project Steering Committee.</p> <p><b>Indicator 2.1.3.:</b> Approved Operational Plan</p>

			<p><b>Target 2.1.3.:</b> <i>one operational plan approved by PSC</i></p> <p><b>Output 2.1.4.:</b> Risk management plans developed in conjunction with the community and approved by the Project Steering Committee.</p> <p><b>Indicator 2.1.4.a.:</b> <i>Approved risk management plans.</i></p> <p><b>Target 2.1.4.a.:</b> <i>6 risk management plans approved by PSC</i></p> <p><b>Indicator 2.1.4.b:</b> <i>Percentage of the Floreana island male and female residents who participate in the consultations regarding the risk management plans developed for the Project.</i></p> <p><b>Target 2.1.4.b.:</b> <i>100% of the male and female residents participate in the consultations.</i></p> <p><b>Output 2.1.5.:</b> Environmental and Social Impact Assessment completed and environmental certificate awarded.</p> <p><b>Indicator 2.1.5.:</b> Environmental and Social Impact Assessment completed and approved.</p> <p><b>Target 2.1.5.:</b> <i>One ESIA completed and approved by PSC</i></p>
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<b>Component 3: Advancing the recovery of island ecosystems following invasive species eradication through the re-establishment of keystone species (i.e. giant tortoises).</b>			
<p><b>Outcome 3.1.:</b> Ecosystem processes, particularly seed dispersal, re-initiated across Santa Fe island (2,413 ha) as the result of the translocation of giant tortoises.</p> <p><b>Indicator 3.1.:</b> Percentage of Santa Fe Island land area where giant tortoises are dispersing seeds</p>	<p><b>Baseline 3.1.:</b> As of December 2017, 396 giant tortoises of the species <i>Chelonoidis hoodensis</i> were dispersing seeds on approximately 10% (240 ha) of the area of Santa Fe Island</p>	<p><b>Target: 3.1.:</b> At least 506 giant tortoises of the species <i>Chelonoidis hoodensis</i> are dispersing seeds on approximately 50% (1,206 ha) of the area of Santa Fe Island</p>	<p><b>Output 3.1.1.:</b> Giant tortoises (<i>Chelonoidis hoodensis</i>) translocated to Santa Fe Island</p> <p><b>Indicator 3.1.1.:</b> # of giant tortoises (<i>Chelonoidis hoodensis</i>) translocated to Santa Fe Island</p> <p><b>Target 3.1.1.a:</b> On average, at least 40 juvenile giant tortoises (<i>Chelonoidis hoodensis</i>) are translocated annually</p> <p><b>Target 3.1.1.b.:</b> At least 30 sub-adult giant tortoises (<i>Chelonoidis hoodensis</i>) are translocated</p> <p><b>Output 3.1.2.:</b> Monitoring and evaluation protocols for assessing the role of giant tortoises as ecosystem engineers, including seed dispersal are tested and optimized</p> <p><b>Indicator 3.1.2.:</b> Tested and optimized monitoring and evaluation protocols accepted by the Project Steering Committee</p> <p><b>Target 3.1.2.:</b> One monitoring and evaluation protocol</p>
<p><b>Outcome 3.2.:</b> Production in captivity of giant tortoises for future reintroductions throughout the archipelago is significantly increased</p>	<p><b>Baseline 3.2.:</b> In the breeding centers the following numbers of giant tortoises are reaching the age of one year:</p>	<p><b>Target 3.2.:</b> In the breeding centers, an enhanced and expanded breeding stock contributes to the following numbers of giant tortoises reaching the age of one year:</p>	<p><b>Output 3.2.1.:</b> Giant tortoise breeding centers on Santa Cruz and Isabela Islands are modernized and expanded</p> <p><b>Indicator 3.2.1.:</b> Number of centers modernized and expanded</p>

<p><b>Indicator 3.2.:</b> Number of giant tortoises raised in captivity annually</p>	<ul style="list-style-type: none"> <li>• In Santa Cruz, an average of 250 tortoises annually from the populations of Española, Santiago, Floreana, Pinzón and Eastern Santa Cruz</li> <li>• In Isabela, an average of 200 tortoises annually from the populations of the Sierra Negra and Cerro Azul volcanoes</li> </ul>	<ul style="list-style-type: none"> <li>• In Santa Cruz, at least 400 tortoises annually from the populations of Española, Santiago, Floreana, Pinzón and Eastern Santa Cruz</li> <li>• In Isabela, an average of 300 tortoises annually from the populations of the Sierra Negra and Cerro Azul volcanoes</li> </ul>	<p><b>Target 3.2.1.:</b> Two centers modernized</p> <p><b>Output 3.2.2.:</b> Giant tortoise breeding stock with partial ancestry of <i>C. niger</i> are selected, located and transferred to the Santa Cruz breeding center.</p> <p><b>Indicator 3.2.2.:</b> # of breeders selected, located, and transferred to breeding center</p> <p><b>Target 3.2.2.:</b> At least five giant tortoises located and transferred (20% increase in captive population of Floreana breeders)</p> <p><b>Output 3.2.3.:</b> Scientific and technical findings reported in the professional and popular literature</p> <p><b>Indicator 3.2.3.:</b> # of scientific, technical and popular articles and reports.</p> <p><b>Target 3.2.3.:</b> 1 peer reviewed article and 2 popular articles produced.</p>
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## APPENDIX II: Project Timeline

Outcome / Output	Timing									
	Year 1				Year 2				Year 3	
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2
<b>Outcome 1.1.:</b> The number of invasive alien species entering the Galapagos archipelago is substantially reduced										
<b>Output 1.1.1.:</b> Assessment of the biosecurity system at control points, and Action Plan										
<b>Output 1.1.2.:</b> Detection equipment and consumables, as identified in the Action Plan, purchased and installed in adequate infrastructure										
<b>Output 1.1.3.:</b> Protocols updated and capacities built as identified in the Action Plan										
<b>Outcome 2.1.:</b> The social license is established for the protection and recovery of Floreana Island ecosystems										
<b>Output 2.1.1.:</b> Ecologically- sustainable farming practices instituted										
<b>Output 2.1.2.:</b> Floreana Parish Council Declaration adopted										
<b>Output 2.1.3.:</b> Operational Plan for eradication of invasive rodents and feral cats approved by the Project Steering Committee										
<b>Output 2.1.4.:</b> Risk management plans developed in conjunction with the community and approved by the Project Steering Committee										
<b>Output 2.1.5.:</b> Environmental and Social Impact Assessment completed and environmental certificate awarded										



Outcome / Output	Timing									
	Year 1				Year 2				Year 3	
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2
<b>Outcome 3.1.:</b> Ecosystem processes, particularly seed dispersal, re-initiated across Santa Fe island (2,413 ha) as the result of the translocation of giant tortoises										
<b>Output 3.1.1.:</b> Giant tortoises ( <i>Chelonoidis hoodensis</i> ) translocated to Santa Fe Island										
<b>Output 3.1.2.:</b> Monitoring and evaluation protocols for assessing the role of giant tortoises as ecosystem engineers, including seed dispersal are tested and optimized										
<b>Outcome 3.2.:</b> Production in captivity of giant tortoises for future reintroductions throughout the archipelago is significantly increased										
<b>Output 3.2.1.:</b> Giant tortoise breeding centers on Santa Cruz and Isabela Islands are modernized and expanded										
<b>Output 3.2.2.:</b> Giant tortoise breeding stock with partial ancestry of <i>C. niger</i> are selected, located and transferred to the Santa Cruz breeding center										
<b>Output 3.2.3.:</b> Scientific and technical findings reported in the professional and popular literature										

### APPENDIX III: Project Results Monitoring Plan

Indicators	Metrics	Methodology	Baseline	Location	Frequency	Responsible Parties	Indicative Resources
<b>Objective: To safeguard the biodiversity of Galapagos islands by enhancing biosecurity and creating the enabling environment for the restoration of Galapagos Island Ecosystems</b>							
Objective Indicator a:	Each stage of a comprehensive strategy of ecosystem restoration—including enhanced biosecurity, social license for eradication of alien species and the subsequent reintroduction of an endemic species—has been carefully demonstrated, monitored and evaluated, thereby: (i) achieving a state of readiness for future eradication and restoration activities on Floreana Island, and (ii) creating a model process for replication on other key islands in the Galapagos Archipelago.	TBD	No such integrated analysis has been conducted in the past, only specific analyses related to eradication, re-introduction and biosecurity, respectively	PMU	Continuous learning and recording of lessons learned, twice annual stock-taking reviews	DPNG, ABG, IC, CI	Approximately 5-10% of the project team's time will be allocated to monitoring of indicators. No additional dedicated budget is allocated
<b>Component 1: Furthering development of a state-of-the-art biosecurity system</b>							
Outcome indicator 1.1.1:	Number of invasive alien species intercepted at control points	Interceptions are recorded on a daily basis, with statistics compiled by ABG and DPNG	In 2014, 7,034 confiscations were made across all categories of pest-risk goods at all ports	Galapagos and mainland ports	Annual	ABG	Approximately 5-10% of the project team's time will be allocated to monitoring of indicators. No additional dedicated budget is allocated
Output indicator 1.1.1.1:	Action Plan accepted by the Project Steering Committee (PSC)	Plan will be presented to PSC, which will comment and	0% (No action plan)	N/A	Once (Y1, Q3)	PSC members	Approximately 5-10% of the project team's time will be allocated to monitoring of indicators. No additional

Indicators	Metrics	Methodology	Baseline	Location	Frequency	Responsible Parties	Indicative Resources
		ultimately provide written approval					dedicated budget is allocated
Output indicator 1.1.2.:	% of detection equipment identified in the Action Plan purchased and installed in adequate infrastructure	Target (10%) reflects the fact that the Action Plan will continue beyond the conclusion of the project.	0% (No action plan)	Puerto Ayora	Once (Y2, Q3)	ABG, DPNG	Approximately 5-10% of the project team's time will be allocated to monitoring of indicators. No additional dedicated budget is allocated
Output indicator 1.1.3.:	% of Action Plan recommendations regarding Protocols and capacity building targets implemented	Target (20%) reflects the fact that the Action Plan will continue beyond the conclusion of the project	0% (No action plan)	Puerto Ayora	Once (Y3, Q2)	ABG, DPNG	Approximately 5-10% of the project team's time will be allocated to monitoring of indicators. No additional dedicated budget is allocated
<b>Component 2: Solidifying the social infrastructure for the protection and recovery of Floreana Island ecosystems.</b>							
Outcome indicator 2.1.:	The % of residents of Floreana Island who take action for the protection and recovery of Floreana Island ecosystems	Survey / questionnaire	Percentage to be determined during the project inception phase	Floreana Island	Annual (Q2, x3)	DPNG, IC	Approximately 5-10% of the project team's time will be allocated to monitoring of indicators. No additional dedicated budget is allocated
Output indicator 2.1.1:	The % of male and female farmers that implement ecologically sustainable farming practices	Ecologically sustainable farming practices employed, or not, by male and female farmers, according to survey.	18 Agricultural Production Units are managed by X men and X women on Floreana Island in 2017.  In 2018, X% of male and X% of female farmers were employing ecologically sustainable farming practices. (Note: Figures indicated by 'x' to be determined during inception phase)	Floreana Island	Annual (Q2, x3)	IC	Approximately 5-10% of the project team's time will be allocated to monitoring of indicators. No additional dedicated budget is allocated

Indicators	Metrics	Methodology	Baseline	Location	Frequency	Responsible Parties	Indicative Resources
Output indicator 2.1.2.:	Declaration approved by the Floreana Parish Council.	Floreana Parish Council approves a declaration through their standard process.	No declaration of this type exists.	Floreana Island	Once (Y2, Q2)	Island Conservation, Floreana Parish Council	Approximately 5-10% of the project team's time will be allocated to monitoring of indicators. No additional dedicated budget is allocated
Output indicator 2.1.3.:	Approved Operational Plan	Operational plan continues to be co-designed and refined with Floreana community and other stakeholders. Final version is submitted for approval to PSC.	Unapproved rough draft of Operational Plan exists	N/A	Once (Y2, Q3)	IC to complete. PSC to approve.	Approximately 5-10% of the project team's time will be allocated to monitoring of indicators. No additional dedicated budget is allocated
Output indicator 2.1.4a.:	Approved risk management plans.	Risk management plans continue to be co-designed and refined with Floreana community and other stakeholders. Final versions are submitted for approval to PSC.	Unapproved rough drafts of risk management plans exist	N/A	Once (Y2, Q1)	IC to complete. PSC to approve.	Approximately 5-10% of the project team's time will be allocated to monitoring of indicators. No additional dedicated budget is allocated
Output indicator 2.1.4b.:	Percentage of the Floreana island male and female residents who participate in the consultations regarding the risk management plans developed for the Project.	Participant lists from consultations compared to total number of male and female Floreana island residents.		Floreana Island	While community consultations are underway.	IC	Approximately 5-10% of the project team's time will be allocated to monitoring of indicators. No additional dedicated budget is allocated
Output indicator 2.1.5.:	Environmental and Social Impact Assessment completed and approved.	Consultant contracted to complete ESIA.	No ESIA exists.	N/A	Once (Y3, Q2)	Consultant and PSC to approve.	Approximately 5-10% of the project team's time will be allocated to monitoring of

Indicators	Metrics	Methodology	Baseline	Location	Frequency	Responsible Parties	Indicative Resources
		Submitted to PSC for approval.					indicators. No additional dedicated budget is allocated
Outcome indicator 2.2.:	The level of participation and support from Floreana Island residents and strategic project partners for the plans to eradicate invasive rodents and feral cats, and for the concept of reintroduction of endemic species previously extirpated by invasive species	Survey / questionnaire	Participation in consultations to date has been close to 100%; No final plans exist, therefore no baseline level of support for such plans can be measured	Galapagos Islands	Once (Y2, Q3)	IC, DPNG	Approximately 5-10% of the project team's time will be allocated to monitoring of indicators. No additional dedicated budget is allocated
<b>Component 3: Advancing the recovery of island ecosystems following invasive species eradication through the re-establishment of keystone species (i.e. giant tortoises).</b>							
Outcome Indicator 3.1.:	Percentage of Santa Fe Island land area where giant tortoises are dispersing seeds	Hectares within 100 m of a known tortoise occurrence since during project  Mark-recapture surveys of tortoises and tortoise movement studies	240 hectares within 100 m of a known tortoise occurrence	Santa Fe Island (entire island)	Annual prior to project initiation and bi-annual thereafter to project end	DNPG advised by GC/GTRI staff	

Indicators	Metrics	Methodology	Baseline	Location	Frequency	Responsible Parties	Indicative Resources
Output Indicator 3.1.1.:	# of giant tortoises ( <i>Chelonoidis hoodensis</i> ) translocated to Santa Fe Island	Visual counts by Breeding Center staff according to Breeding Center protocols as tortoises are processed into the travel boxes for transfer to Santa Fe Island on day of transfer	As of December 2017, 396 giant tortoises of the species <i>Chelonoidis hoodensis</i> had been released to Santa Fe Island.	Santa Fe Island	Likely annual but dependent any given year on environmental conditions conducive to tortoise release	DNPG advised by GC/GTRI staff	Approximately 5-10% of the project team's time will be allocated to monitoring of indicators. No additional dedicated budget is allocated
		Visual counts by DPNG rangers as subadult tortoises are released onto Santa Fe Island	As of December 2017, there were no subadult tortoises on Santa Fe Island.	Santa Fe Island	Single event when transfer transpires	DNPG advised by GC/GTRI staff	Approximately 5-10% of the project team's time will be allocated to monitoring of indicators. No additional dedicated budget is allocated
Output Indicator 3.1.2.:	Tested and optimized monitoring and evaluation protocols accepted by the Project Steering Committee	Outside verification of tested and optimized monitoring protocol	As of December 2017, there was no tested and optimized monitoring protocol	Not applicable	Single event at project end	DNPG advised by GC/GTRI staff	Approximately 5-10% of the project team's time will be allocated to monitoring of indicators. No additional dedicated budget is allocated
Outcome Indicator 3.2.:	Number of giant tortoises raised in captivity annually – Santa Cruz	Counts of tortoises according to record keeping programs outlined in “The Captive Rearing of Galapagos Tortoises: An Operative Manual”	In Santa Cruz, an average of 250 tortoises annually is produced for the populations of Española, Santiago, Floreana, Pinzón and Eastern Santa Cruz	Santa Cruz Island Breeding Center	Single event at project end	DNPG advised by GC/GTRI staff	Approximately 5-10% of the project team's time will be allocated to monitoring of indicators. No additional dedicated budget is allocated
	Number of giant tortoises raised in captivity annually - Isabela	Counts of tortoises according to record keeping programs outlined in “The	In Isabela, an average of 200 tortoises annually from the populations of	Isabela Island Breeding Center	Single event at project end	DNPG advised by GC/GTRI staff	Approximately 5-10% of the project team's time will be allocated to monitoring of indicators. No additional

Indicators	Metrics	Methodology	Baseline	Location	Frequency	Responsible Parties	Indicative Resources
		Captive Rearing of Galapagos Tortoises: An Operative Manual"	the Sierra Negra and Cerro Azul volcanoes				dedicated budget is allocated
Output Indicator 3.2.1:	Number of centers modified and expanded	Number of new breeding pens Number of quarantine pens Number of pre-adaptation pens Number of pens for hatchling tortoises  Facility inspection at project end	Design blueprint of Breeding centers in 2017	Breeding Centers on Santa Cruz Island and on Isabela Island	Single event at project end	DNPG advised by GC/GTRI staff	Approximately 5-10% of the project team's time will be allocated to monitoring of indicators. No additional dedicated budget is allocated
Output Indicator 3.2.2:	# of breeders selected, located, and transferred to breeding center	Counts of tortoises according to record keeping programs outlined in "The Captive Rearing of Galapagos Tortoises: An Operative Manual"	Breeding stock as of Dec. 2017	Breeding Centers on Santa Cruz Island and on Isabela Island	Single event at project end	DNPG advised by GC/GTRI staff	Approximately 5-10% of the project team's time will be allocated to monitoring of indicators. No additional dedicated budget is allocated
Output Indicator 3.2.3:	# of scientific, technical and popular articles and reports.	Number of technical articles in peer-reviewed literature Number of informal articles in publicly available 'Galapagos Informe'  Number of scientific posters presented DPNG conference	0	Not applicable	Single events at project end	DNPG advised by GC/GTRI staff	Approximately 5-10% of the project team's time will be allocated to monitoring of indicators. No additional dedicated budget is allocated

Indicators	Metrics	Methodology	Baseline	Location	Frequency	Responsible Parties	Indicative Resources
		Provision of final copies of documents					



#### **APPENDIX IV: GEF Core Indicators**

Note: To be included for CEO Endorsement template.

## APPENDIX V: Safeguard Screening Form and Analysis

### CI-GEF PROJECT AGENCY SCREENING RESULTS AND SAFEGUARD ANALYSIS

#### I. BASIC INFORMATION

##### A. Basic Project Data

<b>Country:</b> Ecuador	<b>GEF Project ID:</b> 9282
<b>Project Title:</b> Safeguarding biodiversity in the Galapagos Islands by enhancing biosecurity and creating the enabling environment for the restoration of Galapagos Island ecosystems.	
<b>Executing Agency:</b> Island Conservation (IC), in conjunction with Galapagos National Park Directorate (DPNG)	
<b>GEF Focal Area:</b> Biodiversity	
<b>GEF Project Amount:</b> USD\$3,301,472	
<b>Reviewer(s):</b> Ian Kissoon	
<b>Date of Review:</b> December 13, 2017	
<b>Comments:</b> Analysis completed and approved	

##### B. Project Objective:

To recover threatened endemic species and secure vulnerable ecosystems in the Galapagos Islands by enhancing biosecurity across the Galapagos archipelago, consolidating the social conditions necessary for eradicating invasive vertebrate species from Floreana Island, translocating giant tortoises to Santa Fe island, and increasing the capacity for giant tortoise captive breeding, rearing and head-starting.

##### C. Project Description:

Eighty of the Galapagos archipelago's native species are categorized as Critically Endangered on the IUCN Red List, and a further 164 are considered threatened with extinction. The greatest threat to biodiversity in the Galapagos Islands is biological invasion. Hundreds of invasive alien species are already well established within the archipelago. Some of these organisms arrived with seafarers more than 100 years ago, while others have been introduced (deliberately and inadvertently) within the last decade. Invasive rodents and feral cats have had particularly pervasive impacts on endemic birds, small mammals, and small reptiles.

Although invasive rodents and feral cats have not yet been removed from Floreana Island, invasive vertebrates have been removed from Santa Fe and other Galapagos islands. These islands are now candidates for the recovery of endangered species and associated ecological processes.

Due to their roles as seed dispersers and ecological engineers, giant tortoises (*Chelonoidis spp.*) function as keystone species within Galapagos ecosystems. Thus, the recovery of giant tortoises and their associated ecosystem processes (e.g. seed dispersal) are of particular importance to the restoration of Galapagos Island ecosystems, especially arid islands. In 2015, 201 Española tortoises (*Chelonoidis hoodensis*; IUCN Vulnerable) were released on Santa Fe.

IUCN has developed guidelines to direct conservation-oriented translocations in an ecologically-sound manner. The DPNG's Santa Cruz Tortoise Center has been conducting giant tortoise breeding, head-starting, and translocation activities as part of island-specific recovery efforts for over five decades.

The project aims to: 1) improve biosecurity for cargo and persons moving into, out of, and between islands within the Galapagos archipelago in order to prevent the further introduction, spread, and impact of invasive alien species; 2) consolidate the social enabling conditions to be able to eradicate invasive rodents [black rats (*Rattus rattus*), house mice (*Mus musculus*)] and feral cats (*Felis catus*)] in order to secure 61 species endemic to Floreana Island that are listed as threatened (Critically Endangered to Vulnerable) on the IUCN Red List, as well as safeguard the 140 human residents of Floreana Island who are heavily dependent the services provided by the island's ecosystems; and 3) reinstate ecosystem processes through the reintroduction of giant tortoises to Santa Fe island, where they have gone extinct more than 150 years ago, and increase the capacity of the DPNG to captive breed, grow and head-start hatchling tortoises through the improvement and expansion of tortoise breeding and rearing infrastructure.

#### **D. Project location and biophysical characteristics relevant to the safeguard analysis:**

The project will be executed in the Galapagos archipelago. The Galapagos Islands were formed 3-5 million years ago when deep ocean volcanoes erupted. Situated just below the equator, the archipelago is 1,000 km off the coast of Ecuador in the Pacific Ocean. It is composed of 13 large islands and 100 smaller islands and islets that comprise 7,880 km<sup>2</sup> of land. Located at the confluence of three eastern Pacific currents, the Galapagos are a 'melting pot' for a large diversity of marine life. The equatorial climate, highly varied and rugged terrain, and extreme geographic isolation of the islands has resulted in the development of a rich array of terrestrial plants and animals that are found nowhere else in the world.

All of the marine and coastal environs (13,300,000 ha) and nearly 97% of the land area (761,844 ha) in the Galapagos archipelago are under at least one form of protection. The Government of Ecuador (GoE) created the Galapagos National Park (GNP) in 1959 and designated the Galapagos Marine Reserve in 1996. In acknowledgment of their global conservation value, the Galapagos Islands became the first World Heritage Site in 1978 and were designated as a United Nations Educational, Scientific and Cultural Organization (UNESCO) Man and Biosphere Reserve in 1984. However, largely due to threats posed by invasive alien species, UNESCO listed the Galapagos Islands as a World Heritage Site in Danger in 2007. Within the Galapagos Islands, specific sites have additional protected area status. There are ten distinct Important Bird Areas (IBA's) namely: San Cristobal Island, Espanola Island, two satellite islands of Floreana Island (Champion and Gardner), Floreana Island, the uplands of Santa Cruz Island, Puerto Ayora, southern wetlands of Isabela Island, uplands of Isabela Island, coastal areas of Fernandina Island and western Isabela Island, and the uplands of

Santiago Island. There are also several Alliance for Zero Extinction (AZA) sites including the coastal areas of Fernandina Island and western Isabela Island, Floreana Island and its satellite islands, Champion and Gardner, Espanola Island, and San Cristobal Island.

In the Galapagos archipelago, protected area status has helped curb large-scale deforestation, coastal development, wildlife trafficking, unsustainable hunting, exploitative fisheries, and pollution. Nevertheless, all of the islands and associated marine ecosystems are being adversely impacted by four inter-related threats: invasive alien species, climate change, population growth, and expanding tourism. The four human-inhabited islands (Santa Cruz, San Cristobal, Isabela, and Floreana) are also subject to habitat destruction for township development and agricultural expansion. Santa Fe Island is uninhabited and is one of the oldest islands in the archipelago.

**E. Executing Agency's Institutional Capacity for Safeguard Policies:**

The EA did not indicate any experience in implementing safeguard policies but has highly skilled professional staff who are committed to ensuring compliance with the safeguard policies. The EA plans to conduct orientation that will include, but not be limited to, CI-GEF's ESMF, and all project safeguard documents (e.g. gender mainstreaming, grievance mechanism) for all staff and new hires that may potentially be involved in the project. Additional staff will be hired to increase the capacity of the EA to implement the project.

## II. SAFEGUARD AND POLICIES

### Environmental and Social Safeguards:

Safeguard Triggered	Yes	No	TBD	Date Completed
<b>1. Environmental &amp; Social Impact Assessment (ESIA)</b>		X		
<i>Justification: No significant adverse environmental and social impacts that are sensitive, diverse, or unprecedented is anticipated</i>				
<b>2. Natural Habitats</b>	X			
<i>Justification: The project is proposing restoration of a critical natural habitat (translocation of giant tortoises to Santa Fe Island)</i>				
<b>3. Involuntary Resettlement</b>		X		
<i>Justification: The project is not proposing involuntary resettlement or restriction of access/use of natural resources.</i>				
<b>4. Indigenous Peoples</b>		X		
<i>Justification: The project does not plan to work in lands or territories traditionally owned, customarily used, or occupied by indigenous peoples</i>				
<b>5. Pest Management</b>		X		
<i>Justification: There are no proposed activities related to pest management</i>				
<b>6. Physical &amp; Cultural Resources</b>		X		
<i>Justification: There are no proposed activities related to physical and cultural resources</i>				
<b>7. Stakeholder Engagement</b>	X			
<i>Justification: The project is required to engage stakeholders</i>				
<b>8. Gender mainstreaming</b>	X			
<i>Justification: The project is required to mainstream gender at all levels</i>				
<b>9. Accountability and Grievance Mechanisms</b>	X			
<i>Justification: As a publicly funded GEF project, a Grievance Mechanism is required.</i>				

### III. KEY SAFEGUARD POLICY ISSUES AND THEIR MANAGEMENT

1. Describe any safeguard issues and impacts associated with the proposed project. Identify and describe any potential large scale, significant and/or irreversible impacts:

*From information provided in the Safeguard Screening Form, this project has triggered four safeguard policies. These are:*

- I. Natural Habitats*
- II. Stakeholder Engagement,*
- III. Gender Mainstreaming, and*
- IV. Grievance Mechanism.*

2. Describe any potential indirect and/or long term impacts due to anticipated future activities in the project area:

*The project aims to restore ecosystem processes on Santa Fe through the translocation of giant tortoises. The Santa Fe is a protected area and houses important conservation species. Translocation of giant tortoises and the consequential impact on the island's species and ecosystems will need to be closely monitored and evaluated.*

3. Describe any project alternatives (if relevant) considered to help avoid or minimize adverse impacts:

*The proposed approach of the project is expected to avoid or minimize adverse impacts. As such, no better alternative can be conceived at this time.*

4. Describe measures to be taken by the Executing Agency to address safeguard policy issues.

- I. Natural Habitats*

*To ensure that the project meets CI-GEF Project Agency's "Natural Habitat Policy #2", the Executing Agency is required to prepare an Environmental Management Plan (EMP), specifically for the activity relating to the translocation of giant tortoises on Santa Fe Island, during the PPG phase. The EMP is a document that identifies a set of mitigation, management, monitoring, and institutional actions to be implemented. The EMP should incorporate the IUCN guidelines for conservation-oriented translocations. The EMP must also be disclosed to stakeholders, in a language, manner and means that best suits the local context, for their review and feedback.*

*As part of the EMP, the Executing Agency is required to monitor and report on the following minimum indicator:*

- 1. Number of Hectares of natural and/or critical natural habitats loss or degraded*

- II. Grievance Mechanism*

*To ensure that the project meets CI-GEF Project Agency's "Accountability and Grievance Mechanism Policy #7", the Executing Agency is required to develop an Accountability and Grievance Mechanism that will ensure people affected by the project are able to bring their grievances to the Executing Agency for consideration and redress. The mechanism must be in place before the start of project activities, and disclosed to all stakeholders in a language, manner and means that best suits the local context.*

*As part of the Accountability and Grievance Mechanism, the Executing Agency is required to monitor and report on the following minimum indicators:*

- 1. Number of conflict and complaint cases reported to the project's Accountability and Grievance Mechanism; and*
- 2. Percentage of conflict and complaint cases reported to the project's Accountability and Grievance Mechanism that have been addressed.*

### **III. Gender Mainstreaming**

*To ensure that the project meets CI-GEF Project Agency's "Gender Mainstreaming Policy #8", the Executing Agency is required to prepare a Gender Mainstreaming Plan (GMP) during the PPG phase.*

*As part of the GMP, the Executing Agency is required to monitor and report on the following minimum indicators:*

- 1. Number of men and women that participated in project activities (e.g. meetings, workshops, consultations);*
- 2. Number of men and women that received benefits (e.g. employment, income generating activities, training, access to natural resources, land tenure or resource rights, equipment, leadership roles) from the project; and if relevant*
- 3. Number of strategies, plans (e.g. management plans and land use plans) and policies derived from the project that include gender considerations.*

### **IV. Stakeholder Engagement**

*To ensure that the project meets CI-GEF Project Agency's "Stakeholders' Engagement Policy #9", the Executing Agency is required to develop a Stakeholder Engagement Plan (SEP) during the PPG phase.*

*As part of the SEP, the Executing Agency is required to monitor and report on the following minimum indicators:*

- 1. Number of government agencies, civil society organizations, private sector, indigenous peoples and other stakeholder groups that have been involved in the project implementation phase on an annual basis;*
- 2. Number persons (sex disaggregated) that have been involved in project implementation phase (on an annual basis); and*
- 3. Number of engagement (e.g. meeting, workshops, consultations) with stakeholders during the project implementation phase (on an annual basis)*


## **IV. PROJECT CATEGORIZATION**

<b>PROJECT CATEGORY</b>	<b>Category A</b>	<b>Category B</b>	<b>Category C</b>
		<b>X</b>	
<i>Justification: The proposed project activities, specifically the translocation of giant tortoises, may have adverse environmental impacts on Santa Fe and this increases the risk threshold for the project. However, these impacts are site-specific, may be irreversible, and mitigation measures can be designed more readily than for Category A projects.</i>			

## V. EXPECTED DISCLOSURE DATES

Safeguard Plan	CI Disclosure Date	EA Disclosure Date
Environmental & Social Impact Assessment (ESIA)	NA	NA
Environmental Management Plan (EMP)	<i>Within 15 days of CI-GEF approval</i>	<i>Within 30 days of CI-GEF approval</i>
Voluntary Resettlement Action Plan (V- RAP)	NA	NA
Process Framework for Restriction of Access to Natural Resources	NA	NA
Indigenous Peoples Plan (IPP)	NA	NA
Pest Management Plan (PMP)	NA	NA
Stakeholder Engagement Plan (SEP)	<i>Within 15 days of CI-GEF approval</i>	<i>Within 30 days of CI-GEF approval</i>
Gender Mainstreaming Plan (GMP)	<i>Within 15 days of CI-GEF approval</i>	<i>Within 30 days of CI-GEF approval</i>
Accountability and Grievance Mechanism	<i>Within 15 days of CI-GEF approval</i>	<i>Within 30 days of CI-GEF approval</i>

## VI. APPROVALS

<b><i>Signed and submitted by:</i></b>		
	<b>Name: Free de Koning</b> <b>Sr. Director Project Development &amp; Implementation</b>	<b>Date: 2017-12-15</b>
<b><i>Approved by:</i></b>		
	<b>Name: Ian Kissoon</b> <b>Technical Advisor (Safeguards Manager)</b>	<b>Date: 2017-12-13</b>
	<b>Name: Daniela Carrion</b> <b>Project Manager</b>	<b>Date: 2017-12-14</b>



## APPENDIX VI: Environmental Management Plan for Translocation and Captive Rearing of Giant Tortoises

### 1. Executive Summary

Reintroduction of tortoise populations is increasingly proposed as a tool for ecosystem restoration. Giant tortoises, once widespread on all continents except Antarctica, are ecosystem engineers that manipulate the distribution and abundance of other organisms through direct effects of herbivory, disturbance and seed dispersal on plant communities and subsequent indirect impacts on animal communities.

As part of the Giant Tortoise Restoration Initiative<sup>1</sup>, Española tortoises, as the closest genetic relative and of the same saddleback morphology, will be used as ecological analogs for the extinct Santa Fe tortoise to re-initiate ecosystem processes on Santa Fe Island. Since 2015, a total of 396 Española (*Chelonoidis hoodensis*) tortoises have been released on Santa Fe. Additional efforts will be required in coming years to build capacity and restore the island with approximately 4,000 tortoises, the abundance predicted by habitat suitability models to have been present originally<sup>1</sup>.

Component 3 of the present project aims at restoration of a critical natural habitat, namely Santa Fe Island. Captive raising and translocation of giant tortoises, ultimately to Santa Fe Island, are the means by which such transformation is being sought. Work will proceed in accordance with guidelines developed by IUCN to direct conservation-oriented translocations in an ecologically sound manner.<sup>1</sup>

The reintroduction of Española giant tortoises to Santa Fe Island, like any ecological restoration action, is a long-term process. Its purpose is to achieve the establishment of a population of tortoises large enough for tortoises to fulfill their role as ecosystem engineers and thus actively contribute to the restoration of the ecological integrity of the island.

In order to achieve Target 3.1.1.a., juvenile giant tortoises, approximately five years in age, will be translocated from the Santa Cruz Island tortoise breeding center, where they were hatched and raised, to Santa Fe Island. Prior to being translocated, they will be subject to a quarantine process and equipped with subdermal microchips (transponders) to enable individual identification where re-encountered. These tortoises will be transported via the DPNG 'Sierra Negra' research vessel and will be carried by DPNG rangers from the ship to selected sites on Santa Fe Island for release. At least 40 juvenile giant tortoises will be translocated annually during the course of the project, i.e. at least 80 juvenile giant tortoises in total.

This Environmental Management Plan provides essential physical, scientific and programmatic context which underpins the project efforts. It describes the project's proposed activities and targets. It clearly identifies issues and associated safeguards. It analyzes impacts, risks and mitigation mechanisms. Finally, it presents the project's monitoring system.

#### Context

Santa Fe (0049'0"S, 9003'30"W) is a rectangular-shaped island 2,413 hectares in area located 16.6 km from the main island of Santa Cruz at the archipelago's center. There is no infrastructure at present on the island to support human activity including field researchers, by intent. Noteworthy endemic fauna include the Santa Fe land iguana (*Conolophus pallidus*), the Santa Fe rice rat (*Oryzomys bauri*), and the Santa Fe leaf-toed gecko (*Phyllodactylus barringtonensis*). Santa Fe Island apparently originally had its own lineage of giant tortoise. Santa Fe's terrestrial ecosystems are in a transitional state due to the

extermination of tortoises over a century ago which was soon followed by invasion by an introduced population of feral goats.

Tortoise breeding centers run by the Galapagos National Park Directorate, hereafter DPNG (according to its Spanish-language acronym), have played a critical role in saving several species from extinction and augmenting the population restoration process for others. Improvement and expansion of the physical infrastructure of the rearing centers remains a primary outstanding need of this programme.

The recovery of Floreana Island tortoises is a primary focus now for tortoise restoration in Galapagos. The potential restoration of the Floreana tortoise lineage has been made possible by the recent discovery of inter-species hybrids between an extant and secure lineage and the extinct Floreana tortoise lineage. Recent scientific evaluations elucidate how best to move forward with capturing what remains of the Floreana tortoise lineage and genome, providing clear guidance for proceeding with science-based captive rearing and translocation efforts to resurrect the Floreana giant tortoise lineage.

### *Description*

The project includes three components, which are briefly described below.

Component 1 will build on past and ongoing efforts by the Galapagos Biosecurity Agency, hereafter ABG (according to its Spanish-language acronym) to implement and strengthen biosecurity through interception and control of invasive alien species and diseases. The benefits to biodiversity of adding new pest detection equipment, training inspectors to use the new equipment effectively, and implementing new inter-island biosecurity protocols will be substantial over the long-term and will accrue to the whole of the archipelago, as well as to continental Ecuador and Ecuador's trading partners. Invasive alien species intercepted as a result of enhanced detection capacities will be eliminated from the pathway by which they were being mobilized, and their establishment in natural ecosystems will be prevented.

Under Component 2, a conflict transformation process, led by Island Conservation, that has been underway on Floreana Island for the last six years, will be brought to a conclusion. Additional rounds of consultation and feedback solicitation will help to deepen the community and partnership's understanding of the proposed actions and responsibilities, and to refine details of risk management plans. All plans will be included within an Environmental and Social Impact Assessment (ESIA), the development of which will include additional stakeholder engagement and considerations for gender mainstreaming.

Under Component 3, Española tortoises (*Chelonoidis hoodensis*), as the closest genetic relative and of the same saddleback morphology, will be used as ecological analogs for the extinct Santa Fe tortoise to re-initiate ecosystem processes on Santa Fe Island. Since 2015, a total of 396 Española tortoises have been released on Santa Fe. Additional efforts will be required in coming years to build capacity and restore the island with approximately 4,000 tortoises, the abundance predicted by habitat suitability models to have been present originally.

### *Issues and safeguards*

The Espanola Island population of *C. hoodensis* has been chosen as the target species for translocation to Santa Fe Island in order to reinstate the ecological services the original lineage of giant tortoises once provided as well as to help in fully restoring the island's plant communities and the wide variety of fauna that depend on it. The **rationale** for the choice of this taxon as the "ecological analog" species integrates phylogenetic, ecological and operational considerations.

Aside from a few informal and illegal short-term campsites used by fishermen, there are **no known physical cultural resources or sites** on Santa Fe Island.

Having never been occupied by humans for an extended period, Santa Fe Island **lacks any known cultural resources or sites**. It receives the highest level of protection within the DPNG park zonation system.

The project has been designed to comply with major elements of **national and international legislation, regulations and policies**, all of which are being taken into account in the design, implementation and monitoring of the project's translocation and captive rearing elements. These include: the Galapagos Islands Protected Areas Management Plan; National Park protocols for handling of giant tortoises (including repatriation and captive rearing), and IUCN Guidelines for reintroductions and other conservation translocations.

#### *Impacts, risks and mitigation mechanisms*

The **expected impact** of the tortoise reintroduction programme is the establishment of a self-sustaining breeding population of giant tortoises on Santa Fe Island, using individuals from the population of Española. The island tortoise population is expected to reach a level of about 12.5% of its original abundance *within the life of the project*, and 65% occupancy after 30 years. The following risks have been identified, together with corresponding mitigation measures:

- risks to source population
- vectoring plant seeds among islands
- disease risk
- invasion risk
- biological risk
- ecological engineering impacts
- Risk to other endemic species
- Financial risks

#### *Monitoring*

Each of the above identified risks will be carefully monitored, with clear responsibilities identified along with dissemination pathways. In biological terms, key populations subject to monitoring will include: tortoises, pallid iguanas, rice rats and cactus, along with broader changes in island plant communities.

## **2. Overview of the GEF project**

The objective of the project is to safeguard biodiversity in the Galapagos Islands by enhancing biosecurity and creating an enabling environment for the restoration of Galapagos Island ecosystems. The project includes three technical components, with four outcomes and multiple outputs. The three components have been carefully identified to cover the major pieces in a change process aimed at reversing a downward spiral of degradation and species loss associated with invasive species introductions.

Outcomes and outputs will be delivered through a combination of GEF support and cofinancing. The activities identified for GEF financial support have been selected based on:

- Priority needs to prevent and mitigate the impacts of invasive alien species on globally significant biodiversity in the Galapagos Islands;
- Their ability to prevent the extinction of IUCN Critically Endangered species and facilitate ecosystem recovery region wide;
- The likelihood that they can serve as catalysts for the next phase of work in the Galapagos, as well as similar initiatives in other island systems worldwide;
- The inability of other donor institutions and organizations to access sufficient resources (i.e. GEF funding is allowing incremental activities to occur); and
- National priorities for public finances and international non-reimbursable cooperation<sup>92,93</sup>.

The present Environmental Management Plan (EMP) is focused on Component 3 of the project, the context and contents of which are described in detail in sections 3 and 4 respectively.

### **3. Context for Component 3 activities**

#### *i. Physical context*

Santa Fe (0049'0"S, 9003'30"W) is a rectangular-shaped island 2,413 hectares in area located 16.6 km from the main island of Santa Cruz at the archipelago's center. Santa Fe terrestrial ecosystems present particularly favorable conditions for young tortoises to grow and survive upon release to the wild: highly abundant cactus of all stage classes, extended flat plains that support production of grasses in the wet season (an important tortoise forage), patches of woody vegetation, cliff areas and abundant land iguana burrows for tortoises to find refuge during hot, dry periods and at night, and a flooded area in the island's central zone with surface water that persists for many months of the year as an accessible source of drinking water for tortoises.

There is no infrastructure at present on the island to support human activity including field researchers, by intent. As an island designated for strictest protection by the DPNP, all researchers arrive and leave in self-supported expeditions according to a "leave-no-trace" approach. However, there is a significant monitoring infrastructure present, consisting of 20 experimental plots for measuring vegetation change (10 with fences to exclude tortoises and/or iguanas), a series of 25 permanently marked plots for measuring change in population structure, growth and survival of the cactus population along a gradient of tortoise density, a large cactus "macroplot" with almost 600 individuals permanently tagged and measured to enable monitoring cactus population dynamics, and an island-wide series of permanently marked transects (~60 km in length, total) and plots for measuring iguana and cactus populations.

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<sup>92</sup> DGNP 'Reducing vulnerability of endemic species by eradicating priority invasive species' project, approved by National Planning Authority (2012)

<sup>93</sup> ABG 'Consolidating the system of preventing, controlling and eradicating invasive species in the Galapagos Islands' approved by National Planning Authority (2013)

ii. *Biodiversity context*

Santa Fe Island has a low profile (< 260 meters above sea level throughout) and is formed by flat uplifted fault blocks of basaltic lavas, which generally are orientated east-west alternating with ridges and cliffs formed by conspicuous fault scarps. At 2.8-4.6 million years of age, Santa Fe is one of the oldest islands in the archipelago. Lacking significant elevation to precipitate moisture from passing air currents, Santa Fe's vegetation is of predominantly arid types (Wiggins and Porter, 1971) comparable to those found at low altitude elsewhere in the archipelago (Hamann 1981). The vegetation types that characterize Santa Fe Island range from open, desert-like scrub to denser dry season deciduous steppe forest (the most prevalent type) or forest (Hamann 1981). Some 95 plant taxa have been recorded from Santa Fe, of which 44 are endemic, 47 indigenous and not endemic and four introduced (Hamman 2004).

Among the flora are two prominent island endemics. The first is *Opuntia echios* var. *barringtonensis*, which is significant not only as an endemic but also due to its extraordinary abundance. An evaluation carried out by the GNPS in 2011 of the entire island estimated a cactus population of approximately 250,000 individuals, with a population structure dominated by adults. The second notable island endemic is *Scalesia helleri* ssp. *helleri*, still largely restricted to the coastal cliffs to which it was marginalized through decades of herbivory by invasive goats, but increasingly repopulating the island's interior since goat eradication. Other dominant and common species are *Bursera graveolens*, *Cordia lutea*, *Lantana peduncularis*, *Encelia hispida*, *Castela galapageia* and *Croton scouleri*, while such species as *Maytenus octogona*, *Prosopis juliflora*, *Scutia pauciflora* and *Alternanthera filifolia* are regular in occurrence and locally dominant. The characteristic and visually impressive Santa Fe landscape is not found elsewhere in the archipelago, with the conspicuous presence and dominance of *Opuntia* "forest" a highly distinct feature of the island (Hamman 2004).

Noteworthy endemic fauna include the Santa Fe land iguana (*Conolophus pallidus*), the Santa Fe rice rat (*Oryzomys bauri*), and the Santa Fe leaf-toed gecko (*Phyllodactylus barringtonensis*). The land iguanas are particularly important for the ecology of the island, because they are the only large herbivores currently present there in substantial numbers. A DPNG survey in 2011 estimated a population of 6,500 pallid iguanas, with a density of 2.7 individuals per hectare. They are solitary and territorial animals that occur over most of the island, but most abundantly in the many areas with loose, gravel-like soil where they can dig their burrows. Free-ranging land iguanas on Santa Fe mostly eat leaves of *Lantana* in the hot season and leaves of *Cordia* in the garua (cool) season due to the high digestibility and protein content of these shrubs' leaves. *Opuntia* pads are an additional focus for pallid iguana foraging given their high water and calcium content (Carpenter 1969, Christian et al. 1984).

The Santa Fe rice rat is at present a thriving species found throughout the island, with an estimated population of > 10,000 individuals and one of the most stable populations ever recorded for a rodent species (Clark 1980). The Santa Fe rice rat is also one of the few remaining native rat lineages in the archipelago, a once widespread group now mostly exterminated due to introductions of black and Norway rats and remaining only on Santa Fe Island, Fernandina Island, and at one site on Santiago Island.

No formal investigation of the Santa Fe leaf-toed gecko has ever been made, yet the species is considered secure (“Least Concern”) at present given that it faces no obvious threats (Márquez and Yáñez-Muñoz 2016).

Notably, Santa Fe Island apparently originally had its own lineage of giant tortoise. As happened throughout the archipelago, this population of giant tortoises was subject to overexploitation by pirates, whalers and colonists as a source of fresh meat (Van Denburgh, 1914; Townsend, 1925). According to Townsend (1925), 22 tortoises were removed from Santa Fe Island by the ship *George and Susana* in 1839 and one tortoise was removed by the *Henry Crapo* in 1853. According to Van Denburgh (1914), the expedition of the California Academy of Sciences (1905-1906) found compelling evidence that tortoises were once abundant on the island, with Rollo Beck collecting remains of 14 individuals as well as discovering the remains of eggs and very old feces. Van Denburgh (1914) also presented the testimonies of captains from local boats, who reported that they had captured several dozen tortoises on Santa Fe Island between 15 and 30 years before the visit of the California Academy of Sciences (i.e., around 1875 and 1890) and that during that earlier period there had been tortoises and tortoise feces throughout the island. A recent analysis of habitat suitability for tortoises throughout the archipelago—done with the help of a species distribution model that linked habitat conditions at 16,000 known points of occurrence of giant tortoises throughout the archipelago that had been recorded in the database of the DPNG—revealed that the entire island of Santa Fe represents suitable habitat for tortoises, especially those of the saddle carapace type (Gibbs et al., unpublished data).

Phylogenetics data also supports the contention that Santa Fe tortoise, though not yet formally described, constitutes a distinct lineage. A group of geneticists from Yale University, led by Gisella Caccone, has extracted DNA from sub-fossilized material from tortoises from Santa Fe, including four bone samples obtained from the collections of the California Academy of Sciences (CAS 8143, 8145, 8146, and 8148). Mitochondrial DNA from three samples was sequenced using the control region (CR) (715 bp), 16s rDNA (16S, 361bp) and cytochrome b (cyt b; 415bp). Analyses indicated that the Santa Fe tortoise is a monophyletic lineage, that is, genetically distinct from all the other species described in Galapagos (Poulakakis et al 2008) but not yet formally described taxonomically since it became extinct more than 150 years ago. The Yale group is currently working on a formal species description along with a formal taxonomic revision of the entire Galapagos giant tortoise species complex based on an integration of the corpus of phylogenetic and morphological data that has accumulated on these animals during the last decade.

Santa Fe’s terrestrial ecosystems are in a transitional state due to the loss of an important native herbivore and subsequent invasion by an exotic one. More specifically, the extermination of tortoises over a century ago roughly was soon followed by invasion by an introduced population of feral goats (Hamman, 1979). Specifically, goats on Santa Fe were first recorded in 1905 (although they were likely there well before that date) and removed 67 years later, in 1972. The eradication program removed some 3,008 goats (Carrion et al. 2011). The goats appear to have caused severe changes in the structure but not the composition of the island’s vegetation (Hamman, 1979, 2004). Hamman (2004) has summarized 30 years (1972-2003) of change on Santa Fe Island following goat eradication based in tracking vegetation on a series of permanent plots he established on the island. After the eradication of feral goats, the previously threatened small tree *Scalesia helleri* ssp. *helleri* recovered and some recruitment of the dominant trees *Opuntia echios* var. *barringtonensis* and *Bursera graveolens* took place. Recovery of the *Bursera* has been greatly aided by animal dispersal, in some combination of animal dispersal resulting from birds (likely mockingbirds), reptiles (land iguanas) and mammals (rice rats) (Clark and Clark 1979). The disproportionate recruit of *Bursera* beneath *Opuntia* suggests seed

dispersal by mockingbirds. The dominant shrub species *Cordia lutea*, *Encelia hispida* and *Lantana peduncularis* increased in number, whereby the shrub layer became denser and the structure of the predominant dry season deciduous steppe forest vegetation also became more dense. The strong impact of El Niño on the survival and recruitment of cactus indicates that recovery of cactus should be viewed on a time-scale of perhaps 150 years or more, in correspondence with the long life-expectancy of adult cacti. Recruitment and survival of cacti may be hindered if future El Niño events are to occur with increased strength. Recent research corroborates a spread of woody vegetation since tortoise extinction and goat appearance and eradication as indicated by shifts in characteristic forms of carbon isotopes of woody versus herbaceous plants in the upper, more recent soil strata (J. P. Gibbs, unpublished data). Moreover, this same soil isotope study suggest that Santa Fe Island had a more extensive presence of herbaceous plants (like grasses and annual dicots) 1,000 - 10,000 years before present, perhaps reflecting what was once a more heavily browsed system, with populations of both an endemic tortoise and iguana present.

### iii. *Previous tortoise captive breeding and rearing: experience and lessons*

The DPNG tortoise breeding centers have played a critical role in saving several species from extinction and augmenting the population restoration process for others. In 1965, the Charles Darwin Research Station (CDRS) established the Tortoise Rearing Center on Santa Cruz Island with the specific aim of preventing the extinction of the race of tortoises from Pinzón. Within a few years, the rearing program was expanded to include other threatened populations. Since the establishment of the Galapagos National Park Service (GNPS) in 1968, the program began to be managed jointly by the CDRS and the GNPS and is now managed solely by the GNPS.

The Tortoise Rearing Centers include corrals for adults, clinic corrals for adults, corrals for juveniles (hatchlings to 1.5 to 2 years old), adaptation corrals (1.5 to 2 year olds until repatriation), and incubator houses. The centers focus on an annual cycle of activities needed to sustain each captive population and the offspring produced: maintenance of nesting areas, inspection of nesting areas, inspection and collection of eggs and hatchlings, maintenance of juvenile corrals, maintenance of incubation temperatures and conditions, measuring and health inspection of adults and juveniles, and introduced animal control (mainly rat trapping/poisoning).

During the 1990s and into the new century, work at the Tortoise Center of Santa Cruz focused on four populations—*C. hoodensis*, *C. ephippium*, *C. porteri*, and *C. darwini*. A second Tortoise Rearing Center, established in 1990 at Puerto Villamil, Isabela, contains tortoises from southern Isabela Island (*C. vicina* and *C. guntheri*). Both centers focus on completing an annual cycle of maintaining breeding stock for highly endangered forms while head-starting their offspring as well as those from wild populations via eggs collected in the field.

An international workshop, *Giant Tortoise Recovery through Integrated Research and Management*, was convened by the Galapagos National Park Service (GNPS) in Puerto Ayora in July 2012 to review the status of Galapagos giant tortoises and develop priority research and management plans for the next 5-10 years. The workshop resulted in the launch of the Giant Tortoise Restoration Initiative (GTRI) in 2014, a collaborative effort led by Galapagos Conservancy and the Galapagos National Park Directorate (DPNG). The long-term goal of the GTRI is to restore tortoise populations to their historical distribution and numbers across Galapagos, including on islands where tortoises went extinct. This historic effort is composed of four main components: 1) Research and conservation on tortoises,

vegetation, etc., on targeted islands, 2) Breeding and rearing tortoises of threatened species, 3) Repopulation of islands where tortoises went extinct, and 4) Research and management of tortoise-human interactions and conflicts. All of these efforts are now well underway, with Galapagos-based staff and outside collaborators advancing tortoise restoration efforts across the islands. This ambitious initiative builds on a half century of tortoise research and conservation carried out by the Charles Darwin Research Station, the DPNG, and numerous visiting scientists and volunteers, with extensive support from the Galapagos Conservancy.

Among the workshop's many foci was the captive rearing programs for tortoises. The workshop concluded that the Galapagos National Park's highly successful tortoise breeding and rearing program, which had been running for over 45 years, had ensured that many tortoise populations had avoided extinction and that they have begun to increase in numbers. The program had expanded substantially in the past decade with, until recently, three tortoise centers (Santa Cruz, San Cristóbal and Isabela), as well as a corral of captive adult tortoises on Floreana.

Significant deficiencies were identified as well, the identification of which catalyzed the formation of an expert group that toured the rearing centers and discussed the current status of each center with emphasis on health, nutrition, reproduction and repatriation issues. The team of assessors included DPNG senior staff, Galapagos Conservancy-based tortoise experts, and an international veterinary expert. This external assessment was conducted under an existing Memorandum of Understanding between Galapagos Conservancy and DPNG to provide technical assistance as requested and also under a permit granted by the DPNG to the Galapagos Conservancy to operate to Galapagos Tortoise Restoration Initiative. As a result of the assessment, there was agreement that there were many improvements that needed to be made to tortoise center operations including genetic perspectives needing to be incorporated in decision-making regarding breeding pairs and groups, greater consistency in practices among the different tortoise centers, and improved supervision. In the context of captive-rearing to advance tortoise restoration, the workshop emphasized the clear need across all centers to:

- Compile all available tortoise reproduction and survival data from captive tortoise program as well as all available tortoise health status information
- Improve and expand the physical and infrastructure of the rearing centers

Importantly, on the first point -- compile all available tortoise reproduction, survival and health data -- this massive effort is now underway by Galapagos Conservancy, which has recovered and is assembling data archives and has scanned countless pages of paper records in anticipation of digitizing those data on a unified platform that will be compatible with DPNG data systems. This recovery, digitization and integration process is well underway, leaving improvement and expansion of the physical infrastructure of the rearing centers as the primary outstanding need.

#### *iv. Previous restoration work: experience and lessons learned*

The process that has unfolded with the restoration of the Espanola tortoise species on its home island of Espanola Island over the last 50 years is perhaps one of the most successful species recovery programs ever undertaken, while also one of the least heralded. The outcomes of the program provide a clear guide to what can be expected to happen on Santa Fe given the similarities of the islands' ecosystems



combined with the use of the very same core breeding group of tortoises and captive breeding and repatriation protocols and facilities.

About half of tortoises released on Espanola Island since 1975 were still alive in 2007 and reproducing *in situ* and considerably so. Population viability analyses built around vital estimates derived from 40 years of mark-recapture population monitoring indicate future extinction risk is low with or without continued repatriation. There was, however, some evidence for declining survival rates, growth rates, and body condition over the last decade, suggesting that resources for continued population growth are becoming limiting. This is likely due to the well-known paucity of cactus on Espanola Island (Marquez et al. 2003), the cause of which is not known but suspected to be due to a lack of tortoises that hindered cactus dispersal over the last 300 years, combined with a feral goat infestation during the last 100 years that caused extensive mortality of adult cacti. Monitoring of the impact of tortoises on the island's vegetation via measurement of vegetation in a set of 25, 6 m x 6 m plots of which 12 have tortoises excluded and 13 serving as controls suggests that tortoises do significantly reduce woody plant recruitment and expand herbaceous plant cover (Tapia and Gibbs, unpublished data).

It has also become clear that deterministic changes in woody plant communities in these arid zones is slow, despite strong inter-annual changes in herbaceous plant communities associated with the highly variable patterns of rainfall that characterize Galapagos. In other words, tortoise impacts will likely manifest slowly and will unfold fully over the course of several decades. In terms of impacts on cactus, the keystone resource for many vertebrate animals during the dry season, tortoises seem to remove virtually all fallen pads and fruits from below adult cacti, thereby eliminating any vegetation reproduction that might otherwise have occurred. But by dispersing seeds away from adult plants where seed predators (mainly cactus finches) focus their efforts and also by depositing scarified seeds in moist nursery packages (tortoise droppings) far from adult cactus, tortoises have been effecting a remarkable recovery of cactus in areas across the central zone of Espanola Island where they have been reintroduced. There are now two primary classes of cacti on the island – very old, “pre-goat” adults and a new cohort of small juveniles aged via growth rate calculations to coincide with the restoration of tortoises. Notably, there are very few subadults or young adults of intermediate age.

#### v. *Optimizing tortoise recovery on Floreana Island*

The recovery of Floreana Island tortoises (*C. niger*, previously referred as *C. elephantopus*) is a primary focus now for tortoise restoration in Galapagos, for the same reasons provided earlier regarding the restoration of tortoises to Santa Fe Island. However, the Floreana tortoise presents its own peculiarities as a globally unique (at this time) opportunity for species restoration, while also presenting its own significant challenges. The potential restoration of the Floreana tortoise lineage has been made possible by the recent discovery of inter-species hybrids between an extant and secure lineage and the extinct Floreana tortoise lineage. The latter, *C. niger*, went extinct during the 19<sup>th</sup> century with no records of animals alive beyond the 1840s. However, genetic data (Poulakakis et al., 2008) identified tortoises with genomic representation from this extinct species living on Wolf Volcano on northern Isabela island, where they co-occur with tortoises of the endemic species *C. becki*. This is likely the outcome of human-mediated translocation (many tortoises were recorded to have been moved around the archipelago by whalers). This discovery provides a novel opportunity for partially restoring *C. niger* species using inter-species hybrids. This is globally unique in that no species has yet been rescued from hybrids (although other opportunities may present themselves in the future).

In 2015, an expedition conducted in the region of Wolf Volcano, where admixed individuals occur, revealed that 127 of the 144 individuals sampled with saddle-backed morphology characteristic of *C.*

*niger* had some *C. niger* genetic ancestry (Miller et al 2017). Twenty-two of these tortoises were brought to the Galapagos National Park Directorate (DPNG) breeding center on Santa Cruz Island and integrated with four other individuals already in captivity with high genetic assignment to *C. niger* in order to initiate a breeding program. The program poses major challenges, some conventional—such as how best to maximize the amount of genetic diversity in the resulting offspring— and others unique, such as to maximize the retention of *C. niger* ancestry present in the founders. Moreover, these genetic-driven considerations need to be balanced against the need to introduce tortoises on Floreana island to help restore its terrestrial ecosystem, especially given the species' sluggish demography (age of first breeding of ~ 20 years; Marquez et al 1991) and limited resources available for captive-rearing of tortoises.

To these ends, two related evaluations have been made to generate science-based guidance on how to build the most effective captive breeding programs to recover the Floreana tortoise lineage. In the Quinzin et al evaluation (manuscript in review) that focused on genetic management issues in captivity, genetic estimates developed from screens of microsatellite loci derived from DNA extracted from blood samples of known, living hybrids were used together with a forward-in-time simulation-based framework to identify optimal groups of breeders. The Quinzin et al. study first focused on how to maximize genetic diversity of the offspring of the *C. niger* "hybrids" both in terms of the numbers of individuals in each group and the number of groups and mating strategies. With regard to group combinations, it was determined that the 22 breeders already in captivity would best be divided into 4 groups of 5 individuals, with an alternative option of 5 corrals with 7 breeders per corral. With regard to changing group compositions, doing so periodically would also increase the offspring genetic diversity. For the 50-year long-term scenarios, changing group composition improved genetic diversity, regardless of the combinations used. This improvement was higher when changing the groups every 5 years rather than once after 25 years. Frequently changing group composition may also have the added value of breaking up group hierarchies, which can lead to skewed reproductive success among breeders. Such reproductive skewedness has been shown to occur within the 35-year captive breeding program for *C. hoodensis* from Española Island. Skewed breeder contribution is known to reduce population persistence in the wild by reducing effective population sizes (Frankham et al 2002).

The major insight from the Quinzin et al. (in prep) evaluation was that the best strategy for genetic management of the founding population of *C. niger* in captivity is to augment the captive breeding population with unrelated individuals with high *C. niger* ancestry, many of which still occur on Wolf Volcano. Increasing number of breeders by adding a new corral and including more tortoises per corral would catalyze a significant increase in genetic diversity of the offspring and hence improve capture of the *C. niger* genome. Doing so is important to ensure that as many of the original *C. niger* alleles are present in the tortoises released to Floreana Island, which will facilitate the process of re-adaptation of the tortoise lineage to the Floreana ecosystem. If the remaining *C. niger* polymorphisms captured through this captive-rearing program are still adaptive in the current Floreana island conditions, then the genomic representation of *C. niger* will increase over time. In contrast, if these variants are no longer adaptive, new genetic combinations suited to local environmental conditions will likely emerge. To facilitate this process, Quinzin et al. recommended that because population growth is important for assuring population establishment, all offspring should be released on Floreana Island as soon as they reach an age that maximizes their survival chance, i.e. 4-7 years (Gibbs et al 2014).

As second evaluation of how to optimize tortoise recovery on Floreana Island was conducted by Hunter et al. (in review) who examined the complex trade-offs that exist among recovering the *C. niger* tortoise lineage and regenerating the ecosystem services it provided in a timely fashion under time and cost constraints. To do so, Hunter et al. (in prep) built an individual-based model that integrated giant

tortoise demography and the genetics data from the Quinzin et al. study to investigate the effects of management actions on four potentially conflicting program objectives for a wild tortoise population: 1) producing an ecologically relevant population size, 2) capturing the *C. niger* genome, 3) creating a genetically diverse population, all while 4) minimizing costs. Optimal solutions for each program objective differed with respect to most simulated management actions, including program duration, translocation age of juveniles, sex ratios of captive-bred juveniles, and direct translocation of adults with low *C. niger* genome representation to Floreana Island.

One important outcome was that manipulation of juvenile sex ratios (via temperatures at which eggs are incubated) to produce more females favored population growth but had a negative effect on overall genetic diversity ( $H_o$ ), producing a conflict. The advantage of highly biased sex ratios for the population growth objective is clear – with each male tortoise mating with multiple females, the number of females is expected to limit population growth. However, wild giant tortoise populations have approximately 1:1 sex ratios for both adults and hatchlings, suggesting that female-skewed populations may have disadvantages from an evolutionary perspective. Furthermore, it is unclear how female-skewed a population can be without negatively affecting breeding opportunities. Thus, a compromise 2:1 sex ratio is likely the best option; fortunately, the DPNG Tortoise Center has successfully used 2:1 female:male juvenile sex ratios in its captive breeding programs for decades. These results indicated that there may be genetic diversity consequences for biasing sex ratios towards females, so the benefit for population growth should be weighed against long-term population sustainability.

The Hunter et al. (in prep) evaluation corroborated the Quinzin et al. (in prep) assessment on a critical point: direct translocation of 20 adults with lower *C. niger* representation than the original breeders improved overall genetic diversity by infusing the population with new alleles albeit reducing, as expected, overall *C. niger* genome representation in the population. Outcomes of this option are largely dependent on which individuals can be found and recovered from the mixed ancestry population on Wolf Volcano, where individuals of both high (e.g., backcrosses to *C. niger*) and low levels of *C. niger* ancestry still occur. If more individuals with high levels of *C. niger* ancestry are recovered, adding them to the captive breeders would support all program objectives. If adults with lower *C. niger* genome representation than the breeders currently in captivity are recovered on Wolf Volcano, translocating them directly to Floreana Island would have minimally negative effects on the *C. niger* genome representation objective.

In summary, the evaluations of Quinzin et al. and Hunter et al. elucidate how best to move forward with capturing what remains of the Floreana tortoise lineage and genome via the recent discovery in the wild of individuals with mixed ancestry between an extant and extinct species of Galapagos giant tortoises. The primary outcomes of both of these evaluations provide clear guidance for proceeding with science-based captive rearing effort to resurrect the Floreana giant tortoise lineage:

- Change group compositions regularly;
- Release all offspring to the wild as soon as they reach 5 years;
- Generate offspring at a 2:1 female: male sex ratio via manipulation of incubation temperatures;
- Augment the captive breeding population with unrelated individuals with high *C. niger* ancestry, many of which still occur on Wolf Volcano

#### **4. Description of Component 3: Advancing the recovery of island ecosystems following invasive species eradication through the establishment of keystone species (i.e. giant tortoises)**

Although invasive rodents and feral cats have not yet been removed from Floreana Island, invasive vertebrates have been removed from Santa Fe (goats) and other Galapagos islands. These islands are

now candidates for the recovery of endangered species and associated ecological processes. Giant tortoises are a case in point because these icons of Galapagos act as “engineers” of Galapagos ecosystems, yet have been lost from several of the main islands of Galapagos. Although it is not feasible to resurrect extinct species, saddleback tortoise species characteristic of the arid zones that comprise most of Galapagos are similar enough in ecological role to enable the recovery of ecological processes through the translocation of closely related species—so-called ‘ecological replacements’. The DPNG’s Tortoise Breeding Centers have been conducting giant tortoise breeding, head-starting, and translocation activities as part of island-specific recovery efforts for over five decades, resulting in remarkable conservation success stories like the Española Island tortoise.

As part of the Giant Tortoise Restoration Initiative<sup>94</sup>, Española tortoises, as the closest genetic relative and of the same saddleback morphology, will be used as ecological analogs for the extinct Santa Fe tortoise to re-initiate ecosystem processes on Santa Fe Island. Since 2015, a total of 396 Española (*Chelonoidis hoodensis*) tortoises have been released on Santa Fe. Additional efforts will be required in coming years to build capacity and restore the island with approximately 4,000 tortoises, the abundance predicted by habitat suitability models to have been present originally<sup>95</sup>. Work will proceed in accordance with guidelines developed by IUCN to direct conservation-oriented translocations in an ecologically sound manner.<sup>96</sup>

**Outcome 3.1.: Ecosystem processes, particularly seed dispersal, re-initiated across Santa Fe island (2,413 ha) as the result of the translocation of giant tortoises.**

Outcome target 3.1: At least 506 giant tortoises of the species *Chelonoidis hoodensis* are dispersing seeds on approximately 50% (1,206 ha) of the area of Santa Fe Island

Output	Output targets
<b>3.1.1:</b> Giant tortoises ( <i>C. hoodensis</i> ) translocated to Santa Fe Island	<p><b>3.1.1.a.</b> On average, at least 40 juvenile giant tortoises (<i>C. hoodensis</i>) are translocated annually</p> <p><b>3.1.1.b.</b> At least 30 sub-adult giant tortoises (<i>C. hoodensis</i>) are translocated</p>
<b>3.1.2:</b> Monitoring and evaluation protocols for assessing the role of giant tortoises as ecosystem engineers, including seed dispersal, are tested and optimized	<b>3.1.2.</b> One monitoring and evaluation protocol

As of December 2017, those surviving among the 396 giant tortoises of the species *C. hoodensis* released were dispersing seeds near their release site in the central part of Santa Fe Island, on approximately

<sup>94</sup> A collaborative 15-year project (2014-2028) implemented by the DPNG and Galapagos Conservancy, with support from visiting scientists from around the world. <https://www.galapagos.org/conservation/our-work/tortoise-restoration/>

<sup>95</sup> Tapia et al. 2015. Plan para la Reintroducción de las Tortugas Gigantes a la isla Santa Fe como Estrategia para su Restauración Ecológica.

<sup>96</sup> <http://www.iucn-whsg.org/node/1471>

10% of the island's area, or 240 ha. Following translocation activities, these figures will be increased as per the above target.

Output 3.1.1.: Giant tortoises (*Chelonoidis hoodensis*) translocated to Santa Fe Island

**Output target a. On average, at least 40 juvenile giant tortoises (*C. hoodensis*) are translocated annually**

**Output target b. At least 30 sub-adult giant tortoises (*C. hoodensis*) are translocated**

This output seeks to enhance the process of populating Santa Fe Island with Española tortoises (*C. hoodensis*) by:

- translocating juvenile tortoises from the Santa Cruz breeding center to Santa Fe (target 3.1.1.a), and
- translocating sub-adult tortoises from Española to Santa Fe (3.1.1.b).

In order to achieve Target 3.1.1.a., juvenile giant tortoises, approximately five years in age, will be translocated from the Santa Cruz Island tortoise breeding center, where they were hatched and raised, to Santa Fe Island. Prior to being translocated, they will be subject to a quarantine process and equipped with subdermal microchips (transponders) to enable individual identification where re-encountered. These tortoises will be transported via the DPNG 'Sierra Negra' research vessel and will be carried by DPNG rangers from the ship to selected sites on Santa Fe Island for release. At least 40 juvenile giant tortoises will be translocated annually during the course of the project, i.e. at least 80 juvenile giant tortoises in total.

To achieve Target 3.1.1.b., the project will bring older, sub-adult giant tortoises, which will soon begin breeding (at 18 – 20 years of age), from Española Island to Santa Fe Island to accelerate the natural breeding process, an intervention demonstrated via population viability modeling to not affect likelihood of population persistence. The sub-adult tortoises targeted for translocation from Española were originally incubated in the breeding center on Santa Cruz Island and then released on Española at around age five. Over the years, as they were maturing, Santa Fe Island has been with "goat-free"; as a result, the island is now a suitable destination for these sub-adults, which will likely commence breeding shortly after being translocated. The advantage of bringing sub-adult tortoises to Santa Fe—as opposed to only bringing juveniles—is jumpstart the population restoration process by some 15 years (as compared with waiting until the 5-year old juveniles turn 20 and are able to reproduce).

The translocation process will begin with a trip by scientists and park rangers to Española Island to locate sub-adult tortoises suitable for translocation. Before traveling to Española Island, people, equipment and provisions will undergo a thorough quarantine process, as per protocols being developed in component 1. Search groups will be divided into 10 camps throughout Española Island. Once the search groups locate suitable sub-adult Española tortoises, they will be marked with telemetry equipment until they are ready to be airlifted. At that point, helicopters will transfer the tortoises from remote locations on Española Island to the Sierra Negra vessel<sup>97</sup>, which will bring them to the breeding center on Santa Cruz Island for at least a three month quarantine. Following the quarantine process, the tortoises will be airlifted back to the Sierra Negra ship, which will move with the tortoises to Santa Fe Island, where they will be transported via helicopter to carefully

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<sup>97</sup> Without a helicopter, it may require up to two to three days to transport these very heavy animals overland over very difficult terrain, with associated risks for both tortoises and people.

selected locations throughout the island. A portion of the costs of the expedition will be covered by GEF and the remainder through co-financing from GC and DPNG.

**Output 3.1.2.:** Monitoring and evaluation protocols for assessing the role of giant tortoises as ecosystem engineers, including seed dispersal, are tested and optimized

**Output target: One monitoring and evaluation protocol**

Tortoises released under Output 3.1.1 will be equipped with microchips (subdermal transponders) to aid monitoring. A standard protocol will be developed and tested in the field to evaluate the health and status of individual tortoises repatriated, tortoise population growth and dispersal, and interactions of tortoises with other species, particular the plant community. The protocol will be updated as additional knowledge is generated. This is among the first experiences in the world of repopulating an island with “ecological analog” giant tortoises, thus the importance of carefully developing a protocol based on ongoing experience gained and lessons learned. The protocol will be made available for use by, *inter alia*, the DPNG and its partners to start and manage the repopulation of adult tortoises on other islands, such as Floreana.

Monitoring will be undertaken in accordance with the above protocol. In biannual monitoring, survival rates, body condition, growth rates, habitat use and dispersal will be measured through mark-recapture methods. Interactions with other species, including seed dispersal and habitat change attributable to tortoises, will be measured via studies of diet (inferred from fecal samples) and foraging ecology of tortoises (observational studies) as well as vegetation response and habitat use by other animals inside and outside of areas from which tortoises are excluded. *Opuntia* cactus represents a keystone species for the entire vertebrate community on Santa Fe Island, and a major focus of both tortoise and terrestrial iguana foraging: demographic studies of *Opuntia* across a gradient of tortoise density will enable tracking *Opuntia* response to tortoise re-establishment.

Outcome 3.2.: Production in captivity of giant tortoises for future translocation throughout the archipelago is significantly increased along with associated capacities.

Outcome target 3.2: In the breeding centers, an enhanced and expanded breeding stock and associated husbandry capacities contribute to the following numbers of giant tortoises reaching the age of one year:

In the Santa Cruz Island breeding center in Puerto Ayora, at least 180 tortoises annually from the populations of Española, Santiago, Floreana, Pinzón and Eastern Santa Cruz;

In Isabela Island breeding center in Puerto Villamil, an average of 140 tortoises annually from the populations of the Sierra Negra and Cerro Azul volcanoes.

Output	Output targets
<b>3.2.1:</b> Giant tortoise breeding centers on Santa Cruz and Isabela Islands are modernized and expanded	<b>3.2.1.</b> Two centers modernized and expanded
<b>3.2.2:</b> Giant tortoise breeding stock with partial ancestry of <i>C. niger</i> are selected, located and transferred to the Santa Cruz breeding center	<b>3.2.2.:</b> At least 5 breeders with partial ancestry of Floreana ( <i>C. niger</i> ) selected, located and

**3.2.3** Scientific and technical findings reported in the professional and popular literature.

transferred to the breeding centers.

**3.2.3:** 1 peer reviewed article and 2 popular articles produced

Taking full advantage of the ongoing expansion of suitable habitat for giant tortoise reintroduction— itself a function of previously planned and carefully executed invasive species eradications—will require a significant increase in the capacity of giant tortoise breeding facilities from baseline levels. Increases in the number of tortoises reaching one year of age at the captive breeding centers of Santa Cruz and Isabela will be the indicator used to measure this outcome, which will be enabled by expansion of breeding centers (Output 3.2.1). In addition, the genetic quality of the juvenile population will be improved through the acquisition of enhanced breeding stock with partial ancestry of *C. niger* for the repopulation of Floreana Island (Output 3.2.2). Finally, the findings will be shared with both scientific and popular audiences (Output 3.2.3)

**Output 3.2.1.:** Giant tortoise breeding centers on Santa Cruz and Isabela Islands are modified and expanded

**Output target: 3.2.1. Two centers modified and expanded**

201. The process of producing 320 tortoises from the Española, Santiago, Floreana, Pinzon, Eastern Santa Cruz, Sierra Negra and Cerro Azul lineages begins with collection of eggs. For some species, breeders are kept in captivity at the breeding center and their eggs harvest from nesting areas at the Breeding Center. For other species, eggs are collected in the wild. In both cases, eggs are incubated in the Breeding Center under controlled conditions to improve the hatching percentage. Young tortoises are kept in the Centers until they reach five years of age, which generates a huge increase in survival rates (typically 90% of eggs reach juvenile stage) versus in the wild (estimated at just 5%), with major ramifications for tortoise population growth rates.

To strengthen the role of captive breeding in restoration of wild populations, GEF funding will be used to renovate and expand the giant tortoise breeding centers on Santa Cruz and Isabela Islands. Improvements will include construction<sup>98</sup> of at least two new breeding pens, a quarantine pen, a pre-adaptation pen, and ten pens for hatchling tortoises.<sup>99</sup> These augment the recent installation of 8 state-of-the-art tortoise egg incubators. A competitive bidding process will be used to select and hire a general contractor for construction of the pens.

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<sup>98</sup> Tortoise pens are open air enclosures of natural terrain, delineated by rock walls. They are not buildings. The current footprint of these facilities is 3.6 ha, a figure which will increase to approximately 5 ha due to the project activities. Most construction by volume will be of lava block for corral walls sourced adjacent to the corrals – lava block is very abundant locally and corral construction will in no measureable manner reduce local supply. Remaining construction will be cement block based from cement imported from the mainland and brought in via freighter system with quarantine stage such that impacts on local environment are minimal. The footprint of the rearing center both currently and when expanded will be just 0.01% of the island.

<sup>99</sup> These will augment the current facilities which consist of 8 breeding pens, 1 quarantine pen, 4 pre-adaptation pens and 20 hatching pens

Within the improved breeding centers, breeders will be kept in captivity and eggs will be incubated<sup>100</sup>. Newly hatched tortoises will be cared for in secure, covered pens until they are a year old, including daily feeding and provisioning of water, ensuring adequate barriers to prevent predation by rats, and health monitoring. Beyond the life of this project, the tortoises will be transferred to pre-adaptation pens where they will remain until they are five years old. Here, they will adapt to the terrain and temperature extremes that they will face in the wild. Finally, the tortoises will be subject to a quarantine period, which aims to ensure that they are healthy and also have been purged of seeds in their digestive tracts, before being released in the wild in their respective species' ranges<sup>101</sup>.

**Output 3.2.2:** Giant tortoise breeding stock with partial ancestry of *C. niger* are selected, located and transferred to the Santa Cruz breeding center to enable eventual repopulation of Floreana Island

**Output target: At least five giant tortoises located and transferred (20% increase in captive population of Floreana breeders)**

Beginning in the late 1990s and continuing through 2014, a series of systematic scientific expeditions took place to Wolf Volcano, located at the northern end of Isabela Island, to inventory the tortoise population there. In 2008, scientists tagged and collected blood samples from some 1,600 tortoises, 89 of which turned out to be partly related to the extinct Floreana Giant Tortoise (*C. niger*). Another 17 were found to be related to Pinta Island tortoises. Their presence on Wolf, as much as 100 miles from their place of origin, was explained by the fact that, over a century ago, sailors left many saddlebacked tortoises, initially collected from other islands in the Galapagos, at neighboring Banks Bay (a major stopping over place for whalers and other sailors to repair their ships). Some of these tortoises interbred with the local domed tortoises (*C. becki*), enabling the *C. niger* genome to persist in the resulting hybrid offspring. To date, over 200 tortoises have been identified as having partial Floreana ancestry. In November 2015, an expedition to Wolf Volcano selected 17 individuals from this group, which were transported to the Santa Cruz Breeding Center to begin the current *C. niger* breeding program. As elaborated in Section 3v above, it was concluded that the Floreana repopulation program would be significantly enhanced by expanding the pool of breeders with additional, carefully selected giant tortoises with Floreana ancestry from Wolf Volcano. The project will therefore support a ten-day expedition to Wolf Volcano to search for and remove at least five tortoises and no more than 20 tortoises with partial *C. niger* ancestry—from a population of 5,000 – 6,000 individuals—which will be added to the breeders' stock. Doing so will provide a critically needed increase in genetic diversity and Floreana tortoise genome capture, with the added benefit of removing them from the endemic *C. becki*, thus improving that species' genetic status.

Before the field trip, a laboratory analysis of the genetic identity of previously identified collected blood samples will be performed, using molecular techniques to identify the set priority individuals<sup>102</sup> to be re-located on Wolf Volcano. All previously sampled tortoises with Floreana tortoise-like morphology whose blood will be analyzed had subdermal transponders (PIT tags) added, enable us to identify them with very high confidence when re-encountered on Wolf Volcano. To find the selected

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<sup>100</sup> In the wild, 10% of the eggs hatch and make it to 5 years of age. In breeding centers, >90% of eggs hatch and reach 5 years of age.

<sup>101</sup> This captive breeding program uses the data and learning that DPNG and its partners have learned in the last 50 years, each time improving the hatching and survival rates.

<sup>102</sup> Priority individuals for selection will be those with the highest % of *C. niger* genes, greatest heterozygosity and most "outbred" relative to the current breeders.



tortoises, ten groups of four people each will be deployed across the very rugged terrain in Wolf Volcano. A helicopter will provide logistical support—including ferrying water and food—to the teams and remove the priority tortoises once they have been located. The DPNG's Sierra Negra vessel will remain on the coast at Banks Bay as a base of operations for the helicopter and the search groups. Importantly, the helicopter is critical to move by cargo net priority tortoises re-located in the field back to the ship (tortoises are generally too heavy to be moved by people over long distances and rough terrain). Veterinarians will be on board to receive the tortoises and to take samples to ensure the health of selected individuals. The GEF funding will support helicopter time, genetic analysis to support identification of the best individuals, field equipment (tents, sleeping bags, GPS, etc.) and protection (clothing, boots, helmets, etc.) for park rangers and scientists, as well as planning of the field work. The selected tortoises will be brought by the Sierra Negra vessel to the breeding facility at Santa Cruz Island. These tortoises will be integrated into the existing breeding stock and provide expanded genetic variation to the program and greater capture of the Floreana tortoise genome, thereby improving the fitness of the offspring and helping to ensure the future success of the tortoise population restoration on Floreana Island. The addition of these five breeders represents a 20% increase in the size of what is at present a small core breeding population to restore tortoises to Floreana Island. Given that lifetime female production of offspring reaching breeding age is likely 2-3 in the wild over the ca. 100-year life span of a female giant tortoise, captive rearing intervention can increase her production to some 250-300 offspring reaching breeding age (a factor of 100x). Therefore, the gains of adding this seemingly modest number of 5 individuals to the core breeding stock plus head-starting in the long-term represents a substantial contribution to population recovery on Floreana Island. Keeping the number of additional breeders to this modest level also recognizes the very significant financial burden that hosting these additional new breeders for the rest of their lifespan (many decades) in captivity plus the costs rearing all their offspring and releasing them to the wild.

**Output 3.2.3:** Scientific and technical findings reported in the professional and popular literature

**Output target:** 1 peer reviewed article and 2 popular articles produced.

This output seeks to share the project's scientific findings regarding tortoise relocation and habitat restoration with global audiences and especially with the population of Galapagos. First, a scientific article will be produced which will be submitted for publication to a respected, peer-reviewed science periodical.<sup>103</sup>

Second, at the local level, it is also important to share knowledge with decision makers and the general public. A popular diffusion article will be produced and submitted for publication in the Galapagos Report, a report published every year with articles about key policies, conservation programmes and summaries of key science reports. This annual publication aims to provide decision makers with key information in terms of key development in conservation and social policy. It is also a very useful resource for students and investigators, by compiling in one place this kind of information. Printed copies are distributed to key decision makers, while PDF copies can be downloaded for free.

The third product will be a poster to be presented at the Galapagos National Park Symposium, which is organized every year and is open to the public. Attendance at the Symposium includes other investigators (both visiting and resident scientists), guides, students and members of the general public.

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<sup>103</sup> Depending on the editorial process of the different journals to which it will be submitted, the article might not be published by the time of project closing.

## 5. Issues and safeguards

### *i. Rationale for selection of species being translocated*

The Espanola Island population of *C. hoodensis* has been chosen as the target species for translocation to Santa Fe Island in order to reinstate the ecological services the original lineage of giant tortoises once provided as well as to help in fully restoring the island's plant communities and the wide variety of fauna that depend on it. The rationale for the choice of this taxon as the "ecological analog" species integrates phylogenetic, ecological and operational considerations.

In phylogenetic terms, the Santa Fe Island tortoise forms part of a larger Pinta-Española-San Cristóbal-Cerro Fatal genetic complex, since it is closely related to *C. chatamensis*, *C. hoodensis*, *C. abingdoni* and the newly described species of Cerro Fatal / Santa Cruz (Poulakakis et al., 2008). Therefore, all members of this complex could be considered as potential "ecological analog" species for restoring tortoises on Santa Fe Island, with the exception of the Pinta Island form that is now extinct as far as is known.

Ecological niche is an important factor in choosing a species for translocation because species occupying similar niches on different islands are pre-adapted to occupying one another's habitats. The habitat suitability analysis discussed above (Gibbs et al., unpublished data) revealed that the islands of Santa Fe, Española and the northeast section of San Cristóbal (where that island's endemic tortoises persist today) share very similar ecological and habitat conditions. In the case of the closely affiliated (genetically) Cerro Fatal tortoise, the ecosystems occupied are quite different, as it migrates between arid and moist ecosystems that do not occur on Santa Fe. Therefore, Cerro Fatal is not a good option for a pre-adapted analog occupying a similar niche. Moreover, the Cerro Fatal population is very small (reduced by overhunting) and therefore not currently suitable for supplying individuals for translocation. The habitats currently occupied by tortoises on Española and the northeast of San Cristóbal are the most similar ecologically (all arid ecosystem types as occur throughout Santa Fe); therefore, these tortoises are likely the best preadapted forms to the ecological conditions currently found on Santa Fe Island.

Operational and logistical factors are further important considerations in selecting an analog species. While analysis of phylogenetic and pre-adaptation aspects have led to the identification of two extant species as suitable candidates (Española and San Cristóbal), in operational and cost terms for the DPNG, the existing breeding program in captivity for Española tortoises provides a more readily accessible and cost effective source of ecologically and genetically appropriate tortoises for translocation to Santa Fe Island. Moreover, the repatriation program for the Española Island population itself has been successful. Starting from just 15 remaining founder individuals (14 recovered from the island and one from a zoo), there are now some 1,000 surviving repatriates on Espanola Island, the product of a ~50% post-release survival rate among the > 2,000 repatriated individuals, all of which were offspring of the 15 surviving founders. Currently, there is a growing tortoise population on Espanola Island with reproduction in the wild and recruitment of juveniles produced by repatriates on the island.

Population viability analyses indicate that population management interventions that include continuing repatriations, terminating repatriations, or extracting 50 subadults while terminating repatriations would not negatively impact the population trajectory or probability of extinction. The only predicted difference is that terminating repatriations or removing 50 subadults and terminating repatriations delays full recovery marginally (Gibbs et al., 2014). In contrast, *C. chatamensis* on San Cristóbal Island has recently (2016) been systematically inventoried and revealed to support a large and rapidly growing tortoise population (Tapia et al. unpublished data) and likely could easily support translocation of some individuals to Santa Fe Island. However, there is no captive rearing program now

in operation to generate repatriates, nor any easy means to secure juveniles from northern San Cristobal to repatriate to Santa Fe Island. For this reason, the Espanola Island giant tortoise is the clear choice from an operations / management perspective.

Based on this integration of genetic, ecological, demographic and logistical considerations, the project design team has concluded that the most suitable species for use as an “ecological analog” to restore tortoises to Santa Fe Island is *C. hoodensis* from Espanola Island. Moreover, there is further value in using Espanola tortoises for Santa Fe insofar as Espanola tortoises can serve as an insurance population for the IUCN-designated “critically endangered” original Espanola tortoise population on Espanola Island itself. In contrast, there is less value in having an insurance population for the IUCN-designated “endangered” form from San Cristobal.

*ii. Description of existing physical cultural resources or sites (if any)*

Aside from a few informal and illegal short-term campsites used by fishermen, there are no known physical cultural resources or sites on Santa Fe Island. The island has likely never been the site of any prolonged human occupation, due to difficulty of access and lack of any reliable and drinkable freshwater supply.

*iii. Description of relevant socio-economic/cultural (including gender), institutional, historical, legal and political context of project area*

Having never been occupied by humans for an extended period, Santa Fe Island lacks any known cultural resources or sites. It receives the highest level of protection within the DPNG park zonation system.

*iv. Compliance with national and international legislation, regulations and policies on protected area/habitat restoration, release/translocation of tortoises and animal welfare/handling*

The following are the major elements of national and international legislation, regulations and policies that are being taken into account in the design, implementation and monitoring of the project’s translocation and captive rearing elements (i.e. Component 3):

(a). Galapagos Islands Protected Areas Management Plan

Release of “ecological analog” tortoises to Santa Fe Island is underpinned by “The Management Plan for Protected Areas of Galapagos for Good Living” which guides decision-making for biodiversity conservation in the Galapagos Islands. The ecological restoration of Santa Fe Island represents a key action for implementation of the Management Plan.

The plan embraces restoration of “ecosystem engineers” and keystone species, including giant tortoises in the case of Santa Fe Island, noting that:

...the conservation of functional biodiversity creates a buffer against anomalous disturbances and a natural insurance for the long-term maintenance of the services that ecosystems supply to human systems, and based on this concept not all species of an ecosystem play the same role in determining its functioning but there are ecologically essential species that take center stage in biodiversity conservation programs. (DPNG, 2014)

The plan also states that "any restoration project, before being carried out, must comply in a sequential and hierarchical manner with the following requirements: (a) scientific feasibility, (b) territorial viability, (c) technical viability, (d) economic feasibility, (e) legal feasibility, (f) social viability, and (g) political feasibility" within the Province of Galapagos (DPNG, 2014). Additionally, the plan establishes that the entire Conservation and Restoration of Ecosystems and its Biodiversity Program is considered an experiment to learn from and build upon (DPNG, 2014). Project activities have been designed in full compliance with all requirements of the Management Plan.

Careful monitoring of the project's ecological impacts will support adaptive management of the process and learning for applying lessons learned to new restoration efforts using ecological analogs in Galapagos and elsewhere.

(b). National park protocols for handling of giant tortoises (repatriation and captive rearing)

In all phases, the care in captivity, transfer, release and monitoring of the tortoises will be carried out according to protocols established by the Directorate of the Galapagos National Park for the transfer of live vertebrates, and more specifically for the repatriation of giant tortoises (DPNG, 2008a, DPNG, 2008b). All activities associated with rearing giant tortoises in captivity will align with the DPNG protocols as outlined in: "*The Captive Rearing of Galapagos Tortoises: An Operative Manual.*" The manual provides guidance in the following areas: (i) *Routine activities* (periodic activities, seasonal activities, measuring and marking), (ii) *Thermal and habitat requirements* (adult corrals, juvenile corrals, hatchling corrals, adaptation corrals), (iii) *Feeding* (type, amount, sourcing and precautions), (iv) *reproduction* (reproductive behavior, nesting areas, inspection of females, inspection and opening of nests), (v) *incubation* (incubation methodologies, inspection of incubators), (vi) *Hatching* (hatching problems, hatchling development, care of newly hatched tortoises, hatchlings or eggs brought from the wild), (vii) *Diseases, treatments, and necropsies, problems with introduced animals* (rats, ants), (viii) *Materials needed at the Rearing Center*, and (ix) *Data collection forms and methods*.

(c) IUCN Guidelines for reintroductions and other conservation translocations

The project will abide by Guidelines outlined by the IUCN for conservation translocations with an emphasis is guidance that pertains to conservation translocations. In this case the focus is on ecological replacements, i.e., intentional movement and release of an organism outside its indigenous range to perform a specific ecological function. Given that project is being augmented and expanded but already implemented. More germane will be a focus on guidelines pertaining to Risk assessment, Monitoring and continuing Management, Dissemination of information.

## **6. Impacts, risks and mitigation**

*i. Additional details regarding the process and expected impacts / benefits*

The reintroduction of Espanola giant tortoises to Santa Fe Island, like any ecological restoration action, is a long-term process. Its purpose is to achieve the establishment of a population of tortoises large enough for tortoises to fulfill their role as ecosystem engineers and thus actively contribute to the restoration of the ecological integrity of the island. Reintroduction of tortoise populations is increasingly proposed as a tool for ecosystem restoration. Giant tortoises, once widespread on all continents except Antarctica, are ecosystem engineers that manipulate the distribution and abundance of other organisms through direct effects of herbivory, disturbance and seed dispersal on plant communities and

subsequent indirect impacts on animal communities. The effects of giant tortoises on terrestrial ecosystems of oceanic islands (to which giant tortoises are currently restricted) are potentially on par with those of continental mega-herbivores as drivers of savanna structure and function.

The overall reintroduction / restoration process, which began in 2015, is broken down into two main phases:

**First phase:** *Introduction in July 2015 of a first group of 205 juvenile tortoises, a second introduction in June 2016 of 191 juveniles, and subsequent annual introductions of between 70 and 100 juvenile tortoises from 2018 to 2026 release site conditions permitting.*<sup>104</sup>

The first component of this phase, consisting of the introduction of juvenile tortoises of the species *C. hoodensis*, was executed in 2015 using a group of juvenile tortoises (n = 205) from the Fausto Llerena Breeding Center on Santa Cruz Island. A second release of 191 juveniles was implemented in 2016. Further releases were contemplated for 2018; however, severe drought curtailed any releases and tortoises remain in quarantine. Juveniles reared in captivity to 4-5 years have been chosen, and will be used, because they have much higher rates of survival upon release to the wild than do younger “head-started” tortoises but comparable rates to older head-started tortoises (Gibbs et al. PLoS); therefore, 4-5 years represents a cost-effective compromise for the investment in head-starting to increase survival in the wild but terminating the process when further gains become marginal.

The reintroduction process takes place as follows. On the day of the release, tortoises are placed in wooden boxes and moved by ship with enough capacity to transport all the tortoises at the same time as well as the personnel required to release them all at once. Tortoises are then moved from the ship to a protected embayment of Santa Fe Island by boat and then transferred to land. Once there, groups of 8 to 10 tortoises are placed in backpacks and carried by park rangers to the release sites (these have been mainly in the central area of the island to date).

For the first week after their release, daily monitoring of the release zone is carried out to monitor the adaptation process. This release process is being iterated annually, environmental conditions permitting (no tortoises will be released unless there is sufficient recent rainfall to generate a supply of herbaceous vegetation and grasses at the release site sufficient to sustain released tortoises for at least 2 months). The number of juvenile tortoises released annually is provided as a range because it cannot be a fixed quota as the number available for release is determined by offspring production “pipeline” in captivity, itself a function of number of females ovipositing, hatching success, and juvenile growth and survival rates in the years preceding release which in turn is affected by vagaries of climate, food supply and husbandry practices. This said, the captive-rearing process does afford a highly predictable *range* of cohort sizes available for release each year.

**Second phase:** *Introduction of a group of 50-100 subadult tortoises collected on Española Island in 2019.*

For the second phase of the project, 50 subadult tortoises between 15 and 20 years old (at the point of sexual maturity) will be located on Espanola Island for eventual translocation to Santa Fe Island. Locating suitable individuals for translocation requires extensive fieldwork by multiple park ranger teams searching through the difficult terrain of Espanola Island over the course of 10 days. Communication and coordination is accomplished through radio. Once suitable tortoises have been identified, a helicopter

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<sup>104</sup> No ESIA or EMP was done for this, although the report submitted by GC to the Park proposing the action was very similar in scope.

will be used to transfer tortoises from capture site to the DPNG ship *Sierra Negra* which will then transfer the selected tortoises from Española Island to the Fausto Llerena Breeding Center on Santa Cruz Island. At the breeding center, tortoises will be subjected to health status evaluation and a strict quarantine process for at least two months, during which they will remain isolated and receive food without seeds (to prevent them from vectoring seeds among islands). After this quarantine period, tortoises will be transferred again via helicopter first from the Centro de Crianza to the DPNG ship *Sierra Negra*, transported by the DPNG ship to a protected embayment on Santa Fe Island, and then moved again by helicopter to release sites around the island where the tortoises will be received by waiting park guards. Following the tortoises' release on Santa Fe Island, a field crew will remain for a week monitoring their activities and movements. Each tortoise will also be outfitted with a satellite tracker to monitor movements, survival and settlement behavior over the next year.

The **expected impact** of these two project phases are reintroduction and establishment of a self-sustaining breeding population of giant tortoises on Santa Fe Island, using individuals from the population of Española. More specifically, a similar outcome is expected to unfold on Santa Fe as has been demonstrated on Espanola, with the exception being that the tortoise population, along with the ecological impacts, will likely increase considerably more quickly on Santa Fe because cactus – a critical resource for tortoises – is far more limited on Espanola Island (an estimated 1,000 adult cacti remained after goat depredations) than on Santa Fe Island (where an estimated 200,000 adult cacti remain). Indeed, survival of the tortoises initially translocated to Santa Fe is already much higher than what has been observed on Espanola.

Based on the estimates of the survival and reproduction of the tortoises repatriated to Española (Gibbs et al., 2014) and the parameters mentioned above (for each of the two project phases) applied to the Santa Fe introduction scenario, a "Lefkovitch" population projection matrix was used to predict 30 years into the future the population of tortoises in Santa Fe based on the two phases of the project. We generated predictions for population growth assuming a relatively low survival of juveniles (= 0.90 per year or 9 of 10 juveniles that survive each year). The model estimated that, within 30 years, there will be about 300 adult tortoises and 1,000 juvenile tortoises distributed throughout Santa Fe, for a total population of some 1,300 individuals. To date, we have estimated 99% survival among tortoises released so far; therefore, these estimates are conservative. Given an approximate historical population of Santa Fe of 2,000 adults (estimated at 1 adult tortoise/hectare of suitable habitat, which is typical for robust populations of giant tortoises in Galapagos) this activity is predicted to repopulate the island tortoise population to a level of about 12.5% the original abundance *within the life of the project*, eventually leading to 65% occupancy after 30 years, enabling *in situ* reproduction and subsequent recruitment to lead to full population recovery and reinstatement of ecosystem services.

## *ii. Risks and mitigation*

Santa Fe Island has never supported a human population; therefore, project impacts, threats and risks are primarily biological as well as operational / financial. These risks, and related mitigation measures, are described below and summarized in **Table 1**.

In terms of biological impacts, **risks to source population** are, in theory, a concern given that individuals of the tortoise species to be deployed on Santa Fe Island will be derived from both captive and wild stocks elsewhere (Espanola tortoises at Santa Cruz breeding center and on Espanola Island). However, a detailed analysis of this issue by Gibbs et al. (Gibbs et. al 2014) revealed that continued repatriation of tortoises from the Santa Cruz breeding center to Espanola Island for 25 more years, termination of repatriation, and termination of repatriation coupled with one-time removal of 50 adults (for translocation to Santa Fe) all yielded nearly equal and, importantly, negligible extinction risk estimates over a 100-year time frame (likely about 5 tortoise generations). Therefore, the approach proposed here—termination of repatriation during the life of the project coupled with one-time removal of 50 adults—is predicted to pose no risk to the source population. Importantly, ongoing monitoring of the Espanola population as part of the Giant Tortoise Restoration Initiative, following completion of the GEF project, will reveal patterns of tortoise population growth on that island during the coming decade.

**Vectoring plant seeds among islands** in the digestive tracts of translocated tortoises is a genuine risk. A nearly completed thesis on this topic by Jennifer Vasconez (unpubl. data) measured the seed retention rates of tortoises captured on Volcan Wolf and relocated to the Breeding Center in Santa Cruz. Tortoises were confined to a study pen, placed on a diet consisting of only plant leaves, and their droppings collected for a year and seeds extracted from those droppings. Results indicate that two months of quarantine are needed to fully purge accumulated plant seeds from tortoise digestive tracts. Large plant seeds are passed quickly but small seeds more slowly. Therefore, quarantine period for translocated tortoises (both headstarts from the Breeding Center and subadults moved from Espanola) will be extended beyond two months to reduce this risk to near zero. As headstarts are reared on a diet of only leaves of three species, risks are near zero to begin with. However, for subadult translocates from Espanola the risk is considerable, with the caveat that the flora of Espanola is nearly identical to that of Santa Fe, both being low dry islands located in the same region of the archipelago.

We do not anticipate any **disease risk** insofar as there are no other tortoises on Santa Fe island to transmit diseases to, and the remaining reptiles (marine and terrestrial iguanas, lava lizards, racers [snakes], and geckos) are so distantly related that inter-taxon disease transmission is unlikely. Moreover, the DPNG breeding center has well-established protocols for disease monitoring and treatment via collaborating veterinarians should disease issues arise in captivity that might lead to vectoring disease via tortoise translocations to the Santa Fe population.

Similarly **invasion risk** is very low. Unlike many vertebrate animals, giant tortoises are unable to make themselves cryptic in refuges, burrows, cavities etc. due to their very large size hence remain readily detectable for removal if such were deemed necessary. Should tortoises be deemed “overabundant” at any point in the future they can simply be removed from the island, in subsets or entirely. For this reason, invasion risk is minimal.

A known **biological risk** is an unusual one: Santa Fe Island currently hosts one massive, male giant tortoise determined by geneticists to have been translocated to the island from the western side of Santa Cruz Island (*C. porteri*). The animal has a domed morphology not adapted to this arid island. The circumstances of its translocation are not well known. The tortoise could pose a risk to young Espanola tortoises translocated to Santa Fe, which will reach sexual maturity at the age of 10 years. Attempted matings between the large alien male and small, sexually maturing headstarts could be problematic both in terms of physical trauma as well as potential gene transfer / hybridization. For this reason, the male will be removed by helicopter during the first phase of this project (the male is too large to be carried out). The male will be removed to the Santa Cruz breeding center, placed in quarantine for six months and then moved by truck for release back in its original range on the western side of Santa Cruz Island.

The most significant risks relate to **ecological engineering impacts** of translocated tortoises and whether they might ultimately have deleterious impacts to populations of native species present on Santa Fe Island. Ecological changes associated with tortoise restoration will not be immediate and will require significant numbers of adult tortoises to manifest, on the order of at least one per hectare (Hunter and Gibbs 2014). Most primary risks will be associated with vegetation change induced by the re-established tortoise population to the habitats of endemic species / subspecies on the island: the *Opuntia* cactus, pallid iguana, Santa Fe leaf-toed gecko, and Santa Fe rice rat. The key question is not whether these changes will occur but whether they could be deleterious. It is clear that the tortoises will alter the ecosystem—indeed, this is the primary rationale for this tortoise translocation—and, by extension, its constituent biota. The issue is whether such changes affect long-term population viability in affected species. Therefore, the focus on risk management, and ecological monitoring conducted to inform it, will be on tracking any dramatic changes in population status of endemic species / subspecies mediated by habitat change induced by tortoises.

Based on their well-documented interactions with the Espanola ecosystem, which is quite similar to that of Santa Fe, tortoises are expected to generate the following primary ecological trajectories: reduce woody plant extent, expand the extent of herbaceous vegetation, and facilitate cactus regeneration through seed dispersal away from parent plants. Given these likely trends, the following changes in habitats components of endemic fauna will be the focus for monitoring to inform risk management. For the pallid iguana, a recently completed MSc thesis by Cano (2018) revealed that diets of iguanas and newly released Espanola tortoises broadly overlapped on Santa Fe Island with 39 species in total consumed from 27 genera and 16 families: 13 species were consumed only by tortoises, 10 only by iguanas and 16 by both. Cactus was a particularly important component of the diet of both. Given dietary preferences, cactus is likely to be the main linkage mediating relationships between these species, along with the shrub / tree *Cordia lutea* (or “muyuyo”) and persistent forb *Lantana peduncularis* (“supirosa endemica”), the leaves of which are also preferred sources of food for iguanas and likely tortoises, as these have high energetic and nitrogen levels (Christian et al. ), as well as seasonal grasses, which are important forage for tortoises. These plants will be the key focus for plant monitoring to understand trends in these key forage species. Cactus impacts of tortoises are likely to be positive for cactus (Gibbs et al. 2008) as well as iguanas and tortoises themselves, negative for muyuyo and supirosa and hence iguanas, and positive for grasses and hence tortoises.

**Risk assessment and monitoring for other endemic species** is more problematic because so little is known about them or the relevant ecological inter-relationships. Given that there has been only a single, limited and now dated study of rice rat ecology (in the 1970’s, Clark 1980) there is sparse information to predict likely consequences, especially given that current population status is unknown.



This said, abundance of the endemic rice rat indicated a weak, positive relation to the “volume” of vegetation and structural complexity of the vegetation (Clark 1980). Ecological factors that simplify vegetation structure, as tortoises likely would, could reduce abundance of the rice rat. As almost nothing is known of the ecology of the Santa Fe gecko it is difficult to frame potential impacts of a tortoise translocation on this taxon; that said, being mostly fossorial during the day and surface active at night, it appears unlikely that the vegetation shifts projected for Santa Fe will affect gecko populations. Inferences about likely risks to these species will be derived from analyses of monitoring data of changes in the island’s vegetation.

**Financial risks** for this undertaking are quite low. The tortoise reintroduction program is built around a captive rearing and repatriation program of the DPNG that has been operating successfully for 50 years. All program components are currently operational in some form with existing personnel and knowledge of processes still engaged. Moreover, all monitoring efforts are underway in some form and have completed several cycles successfully and hence are stable and have low risk of failure. This is to say the program is robust not only in terms of probability of execution but also in terms of capacity to change adaptively as needed based on past successes executing all components proposed.

*iii. Description of stakeholders and their involvement and support for project activities before and during project implementation including mechanism for resolving conflicts/grievances*

The stakeholder “landscape” for this program is simplified. There is essentially only the DPNG and, by extension, the Government of Ecuador as primary stakeholders given that DPNG is the sole decision-maker about management and restoration efforts for strictly protected islands such as Santa Fe. Other than the GEF, the only other entity that will be contributing significantly to this activity is the Galapagos Conservancy, which collaborates with the DPNG strictly in an advisory capacity. Galapagos Conservancy focuses its advising on scientific issues that pertain to decision-making by DPNG, in this case, on matters of giant tortoise conservation and restoration, both for captive-bred and wild populations. Galapagos Conservancy has a long-established relationship with the DPNG with well-honed communication channels and means of resolving any conflicts that might arise. These primarily revolve around reports of monitoring outcomes, relevant scientific work conducted outside Galapagos, and expert knowledge communicated to DPNG decision-makers via annual reports, technical publications (often authored collaboratively), and frequent “sit down” and “in person” meetings.

Ultimately as tortoise numbers build and the population distributes itself fully across the island, tortoises will begin to appear at the sole tourist site on Santa Fe Island, to the northeast of the central tortoise release zone. At that point, tortoises will become a significant part of tourist and guide experience on Santa Fe Island, thereby involving these groups as indirect stakeholders. However, that is not likely to transpire for at least a decade, that is, until such time as the population has increased sufficiently to expand to the site. More generally, the conservation science community will be interested in learning about the outcomes of this innovative restoration program using an ecological replacement species, especially given that reintroduction of tortoise populations is increasingly proposed as a tool for ecosystem restoration in island systems where tortoises once occurred and for other taxa of large herbivores in terrestrial environments.

*iv. Exit strategy if undesired and unacceptable consequences have occurred*

In terms of an exit strategy should project outcomes be determined to be adverse (reducing habitat components and population levels of key endemic species unacceptably), tortoises can be removed from Santa Fe in subsets or entirely. After period of extended quarantine, tortoises removed could be relocated to Espanola Island where they would significantly enhance the population recovery process there (the population is currently at 20% of original size). Moreover, the Espanola tortoise has been frequently identified as a possible surrogate species to use to repopulate Pinta Island where tortoises are now extinct. There is ample habitat capacity on Espanola Island and Pinta Island (should DPNG deem Pinta an appropriate destination to receive Espanola tortoises) in the upcoming decades to accommodate all tortoises that might be produced on Santa Fe should they be subject to removal and translocation if a determination based on monitoring data collected and synthesized be made that undesired and unacceptable consequences to endemic species have occurred. There is certainty all tortoises can be found and removed within a year should they be deemed undesirable.

**Table 1: Details of risk management for Component 3**

Risk	Rating	Risk mitigation measures		Responsibilities (who in the project will be directly responsible)
		incorporated into project design	Managed via ongoing monitoring	
Risks to source populations	Low	Risk assessment already complete (Gibbs et al. 2014) and revealed zero risk	Source population subject to regular monitoring which would reveal and population decline due to conservation translation should it occur	DPNG advised by GC / GTRI
Vectoring plant seeds among islands	High	Translocating tortoises among islands presents a known, high risk for seed transport and plant establishment – scientific dimensions of problem well understood (Vasonez thesis) quarantine procedures well established and proven		DPNG advised by GC / GTRI
Disease risk	Low	Disease management protocols well established and proven in Breeding Centers and very low risk of inter-taxon disease where ecological replacement tortoises present (no other tortoises on Santa Fe Island except for those released).	Health assessments of released tortoises part of tortoise monitoring protocols	DPNG advised by GC / GTRI
Invasion risk	Low	Tortoises can be removed at any time should they be deemed invasive. Highly unlikely to be so deemed given their former presence on Santa Fe Island and evolutionary adaptation of flora and fauna to this herbivore.	Measurement of plant community health and population status of endemic and keystone species part of monitoring protocols	DPNG advised by GC / GTRI

Risk	Rating	Risk mitigation measures		Responsibilities (who in the project will be directly responsible)
		incorporated into project design	Managed via ongoing monitoring	
Biological risk	High	Alien massive tortoise present on island targeted for removal as part of project design.		DPNG advised by GC / GTRI
Risks from ecological engineering	Low	Evolutionary adaptation of flora and fauna to this herbivore implies risks of deleterious impacts low (intention of project is to effect such changes to a beneficial degree)	Vegetation and fauna monitoring to measure such impacts of ecological engineering part of monitoring protocols, be such impacts beneficial or deleterious	DPNG advised by GC / GTRI
Risk assessment and monitoring for other endemic species	Medium		Tortoises could potentially impact endemic iguanas, rice rats and cacti to a deleterious degree – monitoring programs design to detect such impacts should they occur in all relevant taxa	DPNG advised by GC / GTRI
Financial risks	Low	There are no novel approaches employed in this project – all are well-proven with known costs and hence likely highly successful with low risk of failure or cost overrun		DPNG advised by GC / GTRI

## 7. Monitoring

This section presents details of key issues to be monitored under Component 3, along with information on responsible parties and dissemination of information. **Table 2** below provides a summary of these issues.

*i. Description of system for monitoring the ecological, social, and physical-cultural impacts, including key indicators, baseline data, location and frequency of monitoring activities*

The emphasis of monitoring will be on ecological issues because, as indicated earlier, there is no human population present on Santa Fe Island and hence social and physical-cultural impacts are irrelevant in the context of this project. Key indicators will involve the agent of ecological change being introduced to the system – the Espanola tortoises—including their ecological impact on plant communities and habitat components for endemic species, and the population status and trends among those endemic species, with a focus on the species of primary concern in terms of likelihood to be impacted: *Opuntia* cactus, pallid iguanas, and rice rats.

For **monitoring the tortoise population**, since 2015 annual week-long systematic mark-recapture survey of tortoises have been conducted over the release zone and its surrounding regions (2015-2018). For each tortoise encountered, geographic location (accurate to 2 m), multiple measures of size, mass (as a measure of condition relative to size), and unique ID (all tortoises are uniquely identified with subdermal transponders) are recorded. Following four such surveys to date, a database of almost 1,000 captures and recaptures has been assembled. These data enable monitoring of many critical aspects of the tortoise population, including growth rates, body condition, movement, distribution and dispersal, habitat use, survival, detectability per survey and population size.

The above monitoring effort will continue to be undertaken annually during the life of the project in order to inform decision-making as it pertains to the size and well-being of the tortoise population. Tracking devices will also be placed on representative groups of both juveniles and sub-adult tortoises. These devices will report the position of each tortoise tagged several times per day via satellite, such that hardware costs, initial deployment and data fees are the only costs. We will use the newly available tags from the Icarus system – a novel animal tracking program associated with the European Space Station. Tracking tortoise movements will enable a better understanding of dispersal, habitat use, inter-species interactions and hence ecological impact.

For **monitoring the pallid iguana population**, established a remarkable baseline of abundance and distribution of iguanas was established in 2011 via an island-wide, distance sampling program conducted by DPNG rangers who counted iguanas (and the distances they were located away from the transect line) along 307, 100-m-transects. At transect intersections, 185 permanently marked plots were established, where iguanas were counted. This combined approach generated two independent estimates of population size (and structure) that corroborated one another (yielded essentially the same estimate) and that were both highly precise (SE/mean = 10%). Transects in the core of the island associated with the initial tortoise introduction were resampled in 2017, further extending the baseline. This large-scale survey will be repeated once at the end of the project to measure change in pallid iguana numbers and distribution, with special emphasis on changes in iguana numbers at locations with elevated densities of translocated tortoises.

For **monitoring the rice rat population**, the sampling conducted by Clark (1980), who established a baseline on density and distribution during trapping from 1973-1976 (the first and last time this species was systematically surveyed), will be repeated. Following Clark's (1980) methods, rats

will be trapped with collapsible Sherman aluminum live traps baited with peanut butter and opened in late afternoon 16.00-18.00 hours and checked at sunrise (about 6.00 hours). Each trapline will consist of twenty-five stations, two traps per station, with 10 m between stations, distributed at six sites across the island. For each rat, weight, sexual condition, and tail, total, and perineum lengths will be recorded. will trap rats once annually in May/June in conjunction with the tortoise monitoring. By matching sampling to Clark's (1985) sampling sites, much needed data can be generated on rat population change while an updated baseline can be established and follow-up change may be measured. Notably, some of Clark's (1985) trap lines are proximal to the tortoise release site and others distant, thus enabling contrasts to be made regarding population change in the native rats and tortoise occurrence.

For **monitoring the cactus population**, our focus is on general abundance and population structure across the island, detailed studies of population structure across a gradient of tortoise density, and demographic processes at the site of tortoise releases. These will be monitored as follows:

- For monitoring general changes across the island, recorded counts of cactus of three life stages (juveniles, subadults and adults) have previously been made on 183 plots systematically arranged across the entire island. These will be resurveyed in conjunction with the iguana resurvey to examine change associated with time and tortoise impacts, using distance from the tortoise release area and density of tortoise droppings as the proxy variables.
- For monitoring change in cactus populations along a gradient of tortoise density, have established 26 25-m radius circular plots have been established, with every cactus geolocated, its height measured and its life stage recorded. These plots range from the epicenter of the tortoise release zone to well beyond areas where tortoises have dispersed to (or will during this project). These plots have been re-measured annually for three years. Contrasts in densities of different stage classes of cactus on these plots in relation to distance to the epicenter of the tortoise release site will inform about near-term changes in cactus populations associated with tortoise occurrence.
- Demographic processes in cactus at the epicenter of the tortoise release site are being measured starting in 2018 (with one year of baseline data already collected) on a large "macro-plot" where (~2 hectares) where every cactus have been geolocated and its life stage, height, number of pads and fruits (~600 in total) have been recorded, and each one permanently tagged with copper wire and aluminium plant tags. Tracking these individual cacti into the future will enable to track cactus growth rates, recruitment, mortality, and transitions among stage classes as the tortoise population grows. Cacti in this macroplot will be measured annually during the life of the project.

For **monitoring broader changes in the plant community**, baseline data include relevé measures of plant cover, substrate characteristics, overhead canopy and frequency of stems of woody plants in 20, 6x6 m square plots, 5 of which are fenced to exclude tortoises, 5 fenced to exclude tortoises and iguanas, and the remaining 10 unfenced to serve as "controls." Detailed measures on plots have been made annually since 2014, which includes prior to the initial release of tortoises as well as prior to construction of the fences (thereby a "before-after / control-treatment" or BACI design, a classic, statistically powerful design for measure treatment effects in ecology). Data are analyzed not only to estimate extent of cover of key habitat components (herbaceous plants, grasses, woody plants) and species but also the interaction with presence of tortoises and iguanas. The plots are located at the heart of the tortoise release zone where they are optimized to measure tortoise impacts. These plots will continue to be monitored annually during the life of this project.

*ii. Description of responsible party for implementing and monitoring the mitigation measures, including their capacity and experience*

All of the required monitoring activities and mitigation measures will be undertaken by, and be the responsibility of, the Giant Tortoise Restoration Initiative of the Galapagos Conservancy, in close coordination and cooperation with the DPNG. This institutional arrangement has conducted successfully all population and ecosystem monitoring efforts described herein to date, demonstrating ample capacity to conduct the work described.

*iii. Dissemination of information including means and frequency:*

The reintroduction of tortoises to Santa Fe constitutes an important milestone in the process of ecological restoration of the island; therefore, the DPNG will invite the local, national and international press whose representatives will be able to document the transfer process from the Fausto Llerena Breeding Center to the beach in Santa Fe Bay, where the tortoises will then be conveyed to the interior of the island by park rangers. If there are any press and television reporters specializing in nature documentaries, their participation in the entire process will be authorized, including time at the release site in the island's interior. The DPNG Communication and Education Department will be in charge of coordinating this part of the process.

Status and trend data for all key indicators will be synthesized with each iteration of the indicator's monitoring cycle (not all indicators are monitored every year). Outcomes will be shared in written form annually by Galapagos Conservancy to DPNG, with a follow up in-person meeting to discuss findings and implications.

Monitoring outputs will also include a scientific article submitted for publication to a respected science periodical on the near-term ecological outcomes of the tortoise translocation in order to share the scientific findings with the population of Galapagos and with the world. Depending on the editorial process of the different journals to which it will be submitted, the article might not be published by the time of project closing.

Outcomes will also be summarized in a poster to be presented at the Galapagos National Park Symposium, which is organized every year and is open to the public. Attendance at the Symposium includes other investigators (both visiting and resident scientists), guides, students and members of the general public.

**Table 2: Monitoring of Component 3**

Component 3: Advancing the recovery of island ecosystems following invasive species eradication through the re-establishment of keystone species (i.e. giant tortoises).							
Indicators	Metrics	Methodology	Baseline	Location	Frequency	Responsible Parties	Indicative Resources
Indicator 3.1.:  Percentage of Santa Fe Island land area where giant tortoises are dispersing seeds	Hectares within 100 m of a known tortoise occurrence since repatriations began in 2015 to project end	Mark-recapture surveys of tortoises and tortoise movement studies	2014 when no tortoises were present = 0 hectares within 100 m of a known tortoise occurrence	Santa Fe Island (entire island)	Annual prior to project initiation and bi-annual thereafter to project end	DPNG advised by GC/GTRI staff	Approximately 5-10% of the project team's time will be allocated to monitoring of indicators. No additional dedicated budget is allocated
Indicator 3.1.1.a.: # of giant tortoises ( <i>Chelonoidis hoodensis</i> ) translocated to Santa Fe Island	Number of tortoises	Visual counts by Breeding Center staff according to Breeding Center protocols as tortoises are processed into the travel boxes for transfer to Santa Fe Island on day of transfer	As of December 2017, 396 giant tortoises of the species <i>Chelonoidis hoodensis</i> had been released to Santa Fe Island.	Santa Fe Island	Likely annual but dependent any given year on environmental conditions conducive to tortoise release	DPNG advised by GC/GTRI staff	Approximately 5-10% of the project team's time will be allocated to monitoring of indicators. No additional dedicated budget is allocated
Target 3.1.1.b.: At least 30 sub-adult giant tortoises ( <i>Chelonoidis hoodensis</i> ) are translocated	Number of tortoises	Visual counts by DPNG rangers as subadult tortoises are released onto Santa Fe Island	As of December 2017, there were no subadult tortoises on Santa Fe Island.	Santa Fe Island	Single event when transfer transpires	DPNG advised by GC/GTRI staff	Approximately 5-10% of the project team's time will be allocated to monitoring of indicators. No additional dedicated budget is allocated
Indicator 3.1.2.: Tested and optimized monitoring and evaluation protocol (and sub-protocols) accepted	Existence of protocol	Outside verification of tested and optimized monitoring protocol	As of December 2017, there was no tested and optimized monitoring protocol	Not applicable	Single event at project end	DPNG advised by GC/GTRI staff	Approximately 5-10% of the project team's time will be allocated to monitoring of



Component 3: Advancing the recovery of island ecosystems following invasive species eradication through the re-establishment of keystone species (i.e. giant tortoises).							
Indicators	Metrics	Methodology	Baseline	Location	Frequency	Responsible Parties	Indicative Resources
by the Project Steering Committee							indicators. No additional dedicated budget is allocated
Indicator 3.2.: Number of giant tortoises raised in captivity annually: Santa Cruz	Number of tortoises	Counts of tortoises according to record keeping programs outlined in "The Captive Rearing of Galapagos Tortoises: An Operative Manual"	In Santa Cruz, an average of 250 tortoises annually is produced for the populations of Española, Santiago, Floreana, Pinzón and Eastern Santa Cruz	Santa Cruz Island Breeding Center	Single event at project end	DPNG advised by GC/GTRI staff	Approximately 5-10% of the project team's time will be allocated to monitoring of indicators. No additional dedicated budget is allocated
Indicator 3.2.: Number of giant tortoises raised in captivity annually: Isabela	Number of tortoises	Counts of tortoises according to record keeping programs outlined in "The Captive Rearing of Galapagos Tortoises: An Operative Manual"	In Isabela, an average of 200 tortoises annually from the populations of the Sierra Negra and Cerro Azul volcanoes	Isabela Island Breeding Center	Single event at project end	DPNG advised by GC/GTRI staff	Approximately 5-10% of the project team's time will be allocated to monitoring of indicators. No additional dedicated budget is allocated
Indicator 3.2.1: Number of centers modified and expanded	Number of new breeding pens Number of quarantine pens Number of pre-adaptation pens Number of pens for hatchling tortoises	Facility inspection at project end	Design blueprint of Breeding centers in 2017	Breeding Centers on Santa Cruz Island and on Isabela Island	Single event at project end	DPNG advised by GC/GTRI staff	Approximately 5-10% of the project team's time will be allocated to monitoring of indicators. No additional dedicated budget is allocated
Indicator 3.2.2: # of breeders selected, located, and transferred to breeding center	Number of tortoises	Counts of tortoises according to record keeping programs outlined in "The Captive Rearing of Galapagos	Breeding stock as of Dec. 2017	Breeding Centers on Santa Cruz Island and on Isabela Island	Single event at project end	DPNG advised by GC/GTRI staff	Approximately 5-10% of the project team's time will be allocated to monitoring of indicators. No

Component 3: Advancing the recovery of island ecosystems following invasive species eradication through the re-establishment of keystone species (i.e. giant tortoises).							
Indicators	Metrics	Methodology	Baseline	Location	Frequency	Responsible Parties	Indicative Resources
		Tortoises: An Operative Manual"					additional dedicated budget is allocated
Indicator 3.2.3: # of scientific, technical and popular articles and reports.	Number of technical articles in peer-reviewed literature Number of informal articles in publicly available Galapagos Number of scientific posters presented DPNG conference	Provision of final copies of documents	Dec. 2017	Not applicable	Single events at project end	DPNG advised by GC/GTRI staff	Approximately 5-10% of the project team's time will be allocated to monitoring of indicators. No additional dedicated budget is allocated

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## **APPENDIX VII: Grievance Mechanism**

### **I. Introduction**

According to the analysis of the safeguards screening carried out by the CI - GEF Project Agency, it is a requirement that projects must have an Accountability and Grievance Mechanism.

### **II. Brief Project description**

Before analyzing how the project will set up an Accountability and Complaints Mechanism, it is important to understand its scope. The project seeks to safeguard the biodiversity of Galapagos islands by enhancing biosecurity and creating the enabling environment for the restoration of Galapagos Island Ecosystems. The project has three components:

1. Furthering development of a state-of-the-art biosecurity system
2. Solidifying the social infrastructure for the protection and recovery of Floreana Island ecosystems.
3. Advancing the recovery of island ecosystems following invasive species eradication through the re-establishment of keystone species (i.e. giant tortoises).

### **III. Objective**

The objective of the Accountability and Complaints Mechanism is to ensure people potentially affected by the project are able to bring their grievances to Island Conservation, CI-GEF or the GEF about any issues covered in the ESMF for consideration and redress.

The Accountability and Grievance Mechanisms are not intended to replace country level dispute resolution and redress mechanisms. This means that local communities can always use formal country level mechanisms, including arbitration, administrative or legal avenues to raise concerns. Specifically, these mechanisms seek to:

- Address potential breaches of CI's and the GEF's policies and procedures;
- Be independent, transparent, and effective;
- Be accessible to project-affected people;
- Keep complainants abreast of progress with cases brought forward; and
- Maintain records on all cases and issues brought forward for review.

### **IV. Accountability and Complaints Mechanisms at the Project Level**

The process for addressing project-related grievances is:

The person who considers that the project has breached CI's and/or the GEF's policies and procedures may choose to send a letter to Island Conservation.

The complaints mechanism at project level will attend to complaints from the local community, non-governmental entities, governmental institutions and citizens with inference over the area of the project.

The complaints must be attended as long as:

- they are generated within the project's influence zone.
- they are generated throughout the fixed time for the management and implementation of the project.
- they are signed and provide contact information to which a reply can be notified (anonymous complaints cannot be addressed)

The complaints can be sent to:

Project Manager  
Island Conservation  
DPNG Headquarters,  
Santa Cruz, Galápagos.

Or by email to:

[grievance.mechanism@islandconservation.org](mailto:grievance.mechanism@islandconservation.org).

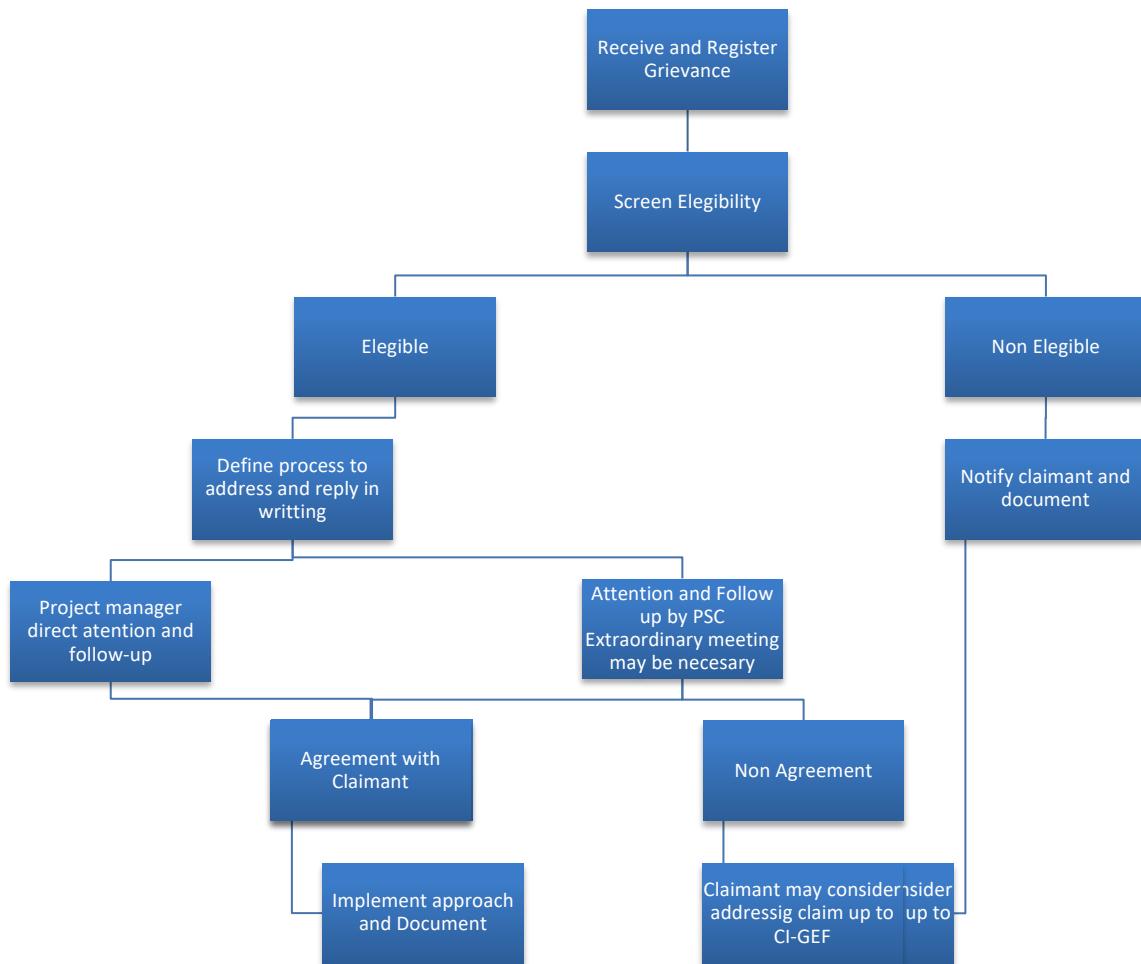
A phone number will be provided once PMU has been established.

The Project Manager will screen for eligibility. Those complaints that do not fulfill with the previous requirements will be omitted. The complaint should be logged and a response provided in writing within 15 calendar days of receipt. The Project Manager should provide a copy of the grievance and response to the CI-GEF Project Agency Team. This response should propose a process for resolving the conflict.

If the Project Manager can solve a complaint, he/she will do so. Otherwise, the complaint will be passed on to discussion by the Project Steering Committee, which will attend to it, depending on the complexity of the complaint. If necessary, a special session will be arranged in order to submit a response or position. The response to the complaint must not exceed 60 working days and must be in writing. Depending on the case, the Project Steering Committee may decide to procure the services of a third party or mediator to prevent conflict of interest and reach a resolution that is acceptable to all parties.

The Project Manager is responsible for documenting all grievances and responses.

If this process does not result in resolution of the grievance, the grievant may choose to file a claim through CI's EthicsPoint Hotline at <https://secure.ethicspoint.com>. CI will respond within 15 calendar days of receipt, and claims will be filed and included in project monitoring processes. Alternatively, the grievant may file a claim with the Director of Compliance (DOC) who is responsible for the CI Accountability and Grievance Mechanism and who can be reached at: Director of Compliance Conservation International 2011 Crystal Drive, Suite 500 Arlington, VA 22202, USA. CI-GEF will determine if it will refer the complaint to the GEF Conflict Resolution Commission.



**Figure 1. Process for complaints at the project level**

## **V. Disclosure of the Accountability and Grievance Mechanism**

Island Conservation will be responsible for informing project-affected parties about the Accountability and Grievance Mechanism. Communities and other interested stakeholders may raise a grievance at any time to the Executing Agency, Implementing Agency, or the GEF. Therefore, contact information of Island Conservation, CI's Project Agency, and the GEF will be made publicly available.

The mechanism will be in place before the start of project activities, and disclosed to all stakeholders in Spanish. Written materials about the Accountability and Grievance process will be distributed to community members in Floreana.

As required, the local community of Floreana will be informed that there is a Grievance and Accountability Mechanism set up for the project, during Project Preparation and Implementation Phases.

At this moment, no grievances have been submitted to the Project Team. If it happens, the complaints mechanism will be applied, as described in the previous section.

## **VI. Monitoring and Reporting**

The following indicators will be included the project's reporting process:

- Number of conflict and complaint cases reported to the project's Accountability and Grievance Mechanism
- Percentage of conflict and complaint cases reported to the project's Accountability and Grievance Mechanism that have been resolved periodically.



## **APPENDIX VIII: Gender Mainstreaming Plan**

202. Every effort will be made by the GoE, CI, and Island Conservation to further gender equality in the Galapagos archipelago by building on an existing platform of success. The aim of the GMP is to identify needs and opportunities to mitigate potentially adverse effects of the project on men and women, as well as promote gender equality as an aspect of the project.

The GoE, EA, and IA have procurement procedures that explicitly recognize the promotion of gender equality as a standard business practice. As a result, gender equality will be taken into consideration through their procurement programs when sourcing staff, equipment, and consultants with GEF trust funds and/or co-financing.

*The following is a list of examples of project elements that are particularly gender-sensitive and thus focal areas for the GMP. These issues are included as project indicators (see Appendix 1, Project Results Framework).*

### **Component 1: Furthering development of a state-of-the-art biosecurity system**

Work under Component 1 will build on past and ongoing efforts by ABG to implement and strengthen biosecurity through interception and control of invasive alien species and diseases. The benefits to biodiversity of adding new pest detection equipment, training inspectors to use the new equipment effectively, and implementing new inter-island biosecurity protocols will be substantial over the long-term and will accrue to the whole of the archipelago, as well as to continental Ecuador and Ecuador's trading partners. Invasive alien species intercepted as a result of enhanced detection capacities will be eliminated from the pathway by which they were being mobilized, and their establishment in natural ecosystems will be prevented.

Issues related to gender mainstreaming under Component 1 include the following:

- Training courses are gender sensitive in terms of participation, instructional design, and use of language;
- In particular, training programmes ensure that detection devices can be effectively operated by both women and men.

### **Component 2: Solidifying the social pathway for the protection and recovery of Floreana Island ecosystems**

A conflict transformation<sup>105</sup> process, led by Island Conservation, has been underway on Floreana Island for the last six years, through which the concerns of the local community and partners have been actively solicited and understood. Additional rounds of consultation and feedback solicitation are required to deepen the community and partnership's understanding of the proposed actions and responsibilities, and to refine details of risk management plans. Risk management and operational plans must be complementary and synergistic, as such changes in details of one plan may affect another; this requires all plans to be advanced simultaneously and considered within the context of each other. Once consultations and this process is complete, plans will be submitted to the PSC for approval. Other plans, including pesticide monitoring, wildlife monitoring, non-target species mitigation, and biosecurity are being developed simultaneously with co-financing to manage other risks and will also be approved by

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<sup>105</sup> Term attributed to John Paul Lederach's longer *The Little Book of Conflict Transformation*, 2003

the PSC but are not a GEF deliverable. As a last step, all plans will be included within an ESIA, the development of which will include additional stakeholder engagement and considerations for gender mainstreaming.

Issues related to gender mainstreaming under Component 2 include the following:

- Community consultative processes will be designed to facilitate equal participation, mutual respect, and collective decision making by women and men;
- The potential project impacts (positive and negative) on both men and women will be taken into consideration during the Environmental and Social Impact Assessment (ESIA).

**Component 3: Advancing the recovery of island ecosystems following invasive species eradication through the establishment of keystone species (i.e. giant tortoises)**

Although invasive rodents and feral cats have not yet been removed from Floreana Island, invasive vertebrates have been removed from Santa Fe (goats) and other Galapagos islands. These islands are now candidates for the recovery of endangered species and associated ecological processes. As part of the Giant Tortoise Restoration Initiative, Española tortoises, as the closest genetic relative and of the same saddleback morphology, will be used as ecological analogs for the extinct Santa Fe tortoise to re-initiate ecosystem processes on Santa Fe Island. Since 2015, a total of 396 Española (*Chelonoidis hoodensis*) tortoises have been released on Santa Fe. Additional efforts will be required in coming years to build capacity and restore the island with approximately 4,000 tortoises, the abundance predicted by habitat suitability models to have been present originally.

Issues related to gender mainstreaming under Component 3 include the following:

- Women's participation in field monitoring expeditions, and;
- Women's participation in captive rearing of tortoises

**Project-wide issues**

- Presentations on lessons learned made to decision makers and resource managers within Ecuador need to reach both women and men in leadership positions; and
- All publications resulting from the project need to use gender-sensitive language and are made equally accessible to men and women.

**Indicators**

Table 1 below presents gender-specific indicators—and associated targets—to be tracked by the project.

**Table 1: Indicators related to gender**

Indicators	Metrics	Methodology	Baseline	Target	Location	Frequency	Responsible Parties	Indicative Resources
Gender Indicator 1	Number of men and women that participated in project	Project reporting	NA	Women account for at least 30% of persons participating in	PMU	Once (Y3, Q2)	PMU	Approximately 5-10% of the project team's time will be allocated to monitoring of

Indicators	Metrics	Methodology	Baseline	Target	Location	Frequency	Responsible Parties	Indicative Resources
	activities (e.g. meetings, workshops, consultations)			project meetings, workshops or consultations				indicators. No additional dedicated budget is allocated
Gender Indicator 2	Number of men and women that received benefits (e.g. employment, income generating activities, training, access to natural resources, land tenure or resource rights, equipment, leadership roles) from the project	Project reporting	NA	Women account for at least 30% of persons trained and/or receiving other benefits	PMU	Once (Y3, Q2)	PMU	Approximately 5-10% of the project team's time will be allocated to monitoring of indicators. No additional dedicated budget is allocated
Gender Indicator 3	Number of strategies, plans (e.g. management plans and land use plans) and policies derived from the project that include gender considerations.	Project reporting	NA	All strategies, plans and policies developed with the support of the project will include gender considerations	PMU	Once (Y3, Q2)	PMU	Approximately 5-10% of the project team's time will be allocated to monitoring of indicators. No additional dedicated budget is allocated

## **APPENDIX IX: Stakeholder Engagement Plan**

### **Introduction**

The greatest threat to biodiversity in the Galapagos Islands is biological invasion. Invasive alien species are one of the most significant drivers of environmental degradation and species extinction worldwide, and are generally considered the primary cause of biodiversity loss in island ecosystems. Hundreds of invasive alien species are already well established within the Galapagos archipelago. Some of these organisms arrived with seafarers more than 100 years ago, while others have been introduced (deliberately and inadvertently) within the last decade. The impacts of invasive alien species on endemic species can have ecosystem-wide ramifications. For example, when invasive rodents feed on giant tortoise eggs and hatchlings, they reduce the number of tortoises available to spread seeds (through their excrement) and ‘plant’ the next generation of native trees and shrubs. As canopy cover declines, so do the populations of understory plants that require shading from the harsh tropical sun. The loss of understory vegetation makes landscapes more vulnerable to soil erosion and contributes to declines in soil fertility through mineral leaching. This impairs soil fertility and undermines the capacity of landscapes to be resilient to further perturbations (e.g., extreme weather events, climate change).

Failure to control invasive alien species in the Galapagos archipelago will:

- Enable the persisting invasive vertebrate species to continue to predate upon, compete with, and/or spread pathogens and parasites to the native species;
- Allow for further degradation of sensitive marine and terrestrial habitats, thus preventing these ecosystems from being able to support the long-term viability of endemic species, and possibly human livelihoods;
- Substantially undermine investments already made in environmental conservation, ecotourism, and sustainable agriculture; and
- Reduce ecological and socio-economic resilience in the face of adverse impacts of climate change and other major environmental disturbances.

The Government of Ecuador (GoE) is well aware of the adverse impacts that invasive alien species have on biodiversity and human livelihoods, and over the last two decades, has made major accomplishments in the prevention, control, and eradication of invasive alien species. Many of the recent advances were achieved between 2002 and 2011 under the auspices of the ‘Control of Invasive Species in the Galapagos Archipelago’ (ECU/00/G31) project funded by the Global Environment Facility and executed by the Ministry of Environment (MAE). Major accomplishments include:

- Establishment of the Fund for Control of Invasive Species in the Galapagos (FEIG);
- Greater management capacity of the Galapagos National Park Directorate (DPNG) and Charles Darwin Foundation (CDF);
- Improved border protection by the Galapagos Inspection and Quarantine System (SICGAL), advances in public policy by the National Institute of the Galapagos (INGALA); and
- A pilot goat eradication project on northern Isabela Island.

Despite progress, numerous challenges to minimizing the spread and impact of invasive alien species remain. The main barriers include: a) limited technical capacity to design and implement highly effective prevention, eradication, or control programs, b) lack of equipment and personnel to adequately inspect the vast amount of cargo and equipment in transit, c) a decline in taxonomic capacity to identify invasive alien species once intercepted, and e) the high cost of effective biosecurity programs, eradication programs, and control programs.

The GoE recognizes that international trade, travel, and transport are pathways for the introduction of invasive alien species, and that prevention is typically the most cost-effective means for minimizing the impact of invasive alien species. The GoE and many project partners have had the opportunity to learn (directly and indirectly) from previous GEF projects executed within Ecuador, as well as similarly themed projects conducted in other countries/regions. Based on these lessons learned, this GEF 6 project was designed.

The objective of the project is ‘to safeguard biodiversity in the Galapagos Islands by enhancing biosecurity and creating the enabling environment for the restoration of Galapagos Island ecosystems.’ This project aims to safeguard biodiversity in the Galapagos Islands by 1) enhancing biosecurity across the Galapagos archipelago, 2) solidifying the social license to eradicate invasive vertebrate species from Floreana Island, and 3) translocating previously extirpated keystone species (giant tortoises) to Santa Fe Island. The project will be carried out through three components:

- Component 1: Furthering development of a state-of-the-art biosecurity system.
- Component 2: Solidifying the social infrastructure for the protection and recovery of Floreana Island ecosystems.
- Component 3: Advancing the recovery of island ecosystems following invasive species eradication through the re-establishment of keystone species (i.e. giant tortoises).

Project success will secondarily lead to a reduction in land degradation, and improved ecotourism opportunities. Consequently, ecosystem services, agricultural production, and economic investments will be better secured on human-inhabited islands in Ecuador and beyond.

### **Internalization of CI-GEF Policy Requirements**

The CI-GEF Project Agency has oversight of Island Conservation, as Executing Agency of both the PPG and the implementation phase of the project. This includes its relationships with all stakeholders, including project-affected groups, and local CSOs, throughout the design/preparation process. The objective is to ensure that a broad range of views and concerns are made known and taken into account in the design and implementation of the project. Efforts have been made to ensure that stakeholder groups of historically vulnerable or marginalized people (e.g. women, youth, elders, and religious/ethnic minorities) have been able to fully participate in this process. This policy will continue through the project’s implementation phase.

Ideally, stakeholder engagement should involve the public in problem-solving. A joint effort by stakeholders, in-country representatives, executing entities, and the GEF Project Agency will help to ensure better results. Executing Agencies—in this case IC—must ensure, *inter alia*, that the key principles of the CI-GEF Gender Mainstreaming Policy – ensuring that both men and women are given equal access to information and decision-making processes—is incorporated throughout stakeholder engagement (see Gender Safeguard Plan above).

As Executing Agency, IC has identified the range of stakeholders that may be interested in the actions of the project and has considered how external communications might facilitate a dialog with all stakeholders. Stakeholders have been informed and provided with information regarding project activities. Where projects involve specifically identified physical elements, aspects and/or facilities that are likely to generate adverse environmental and social impacts to Affected Communities the Executing Agency will identify the Affected Communities and will meet the relevant requirements described below.

The Executing Agency has been responsible for drafting and executing the *Stakeholder Engagement Plan* (SEP), i.e. the present annex, which is scaled to the project risks and impacts and development stage. The Plan is tailored to the characteristics and interests of the affected communities, recognizing that some community members may not be able to effectively communicate outside of the local language (Spanish).

When the stakeholder engagement process depends substantially on community representatives, the Executing Agency will make every reasonable effort to verify that such persons do in fact represent the views of Affected Communities and that they can be relied upon to faithfully communicate the results of consultations to their constituents.

*The CI-GEF Project Agency has reviewed and approved of the present SEP and will oversee its execution.*

### Summary of Previous Stakeholder Engagement Activity

Since 2009, IC and partners have undertaken a series of stakeholder consultations, focused on issues relating to the development and eventual implementation of an eradication and sustainable development plan for Floreana Island (ref. Component 2 of the present project). Examples of some of these consultations are listed in **Table 1** below.

In addition to contributions from other full-time IC staff, from March 2015 to June 2018, a full-time community facilitator was employed by IC to help advance the conflict transformation process<sup>106</sup>. Trips were made by this person at least every month to Floreana, often for a week at a time.

**Table 1: Examples of stakeholder engagement activities, 2009-2015**

Date	Component	Workshop/ Meetings	Attendees	Objective	Comments
10-13 May 2009	2	Community interviews	FPC, Floreana Community members, international feral cat eradication planning team	Understand community perceptions to potential eradication of feral cats and sterilization of domestic cats	Support for feral cat eradication. Concern by some residents about killing domestic cats but support for sterilization.
23 May 2012	2	Half-day workshop	DPNG, FPC, Floreana Community members, IC, facilitator	Understanding community perceptions and impacts from invasive species. Information collection and sharing. DPNG presented idea of rodent and cat eradication.	Objective achieved. Significant impacts to crop production identified by invasive species, particularly rodents. Local extinction of vermillion flycatcher attributed to invasive rodents and cats. General support on rodent and cat eradication.

<sup>106</sup> Term attributed to John Paul Lederach's longer *The Little Book of Conflict Transformation*, 2003. See para. 75 above

Date	Component	Workshop/ Meetings	Attendees	Objective	Comments
8-12 March, 2014	2	Conflict transformation on 5-day retreat on Isabela Island	DPNG, ABG, MAG, FPC, Floreana Community members, IC, CDF, facilitator	Conduct conflict transformation training, develop shared vision, identify next steps and who will lead.	All objectives completed. In addition, major conflicts were tabled and points of views expressed in constructive manner. Community, government and NGO points combined into a shared vision. Invasive rodents and feral cat eradication identified as priority cross-cutting theme. Sustainable development was other key theme.
March-October, 2015	2	Socialization of the Floreana Ecological Restoration Project	DPNG, ABG, FPC, Floreana community , IC	To build a baseline of information between stakeholders and collect the doubts, question and suggestions community had about the project.	Mixed community opinions. Concerns identified about toxicant in water, livestock poisoning, native species risks, tricks by government to remove community, etc. Concerns raised formed the basis for community outreach over the next years and provided opportunity to understand, discuss concerns and potential solutions.
24 July, 2015	1,2	Inter-institutional meeting. Full day.	DPNG, ABG, MAG, IC, facilitator	Define components of the project, next steps and strategies to move forward.	Agreement to continue moving forward. Series of action items identified, including Floreana community socio-economic baseline.
18 July, 2015	2	Workshop for Integral Sustainable Development Plan	FPC, Floreana community , DPNG, ABG, IC, facilitator	Validate and prioritize the projects that are necessary to implement on Floreana Island	Mixed opinions and concerns/support voiced. Used votes to decide upon priority actions. Invasive rodent and feral cat eradication one of the priorities selected.

Stakeholder activities to date have been undertaken with the aim of creating the necessary conditions to present the project and work with the different actors involved. The variety of actors required different strategies that took into account the diverse roles, social status, gender, access to resources, necessities and interest that institutions and communities have related to the project and its implementation.

To get to this stage, individual treatment through a “one-by-one” approach, has been the methodology used to provide specific information to each person in the community and institutional officials linked to the project, providing the quantity and quality of information needed by each stakeholder. The

individual approach also allowed the project development team to identify and collect the concerns and necessities that stakeholders have around the project. This has led to the identification of strategies to fill the information gaps and provide stakeholders with the necessary elements to become active participants in project implementation (see below).

In addition to the above, recent stakeholder engagement under what will be Component 2 of the project has included a series of thematic information and awareness activities, which are summarized in **Table 2** below.

**Table 2. Thematic information and awareness campaigns during preparation of PIF and during PPG Phase, 2016-2018**

Date	Project component	Topic	Attendees/ Stakeholders	Objective	Comments
March 2016	2	Methods of application of bait, management of domestic animals and water mitigation plan	ABG, DPNG, MAG, FPC, Floreana community	To further inform institutions and community about the methodology proposed to eradicate rodents and feral cats and the mitigation actions co-designed with them for domestic animals and water sources	General agreement by all. Specific comments captured as meeting minutes and official comments sent in writing by institutions.
April, July, October, September 2017	2	Mitigation actions for the following topics: livestock, water, tourism, fisheries, pets, children, commensal rodents, agriculture	ABG, DPNG, MAG, FPC, Floreana community	To develop the mitigation actions for the aspects of concerns and interest of stakeholders.	General agreement by all. Specific comments captured as meeting minutes and official comments sent in writing by institutions. Draft plans modified accordingly.
April, November, December 2017; February 2018	2	Mitigation plans	ABG, DPNG, MAG, FPC, Floreana community	Present to stakeholders the revised mitigation plans and receive comments and concerns from stakeholders	Few, very specific concerns captured as meeting minutes. Draft plan revised accordingly.
May 2018	2	Mitigation actions for livestock.  Determination , by drawing from a hat, of	Farmers of Floreana	Provide information about the action and infrastructure that have to be implemented to mitigate risk for livestock and receive	Treated concerns raised since last meeting. Agreements reached, all satisfied with



Date	Project component	Topic	Attendees/ Stakeholders	Objective	Comments
		which farms shall receive pilot chicken coops		comments and concerns from stakeholders to take into account during the management plan development.  Determine which farms to build pilot coops on.	outcome, draft plan modified accordingly.  Meeting minute of process and outcome of pilot coop selection.
May, June, July 2018	2	Property management plans	Floreana community	Discuss with households the various plans as they relate to their property and household.	Continued outreach to Floreana community, deepening understanding. Household visit forms completed and copy provided to household interviewed.
July 2018	2	Silage containers and chicken coops	Floreana farmers	Transport and locate shipping containers to be used as silage storage for cattle/equines and feed storage for pigs.  Working with farmers on coop site preparation and receiving construction materials.	Containers located at farm sites where concrete bases were complete.  Sites prepared for coops in collaboration with farmers.

### Project Stakeholders

Among the strategic actors are: the partner institutions that endorse and will participate in the execution of the project; the institutions that are contributing funding to implement each of the components of the project, and; the target group that constitutes the resident population of the Galapagos Islands, the scientific community and the institutional technicians who are in charge of co-executing the activities of each component. Particularly relevant are the residents of Floreana Island, where activities will take place under Component 2. **Table 3** below links stakeholders to relevant project components.

**Table 3. Stakeholder involvement, by project components**

Stakeholders	Component 1. Biosecurity	Component 2. Ecosystem Restoration	Component 3. Re- establishment of keystone species
<b>Government Agencies</b>			
Ministry of Environment (MAE)	X	X	X
Galapagos National Park Directorate (DPNG)	X	X	X
Galapagos Biosecurity Agency (ABG)	X	X	
Ministry of Agriculture (MAG)		X	
Ministry of Public Health		X	
Galapagos Government Council (CGREG)	X		
Floreana Parish Council (FPC)	X	X	
<b>Non-Governmental Organizations (NGOs)</b>			
Conservation International (CI)	X	X	X
Island Conservation (IC)	X	X	
Durrell Wildlife Conservation Trust (Durrell)		X	
Galapagos Conservancy (GC)			X

Each of the Governmental stakeholders has a specific role within the archipelago, in relation to its jurisdiction and the governmental administrative hierarchy. For their part, Non-Governmental Organizations contribute with technical assistance to the governmental institutions that lead the project components. The mandate / role of each governmental and non-governmental stakeholder, together with its expected role in the project, is shown in **Table 4** below.

**Table 4. Stakeholder roles, overall and with respect to project**

Stakeholder	Role	Engagement in the project
<b>Government Agencies</b>		
<b>Ministry of Environment (MAE)</b>	Formulates and coordinates Ecuador's environmental policies and leads efforts to protect the nation's terrestrial and marine ecosystems	The MAE will serve as the Government of Ecuador's (GoE) primary point of contact for project management and coordination. Ecuador's focal point for GEF 6 is a delegate of the Minister of Environment. The DPNG and ABG, both units of the MAE, will serve as the government leads for 'on-the-ground' implementation activities.
<b>Galapagos National Park Directorate (DPNG)</b>	Part of the MAE; manages and controls the Galapagos Marine Reserve and Galapagos National Park, promotes scientific research with conservation goals, and engages local and visitors in conservation activities	The DPNG will lead aspects of Component 1 and Components 2 & 3, coordinating activities with ABG, FPC, IC, GC and other stakeholders. They will provide a designate to serve on the Project Steering Committee  <a href="http://www.galapagospark.org/">http://www.galapagospark.org/</a>
<b>Galapagos Biosecurity Agency (ABG)</b>	Part of the MAE; controls, regulates, prevents, and reduces risk of the introduction and spread of non-native organisms	The ABG will lead aspects of Component 1 activities and provide a designate to serve on the Project Steering Committee. They will also coordinate with DPNG and IC on Component 2 activities, specifically aspects related to activities outside of the National Park. They will ensure that the environmental impact assessment adequately addresses risks to livestock and pets, and in conjunction with aspects related to human safety.  <a href="http://www.bioseguridadgalapagos.gob.ec/">http://www.bioseguridadgalapagos.gob.ec/</a>
<b>Ministry of Agriculture (MAG)</b>	Manages and executes the proper distribution of economic resources, technical assistance, and other support to agriculture producers	The MAG will interface with the ABG on Component 2 activities in the context of managing livestock. They will also assist DPNG on Component 2 activities, ensuring that the environmental impact assessment adequately addresses risks to agriculture and livestock.  <a href="http://singapgalapagos.agricultura.gob.ec/">http://singapgalapagos.agricultura.gob.ec/</a>
<b>Ministry of Public Health (MoPH)†</b>	Regulates, plans, coordinates, controls, and manages public health in Ecuador	The MoPH will interface with the DPNG and ABG on Component 2 activities ensuring that the environmental impact assessment and implementation adequately addresses risks to human health.
<b>Galapagos Government Council (CGREG)†</b>	Executes regional policies and activities within the Galapagos; formerly known as Instituto Nacional Galapagos	Provides oversight of major projects that are carried out within the Galapagos. Are coordinating the development of a consolidated cargo wharf in Guayaquil for improving Galapagos biosecurity (component 1).

	(INGALA)	<a href="http://www.gobiernogalapagos.gov.ec/">http://www.gobiernogalapagos.gov.ec/</a>
<b>Floreana Parish Council (La Junta Parroquial de Floreana; FPC)</b>	Part of the San Cristobal municipality; represents 145 residents of Floreana Island	The residents of Floreana Island have requested technical assistance for the eradication and control of invasive alien species. The FPC will provide local political support, community leadership and representation, facilitate community engagement, and participate in stakeholder meetings. They will coordinate with DPNG, ABG and IC to accomplish Component 2 activities in a manner that fully engages stakeholder input and maximizes the benefits of project execution to the people and biodiversity of Floreana Island. They will also coordinate with ABG on component 1 activities that fall within the FPC's jurisdiction
<b>NON-GOVERNMENTAL ORGANIZATIONS (NGOs)</b>		
<b>Conservation International (CI)</b>	CI empowers societies to responsibly and sustainably care for nature, our global biodiversity, for the well-being of humanity	CI will serve as the implementing agency for the project.  <a href="http://www.conservation.org">http://www.conservation.org</a>
<b>Island Conservation (IC)</b>	Prevents extinctions by removing invasive alien species from island ecosystems	IC will serve as the executing agency for the project. It will provide technical assistance to DPNG, ABG and other partners to implement Component 2, as well as provide a designate to the Project Steering Committee. <a href="http://www.islandconservation.org">http://www.islandconservation.org</a>
<b>Durrell Wildlife Conservation Trust (Durrell)†</b>	Provides the research and capacity building necessary to save the most threatened species and threatened places worldwide.	Durrell's work on captive holding endangered species will support development of non-target species risk management strategies as part of Component 2.  <a href="http://www.durrell.org/">http://www.durrell.org/</a>
<b>Galapagos Conservancy (GC)†</b>	Advances and supports conservation of the Galapagos Islands through directed research, informed public policy, and building a sustainable society	GC will support the DPNG in implementation of Component 3. GC is providing co-financing to support Components 1, 2 and 3 of this project. GC also provides technical support to DPNG in tortoise breeding activities, as well as planning and implementing tortoise translocations, such as will be conducted on Santa Fe Island and as is proposed for Floreana Island after the eradication of invasive mammals.  <a href="http://www.galapagos.org/">http://www.galapagos.org/</a>

### Stakeholder Engagement Plan for full project phase

Building on activities summarized in Table 2 above, the project will support information campaigns aimed at providing and raising the level of information about the project to stakeholders. The information will be provided through informative meetings with every governmental institution and in the case of the Floreana community, every family will be visited to provide the information and collect concerns of community members.

This plan seeks to outline all the activities intended to involve stakeholders into a participatory process across all the components with the objective of generating an active participation of actors on the different phases and components of the project. To fulfill this objective, all the actors must understand the scope of the project and have a baseline of information that will allow them to have the necessary knowledge to make decisions, change behaviors and produce the adequate conditions to achieve the project.

Specific objectives will include:

- Develop a participatory process, involving partner institutions and community members into the development and project planning.
- Generate a baseline of information about the project amongst the stakeholders to facilitate involvement and decision making.
- Implement a platform of information to share information about the project across the stakeholders and receive suggestions and concerns.
- Generate a culture of conservation through the implementation of a process to raise environmental awareness and reinforce a cultural identity compatible with the social and natural reality of the Galapagos inhabitants.
- Enable the conditions needed among the Galapagos communities to implement the social infrastructure needed for the eradication of invasive rodents and feral cats on Floreana.
- Promote a change in traditional livestock management to move towards ecologically-sustainable farming practices on Floreana.

**Table 5** below presents a tentative list of consultations planned for the project's implementation phase.

**Table 5: Consultation activities planned to take place during project implementation phase**

Date	Project component	Topic	Attendees/ Stakeholders	Objective	Comments
June 2020	1	Consultation with entities which participate in the biosecurity procedures and processes	Direccion Aviacion Civil Airline and Shipping companies Port Authority CGREG DPNG	ABG will conduct one on one meetings with these stakeholders to introduce the new procedures, explain why the changes are required to take place and ensure buy-in from other entities that are part of the process.	Ensure buy-in from other entities which are part of the biosecurity process
Aug-Oct 2018	2	Chicken coops and farm infrastructure	Floreana farmers	Coordinate construction of 7 chicken coops funded by IC. Discuss additional needs, concerns and next steps	Continues dialogue and directs action in next steps to achieve shared vision.

Date	Project component	Topic	Attendees/ Stakeholders	Objective	Comments
				in sustainable agriculture for each farm.	
Oct 2018, monthly until process completed (potentially June 2019)	2	Operational and management plans	Floreana community.	Discuss with households the various plans as they relate to their property and household.	Continued outreach to Floreana community, deepening understanding. Household visit forms completed and copy provided to household interviewed.
January 2019	2	Chicken coops	Floreana farmers	Coordinate remaining 10 GEF-funded chicken coop constructions with farmers, complete agreements.	Record results in minutes of meeting and signed agreements.
Project inception	1,2,3	Overall project	Public meetings in Puerto Ayora (Santa Cruz Island), and Puerto Velasco Ibarra (Floreana Island).	Presentation of GEF project overview to stakeholders, introduce project manager.	In addition to general project overview, grievance mechanism explained amongst other points.
May 2019	2	Chicken coops and other farm infrastructure	Floreana farmers	Review processes implemented with farmers (After Action Review), to determine what could have been done better.	Record results in minutes of meeting.
May 2019, December 2019	2	FPC declaration	FPC, DPNG, IC	Process to establish the FPC declaration	Record results in minutes of meeting.
September 2019	2	Environmental and Social Impact Assessment	ABG, DPNG, MAG, FPC, IC, Floreana community	Present complete eradication project to stakeholders and solicit public comment.	ESIA Consultant records results.
September 2019	3	Field Planning Meetings	DPNG	Agree on key activities to mission and ensure all parties are clear in terms of roles and responsibilities	Meeting Minutes outlining key responsibilities

## Resources and responsibilities

In addition to significant staff time, approximately \$5,000 has been set aside in the project budget for the stakeholder consultations outlined in Table 5 above. Responsibilities will be in accordance with overall implementation responsibilities, with IC taking the lead, in close co-operation with Governmental partners, in consultations under Components 1 and 2 and Galapagos Conservancy taking a similar role for Component 3-specific consultations.

### Grievance mechanism

The project's grievance mechanism is described in **Appendix VI** above.

### Monitoring and reporting

**Table 6: Indicators related to stakeholder engagement**

Indicators	Metrics	Methodology	Baseline	Target	Location	Frequency	Responsible Parties	Indicative Resources
1	Number of government agencies, civil society organizations, private sector, and other stakeholder groups that have been involved in the project implementation phase on an annual basis	Consultation / participation to be recorded on an ongoing basis and summarized in annual project reporting	NA	At least 15 annually	PMU	Once (Y3, Q2)	PMU	Approximately 5-10% of the project team's time will be allocated to monitoring of indicators. No additional dedicated budget is allocated
2	Number persons (sex disaggregated) that have been involved in project implementation phase (on an annual basis)	Consultation / participation to be recorded on an ongoing basis and summarized in annual project reporting	NA	At least 100 men and 100 women annually	PMU	Once (Y3, Q2)	PMU	Approximately 5-10% of the project team's time will be allocated to monitoring of indicators. No additional dedicated budget is allocated
3	Number of engagement (e.g. meeting, workshops, consultations) with stakeholders during the project implementation	Meetings, workshops and consultations to be recorded on an ongoing basis and summarized in annual	NA	At least 12 annually	PMU	Once (Y3, Q2)	PMU	Approximately 5-10% of the project team's time will be allocated to monitoring of indicators. No additional dedicated budget is allocated

Indicators	Metrics	Methodology	Baseline	Target	Location	Frequency	Responsible Parties	Indicative Resources
	phase (on an annual basis)	project reporting						
4	Percentage of stakeholders who rate as satisfactory the level at which their views and concerns are taken into account by the project	To be undertaken by the consultant hired by the CI-GEF Agency to conduct the MTR and Terminal Evaluation	NA	>95%	PMU	Once (Y3, Q2)	CI-GEF Agency	Approximately 5-10% of the project team's time will be allocated to monitoring of indicators. No additional dedicated budget is allocated



## APPENDIX X: DETAILED PROJECT BUDGET

GEF FUNDED BUDGET				Project budget by component (in USD)					Project budget per year (in USD)			
Category	Comments/Justification	DETAILED DESCRIPTION	Flex Code/Outputs	C 1	C 2	C 3	Project Management Costs	Total	YR1	YR2	YR3	TOTAL
Salary and Benefits Local	Project Manager	Galapagos/Project Specific hire/30 months/ NJ2	All	100,939.16	115,540.43	100,939.16	16,706.25	334,125	133,650	133,650	66,825	334,125
Salary and Benefits Local	Project Assistant	Galapagos/Project Specific hire/ 27 months/ SP4	All	34,077.83	39,007.33	34,077.83	26,790.75	133,954	44,651	59,535	29,768	133,954
Salary and Benefits Local	Biosecurity Specialist	Galapagos / Project Specific hire / 27 months / NJ1 level	1.1.1, 1.1.2, 1.1.3	207,218.25				207,218	69,073	92,097	46,049	207,218
Salary and Benefits Local	IC Staff to produce C2 products	In addition to C2 products they will be in charge of Stakeholder Engagement Plan, Grievance Mechanism, Gender Plan	2.1.1, 2.1.2, 2.1.3, 2.1.4, 2.1.5		289,777.50			289,778	115,911	115,911	57,956	289,778
Salary and Benefits Local	IC High level supervision	EA Supervision	All				68,715.00	68,715	27,483	27,486	13,746	68,715
Salary and Benefits Local	Restoration Specialist	Galapagos / Project Specific hire / 27 months / SP7. Environmental Management Plan	2.1.1, 2.1.2, 2.1.3, 2.1.4, 2.1.5 3.1.1, 3.1.2, 3.2.1, 3.2.2, 3.2.3		84,746.25	84,746.25		169,493	56,498	75,330	37,665	169,493
<b>Total Personnel Salaries and benefits</b>				<b>342,235</b>	<b>529,072</b>	<b>219,763</b>	<b>112,212</b>	<b>1,203,282</b>	<b>447,266</b>	<b>504,009</b>	<b>252,008</b>	<b>1,203,282</b>
Auditing fees	Project Audit (required annually)	USA	All				45,000.00	45,000	15,000	15,000	15,000	45,000
Translation services or fees	Translation of reports sent to CIGEF	Aprox .12 cents per word (inc VAT)	All	10,000.00	10,000.00	10,000.00		30,000	10,000	14,000	6,000	30,000
Consultant fees	Independent external midterm review/Independent terminal examination	Including fees, travel and VAT	All	20,000.00	20,000.00	20,000.00		60,000		30,000	30,000	60,000
Consultant fees	Consultancy for Evaluation and Action Plan	Including Fees, travel and VAT	1.1.1	40,000.00				40,000	40,000			40,000
Consultant fees	Consultancy to develop software to facilitate inspection	Including Fees, travel and VAT	1.1.2	35,000.00				35,000		35,000		35,000
Consultant fees	Environmental & Social Impact Assessment	Including Fees, travel and VAT	2.1.5		123,405.49			123,405	61,703	61,703		123,405
<b>Total Professional Services</b>				<b>105,000</b>	<b>153,405</b>	<b>30,000</b>	<b>45,000</b>	<b>333,405</b>	<b>126,703</b>	<b>155,703</b>	<b>51,000</b>	<b>333,405</b>

Domestic airfare	EA staff Transport to Quito or lapagos	1 pax X 4 trips X 3 years	All	1,900	2,200	1,900	6,000	2,500	2,500	1,000	6,000
Hotel/ Lodging	EA staff Accomodation	1 pax X 4 trips X 3 days X 3 years	All	1,100	1,400	1,100	3,600	1,500	1,500	600	3,600
Per Diem	EA staff meals (per diem)	1 pax X 4 trips X 3 days X 3 years		525	750	525	1,800	750	750	300	1,800
Transportation	EA staff taxis to airports and other incidentals	1 pax X 4 trips X 3 years	All	350	500	350	1,200	500	500	200	1,200
Non-EA staff travel	1 GoE representative domestic travel to induction/closeure meeting, PSC, PMC meetings.	1 pax X 6 trips X 3 years	All	2,900	3,200	2,900	9,000	3,000	4,000	2,000	9,000
Non-EA staff travel	GOE staff Accomodation	1 pax X 6 trips X 3 days X 3 years	All	1,700	2,000	1,700	5,400	1,800	2,400	1,200	5,400
Non-EA staff travel	GOE staff meals (per diem)	1 pax X 6 trips X 3 days X 3 years	All	825	1,050	825	2,700	900	1,200	600	2,700
Non-EA staff travel	GOE staff taxis to airports and other incidentals	1 pax X 6 trips X 3 years	All	500	800	500	1,800	600	800	400	1,800
Meals/ catering	Meetings Steering and Management Comittee	1 PSC per year, 4 PMC per year. 1 day X 15 pax X	All	2,800	5,200	2,800	10,800	3,500	4,500	2,800	10,800
Meals/ catering	Inception Meeting	2 days X 20 pax X \$25	All	300	500	300	1,100	1,000			1,000
Transportation	Inter-island Transport	5 trips X3 years	1	900			900	300	300	300	900
Hotel/ Lodging	Accomodation Interislands travel	5 trips X 3 days X 3 years	1	4,500			4,500	1,500	1,500	1,500	4,500
Per Diem	Meals interislands travel	5 trips X 3 days X 3 years	1	2,250			2,250	750	750	750	2,250
Non-EA staff travel	Inter-island Transport	3 trips X 3 years	1	540			540	180	180	180	540
Non-EA staff travel	Accomodation Interislands travel	3 trips X 3 days X 3 years	1	2,700			2,700	900	900	900	2,700
Non-EA staff travel	Meals interislands travel	3 trips X 3 days X 3 years	1	1,350			1,350	450	450	450	1,350
Domestic airfare	Air transport GPS - Mainland	4 trips X 3 years	1	6,000			6,000	2,000	2,000	2,000	6,000
Hotel/ Lodging	Acomodation Mainland	4 trips X 3 years X 3 days	1	3,600			3,600	1,200	1,200	1,200	3,600
Per Diem	Meals Mainland	4 trips X 3 years X 3 days		1,800			1,800	600	600	600	1,800
Transportation	Taxis to airport and other incidentals	4 trips X 3 years		1,200			1,200	400	400	400	1,200
Non-EA staff travel	Air transport GPS - Mainland	2 trips X 3 years	1	3,000			3,000	1,000	1,000	1,000	3,000
Non-EA staff travel	Acomodation Mainland	2 trips X 3 years X 3 days	1	1,800			1,800	600	600	600	1,800
Non-EA staff travel	Meals Mainland	2 trips X 3 years X 3 days		900			900	300	300	300	900
Non-EA staff travel	taxis to airports and other incidentals	2 trips X 3 years		600			600	200	200	200	600
Meals/ catering	Capacity building workshops with ABG staff	8 mini workshops with ABG staff	1.1.3	2,000			2,000	400		1,600	2,000
Fuel/ petrol	GNPD boat fuel to Floreana	Travel to Floreana	2		6,000		6,000	2,400	3,000	600	6,000
Transportation	Inter-island transport	20 trips X 3 years to Floreana	2		3,600		3,600	1,440	1,800	360	3,600
Hotel/ Lodging	Accomodation Floreana	20 trips X 3 days X 3 years to Floreana	2		6,300		6,300	2,520	3,150	630	6,300

Per Diem	Meals interisland travel	20 trips X 3 days X 3 years to			9,000			9,000	3,500	3,500	2,000	9,000	
International airfare	Eradication specialist, USA-Glpgs-USA, site visits	1 pax X 4 trips	2		7,200			7,200	1,800	3,600	1,800	7,200	
Transportation	Taxis to and from airports, and incidentals	1 pax X 4 trips	2		400			400	100	200	100	400	
Hotel/ Lodging	Accomodation UIO/GYE during international travel	1 pax X 4 trips X 2 days	2		800			800	200	400	200	800	
Per Diem	Per diem UIO/GYE during international travel	1 pax X 4 trips X 2 days	2		400			400	100	200	100	400	
Domestic airfare	Airfare GPS - Mainland	6 trips X 3 years			9,000			9,000	1,500	6,500	1,000	9,000	
Hotel/ Lodging	Accomodation Mainland	6 trips X 3 years X 3 days	2		5,400			5,400	800	3,900	700	5,400	
Per Diem	Per diem mainland	6 trips X 3 years X 3 days			2,700			2,700	450	1,900	350	2,700	
Transportation	Taxis to airports and incidentals	6 trips X 3 years			1,800			1,800	300	1,300	200	1,800	
Meals/ catering	Talleres Floreana	4 workshops with stakeholders	2.1.5		2,561			2,561	1,280.53	1,280.53		2,561	
Total Travel, Meetings and Events					46,040	72,761	12,900	-	131,701	43,221	59,261	29,120	131,601
External grants (sub-grants)	Grantee ABG. Equipment to improve the effectiveness of biosecurity control.	1 X ray equipment for GYE Port	1.1.2		90,000			90,000		90,000		90,000	
External grants (sub-grants)	Grantee ABG. Equipment to improve the effectiveness of biosecurity control.	Weight for pallets at GYE Port	1.1.2		5,000			5,000		5,000		5,000	
External grants (sub-grants)	Grantee ABG. Equipment to improve the effectiveness of biosecurity control.	Crematorium to destroy intercepted articles and potential pests	1.1.2		87,000			87,000		87,000		87,000	
External grants (sub-grants)	Grantee ABG. 2 work vehicles (inc VAT and transport to GPS)	2 work vehicles to support ABG work in Floreana y Santa Cruz	1.1.2		80,000			80,000	80,000			80,000	
External grants (sub-grants)	Grantee ABG. Small gear and materials to improve effectiveness of biosecurity control.	Inspection tables, estetoscope, centrifuge	1.1.2		5,644			5,644	5,644			5,644	
External grants (sub-grants)	Grantee ABG. Inspection kits for GYE, Santa Cruz and Floreana control points	225 Inspection kits with: (front pack, twizers, pliers, flashlights, inspection tape,	1.1.2		33,750			33,750		33,750		33,750	
External grants (sub-grants)	Grantee DPNG. Improvement to cold chambers for quarentene procedures in DPNG Santa Cruz and Floreana offices		1.1.2		25,000			25,000		25,000		25,000	
External grants (sub-grants)	Grantee ABG. Equipment for automatization of inspection to support software (barcode scanner, computers, etc)		1.1.2		16,000			16,000		16,000		16,000	
External grants (sub-grants)	Grantee Floreana Farmers. Chicken coops X8	Galapagos	2.1.3		210,000			210,000	168,000	42,000		210,000	
External grants (sub-grants)	Sub grant to Galapagos Conservancy		3			580,006		580,006	216,190	360,316	3,500	580,006	
Total Grants & Agreements					342,394	210,000	580,006	-	1,132,400	469,834	659,066	3,500	1,132,400

Total Equipment					-	-	-	-	-	-	-	-	
Indirect Costs	Indirect costs-Grants manager, Finance manager, Human resources manager, Accountant fees, Cell phone plans (monthly charges), Office stationary Office shipping and freight, Cleaning Glpgs office fees, %	Global	All		50,494	56,225	50,494	157,213	62,885	62,885	31,443	157,213	
Direct Costs	Shared Direct Costs- Computers, IT support, program licenses, cell phones, professional development training, R&D, global affairs (e.g. GEF meeting	Global	All		104,987	120,175	104,987	330,149	132,060	132,060	66,030	330,149	
Freight, postage, delivery	Related to with Safeguard compliance and communication with key stakeholders	Galapagos	All		850	1,300	850	3,000	1,000	1,100	1,000	3,100	
Communication printing	Related to with Safeguard compliance and communication with key stakeholders	Galapagos	All		1,000	1,322	1,000	3,322	1,000	1,322	1,000	3,322	
Communication printing	Printing of inspection protocols	Galapagos	1		3,500			3,500			3,500	3,500	
Car maintenance, insurance, registration	Registration X 2 vehicles		1		3,500			3,500	3,500			3,500	
Total Other Direct Costs					164,331	179,022	157,331	-	500,684	200,445	197,367	102,972	500,784
Total GEF funded project costs					1,000,000	1,144,260	1,000,000	157,212	3,301,472	1,287,467	1,575,405	438,600	3,301,472

CO-FINANCING				Co-financing by component (in USD)					Co-financing per year (in USD)			
SOURCES OF CO-FINA	NAME OF CO-FINANCIER	CO-FINANCING DI	TYPE OF COFINANCING	C 1	C 2	C 3	Project Managem ent Costs	Total	YR1	YR2	YR3	TOTAL
Recipient Government	DPNG		inkind	2,500,000	3,000,000	5,000,000		10,500,000	3,000,000	4,500,000	3,000,000	10,500,000
Recipient Government	ABG		in kind	4,500,000				4,500,000	1,500,000	2,500,000	500,000	4,500,000
CSO	IC		grants	50,000	1,000,000	50,000	300,000	1,400,000	700,000	500,000	200,000	1,400,000
CSO	GC		grants			1,925,000		1,925,000	600,000	925,000	400,000	1,925,000
Others	CI-GEF		grants	70,000	-			70,000	30,000	30,000	10,000	70,000
				-	-	-	-	-	-	-	-	-
				-	-	-	-	-	-	-	-	-
Sub Total Co-financing IN-KIND				7,120,000	4,000,000	6,975,000	300,000	18,395,000	5,830,000	8,455,000	4,110,000	18,395,000
Sub Total Co-financingIN CASH				-	-	-	-	-	-	-	-	-
<b>Total Co-financing</b>				7,120,000	4,000,000	6,975,000	300,000	18,395,000	5,830,000	8,455,000	4,110,000	18,395,000

## APPENDIX XI: CO-FINANCING COMMITMENT LETTERS



ISLAND CONSERVATION

Preventing Extinctions

2161 Delaware Ave, Suite A Santa Cruz, CA 95060 831-359-4787 [www.islandconservation.org](http://www.islandconservation.org)

Board of Directors

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Founding Advisors

Paul Ehrlich  
Stanford University

Russell Mittermeier  
Conservation International

Harold Mooney  
Stanford University

David Quammen  
Author and Journalist

Peter Raven  
Missouri Botanical Garden

José Sarukhán Kermex  
Institute of Ecology, UNAM

Michael Soulé  
University of California, Santa Cruz

Edward O. Wilson  
Harvard University

August 22<sup>nd</sup>, 2018

Mr. Miguel Morales  
Vice President, CI-GEF Project Agency  
2011 Crystal Drive  
Suite 500  
Arlington, Virginia 22202  
USA

Subject: Co-Financing support for “Safeguarding biodiversity in the Galapagos Islands by enhancing biosecurity and creating the enabling environment for the restoration of Galapagos Island ecosystems.”

Dear Mr. Morales,

On behalf of the Island Conservation, I am pleased to commit \$1,400,000 in co-financing to Conservation International in support of the project, “Safeguarding biodiversity in the Galapagos Islands by enhancing biosecurity and creating the enabling environment for the restoration of Galapagos Island ecosystems.” Of this total, US\$ 1,275,000 has been committed contingent upon award.

This cash co-financing comes from grants and donations that Island Conservation expects to or has already received to fund its activities. Assuming that the Project will receive GEF CEO endorsement by the end of 2018, we have calculated our co-financing for a period of 30 months from January 2019 – June 2021. Specifically, the co-financing will cover staff salaries, activities related to delivery of GEF products and costs to advance the Floreana Restoration Project in general.

This contribution as described above is intended to qualify as co-financing should the project proposal be successful.

Sincerely,

**Karl Campbell**  
**South America Regional Director**  
**Island Conservation**



August 24, 2018

Mr. Miguel Morales  
Vice President, CI-GEF Project Agency  
2011 Crystal Drive  
Suite 500  
Arlington, Virginia 22202  
USA

**Subject: Co-Financing support for "Safeguarding biodiversity in the Galapagos Islands by enhancing biosecurity and creating the enabling environment for the restoration of Galapagos Island ecosystems."**

Dear Mr. Morales,

On behalf of Galapagos Conservancy Inc, I am pleased to commit \$1,925,000 over a 30 month period, commencing in 2019 in co-financing to Conservation International in support of the GEF, "Safeguarding biodiversity in the Galapagos Islands by enhancing biosecurity and creating the enabling environment for the restoration of Galapagos Island ecosystems."

This co-financing is from unrestricted membership donations and will support Components 1, 2, and 3 which covers invasive species control and eradication, biosecurity measures, and advancing the recovery of island ecosystems through the establishment of keystone species (i.e. giant tortoises) during the period of January 2019 – June 2022 (assuming that GEF CEO Endorsement is received before December 2018). Specifically, the co-financing will cover direct costs related to laboratory services, field work, travel, equipment, training, education, outreach, and personnel associated with the activities above. The costs are based on an existing multi-year plan with specific outcomes per year.

This contribution as described above is intended to qualify as co-financing should the project proposal be successful

Sincerely,

Johannah Barry  
President

Oficio Nro. MAE-PNG/DIR-2018-0389-O

Puerto Ayora, 22 de agosto de 2018

Asunto: Co-Financing support for "Safeguarding biodiversity in the Galapagos Islands by enhancing biosecurity and creating the enabling environment for the restoration of Galapagos Island ecosystems."

Señor  
Miguel Morales  
Vice Presidente Ci, Gef Project Agency  
CONSERVATION INTERNATIONAL  
En su Despacho

Dear Mr. Morales,

On behalf of Galapagos National Park Directorate, I am pleased to commit \$10, 500, 000 in-kind in co-financing to Conservation International in support of the GEF, "Safeguarding biodiversity in the Galapagos Islands by enhancing biosecurity and creating the enabling environment for the restoration of Galapagos Island ecosystems."

This co-financing is from national fiscal funds and will support the **component 1**: furthering development of a state-of-the-art biosecurity system; **component 2**: solidifying the social license and infrastructure for the protection and recovery of Floreana Island ecosystems; **component 3**: Advancing the recovery of island ecosystems following invasive species eradication through the re-establishment of keystone species (i.e. giant tortoises), during the period of January 2019 – June 2022. The counterpart of the GNPD was calculated by assessing the costs of administrative staff, field staff, marine and land vehicles, equipment and materials that the GNPD will use to achieve the project's objectives.

This in-kind contribution as described above is intended to qualify as co-financing should the project proposal be successful.

Atentamente,

*Documento firmado electrónicamente*

Dr. Jorge Enrique Carrión Tacuri  
DIRECTOR DEL PARQUE NACIONAL GALÁPAGOS

Copia:

Señor Ingeniero  
Christian Roberto Vega León  
Director de Planificación Institucional PNG

Daniela Carrión  
Asesora Técnica Regional Lac, Ci-gef  
CONSERVATION INTERNATIONAL

Señor Magister  
Danny Omar Rueda Córdova  
Director de Ecosistemas PNG

lc/cv/dr



Firmado electrónicamente por:  
**JORGE ENRIQUE  
CARRION TACURI**





30 June 2018

Mr. Miguel Morales  
Vice President, CI-GEF Project Agency  
2011 Crystal Drive  
Suite 500  
Arlington, Virginia 22202  
USA

Subject: Co-Financing support for "Safeguarding biodiversity in the Galapagos Islands by enhancing biosecurity and creating the enabling environment for the restoration of Galapagos Island ecosystems."

Dear Mr. Morales,

On behalf of the Agencia de Regulación y Control de la Bioseguridad y Cuarentena para Galapagos, I am pleased to commit \$4'500.000 in co-financing to Conservation International in support of the project, "Safeguarding biodiversity in the Galapagos Islands by enhancing biosecurity and creating the enabling environment for the restoration of Galapagos Island ecosystems."

This in-kind co-financing comes from our own fiscal resources and will support Component 1: Furthering development of a state-of-the-art biosecurity system. Assuming that the Project will receive GEF CEO endorsement by the end of 2018, we have calculated our co-financing for a period of 30 months from January 2019 – June 2022. Specifically, the co-financing will cover the value of the personnel assigned to biosecurity tasks, maintenance of equipment and costs of materials and supplies to aid inspection.

This contribution as described above is intended to qualify as co-financing should the project proposal be successful

Sincerely,

Dra. Marilyn Cruz  
Executive Director  
Agencia de Regulación y Control de la Bioseguridad y Cuarentena para Galápagos



2011 Crystal Drive, Suite 500, Arlington, VA 22202, USA  
Tel: +1 703 341.2400  
Fax: +1 703 553.4817  
www.conservation.org



September 10, 2018

Dr. Miguel Morales  
Vice President, CI-GEF Project Agency  
2011 Crystal Drive  
Suite 500  
Arlington, Virginia 22202  
USA

Subject: Co-Financing support for "Safeguarding biodiversity in the Galapagos Islands by enhancing biosecurity and creating the enabling environment for the restoration of Galapagos Island Ecosystems"

Dear Dr. Morales,

On behalf of Conservation International Foundation (CI), I am pleased to inform you that CI plans to contribute \$70,000 in co-financing in support of the GEF project "Safeguarding biodiversity in the Galapagos Islands by enhancing biosecurity and creating the enabling environment for the restoration of Galapagos Island Ecosystems."

This co-financing will be generated by the *Fondo para el Control de Especies Invasoras de Galápagos* (FEIG) using financial resources catalyzed by a contribution from CI's Global Conservation Fund in 2007. During the period from January 2019 to June 2021, this co-financing will support "Component 1: Furthering development of a state-of-the-art biosecurity system," including "Outcome 1.1.: The number of invasive alien species entering the Galapagos archipelago is substantially reduced." Specifically, the co-financing will cover technical support, implementation, equipment, administrative support and other costs related to the strategic deployment of conservation resources throughout the Galapagos. The amount of these contributions was estimated by projecting FEIG's annual disbursements based on annual returns from CI's initial investment.

This contribution as described above is intended to qualify as co-financing should the project proposal be successful

Sincerely,

A handwritten signature in black ink, appearing to read "Barbara DiPietro", with a long horizontal flourish extending to the right.

Barbara DiPietro  
Chief Financial Officer  
Conservation International

## APPENDIX XII: VEHICLE JUSTIFICATION

### PURPOSE:

To mobilize staff to the control and monitoring points for introduced species, to transport confiscated cargo to disposal and/or incineration facilities, to serve as a means of transportation and mobilization of fumigation, spraying, disinfection, and pest control equipment to areas that are difficult to access.

### BUDGET ALLOCATION:

Total for two (2) vehicles      \$80.000 USD

### CUSTODIAN:

Agency for the Regulation and Control of Biosecurity and Quarantine for Galapagos (*Agencia de Regulación y Control de la Bioseguridad y Cuarentena para Galápagos*, in Spanish).

### USERS:

The vehicles will be used exclusively by ABG technicians from the offices located in Floreana and Baltra islands.

The vehicles will be granted to ABG as soon as they are bought. ABG will pay for maintenance and insurance costs.

### RELATION TO PROJECT OUTPUTS (Low, Medium, High)

High

### PROCUREMENT REQUEST:

#### Technical Specifications

Engine	3.0L Diesel CRDI	<b>CAPABILITIES AND WEIGHTS</b>	
Engine Specification	2999	Gross Vehicle Weight (kg)	2950
Valves	16	Front axle capacity (kg)	1350
Net power (HPrpm)	134@3600	Rear axle capacity (kg)	1870
Torque (NM rpm)	294@1400 -3000	Loading capacity (kg)	1045
Fuel Supply	CRDI		
Transmission	Manual, 5 speeds		

Traction	4x4 drive
Transfer Case	Shift on the fly
Steering	Hydraulic rack and pinion
Front Suspension	Independent Double Wishbone type
Rear Suspension	Rigid with leaf spring
Front Brakes	Ventilated disc
Rear Brakes	Drum
Parking Brake	Between seats
Tires	245/75/R16

#### ESPECIFICACIONES TÉCNICAS

Motor	3.0L Diésel CRDI
Motorización c.c.	2999
Válvulas	16
Potencia neta (HP@rpm)	134 @ 3600
Torque (Nm@rpm)	294 @ 1400 - 3000
Alimentación	CRDI
Transmisión	Manual 5 Velocidades
Tracción	4x4
Candados	Shift on the fly
Dirección	Hidráulica Píñón y Cremallera
Suspensión Delantera	Independiente Tipo Doble Wishbone
Suspensión Posterior	Rígida con Ballesta
Frenos Delanteros	Disco Ventilado
Frenos Posteriores	Tambores
Freno de Parques	Entre Asientos
Llantas	245/75/ R16

#### CAPACIDADES Y PESOS

Peso Bruto Vehicular (kg)	2950
Capacidad Eje Delantera (kg)	1350
Capacidad Eje Posterior (kg)	1870
Capacidad de Carga (kg)	1045



## JUSTIFICATION

### Vehicle for Floreana Island:

Floreana Island is located in the south of the Galapagos Archipelago. From a biosecurity point of view, Floreana is a key objective to the project since it has the necessary conditions to implement an optimal prevention and control system (under Component 1) which will allow the ecological restoration of the island (plans for which will be elaborated under Component 2).

Prevention activities related to control and monitoring of pests and/or diseases are distributed throughout the island, including within the protected area. In order to carry out these activities, 30 - 40 km (19 - 25 miles) circuits must be covered daily, in some cases in areas that are difficult to access.

Currently, these control and prevention activities are carried out through inter-institutional collaboration between the Parochial Board and the Galapagos National Park, working together to enable personnel and equipment to be moved to the work areas.

With the project's implementation, control and prevention efforts will be increased, making it necessary to have a vehicle which complies with the required characteristics that will allow the transportation of personnel, equipment, and tools to and from the work areas.

The vehicle will support the following project activities:

- Monitoring quarantine pests in the rural area; inspect and service traps. Circuit's approximate route is 35km (22 miles). Transportation of personnel and equipment.
- Monitoring ants in urban and rural areas. Circuit's approximate route is 20 km (12.5 miles). Transportation of personnel and equipment.
- Mobilizing personnel to Los Naranjos Hill for fruit fly control and monitoring. Approximately 20 km (12.5 miles). Transportation of personnel and equipment.
- Inspecting traps in the Las Palmas area, harvesting and fruits and marking trees. Circuit's approximate route, 20 km (12.5 miles). Transportation of personnel and equipment.
- Spraying for insect control in urban areas. Approximately 15 km (9.3 miles). Transportation of personnel and equipment.
- Serve as a supporting tool to transport confiscated products in inspection points.

The vehicle will also be used to support activities taking place under Component 2 of the project.



*Routes in Floreana Island which must be covered to monitor introduced species.*

#### **A vehicle for Santa Cruz/Baltra Islands:**

Baltra Island is located at the center of the archipelago. Since the airport is located in this island, its importance is ecological as well as economic. Baltra is the gateway for the largest number of tourists and luggage coming from continental Ecuador.

The island's geographical location, as well as its climate, have made it a natural barrier for pests that were able to go through the first prevention barrier at the Quito and Guayaquil airports since they cannot

survive or be dispersed. In this sense, Baltra is another natural barrier, which strengthens the entry prevention system for introduced species.

Timely detection of any type of introduced organism in Baltra Island is crucial, since it will probably not find the favorable environmental conditions necessary to flourish. This allows deploying an appropriate and rapid response to eliminate the organism before it can move to the closest islands. This happened when a quarantine species of fruit fly was detected in an aircraft from Guayaquil; with a rapid response and appropriate emergency actions, it was possible to prevent its dispersal.

Currently, in order to carry out its prevention, surveillance, and monitoring activities on Baltra, ABG has assigned permanent staff to work at the airport making monitoring and pest surveillance rounds. The current logistic conditions are basic, and bicycles have been implemented to inspect the traps located at different points on the island.

When the project is implemented, the demand for activities will be much greater and the logistical support will require a vehicle that can transport equipment, personnel, and materials to carry out prevention and surveillance activities.

At the airport itself, forbidden products and/or in poor condition are retained daily. These need to be transported to the appropriate disposal facilities. Daily monitoring runs are also made on routes where there is constant surveillance monitoring that no new species have arrived; there will also be greater response actions to this improved monitoring.



*Map of Baltra Island. The inspection routes consist of a circuit through several points in the island, including the airport's surrounding areas.*

## **EFICIENCY**

With the acquisition of the proposed vehicles, the actions foreseen in component 1 of the project will be drastically impacted in a positive manner; they will help to meet the goal of increasing the number of retentions by consolidating a technical, operational, and reliable system.

The vehicles will support a number of important ABG technical processes; this will improve the response times, the effectiveness of actions, and overall system efficiency.

## FINANCIAL ANALYSIS

Cost-benefit analysis:

### COSTS

DETAIL	UNIT	QUANTIT Y	UNIT PRICE	TOTAL
Acquisition of double cab pickup truck	Unit Price	2	\$40,000.00	\$80,000.00
*Cost of fuel	Cost per month	30	\$200.00	\$6,000.00
*Cost of preventive maintenance	Cost per month	30	\$100.00	\$3,000.00
* Cost of changing tires for 2 vehicles	Cost per set of tires	6	\$1,000.00	\$6,000.00
TOTAL COSTS				\$95,000.00

\* ABG absorbs these costs as the project's counterpart.

### SAVINGS/BENEFITS

DETAIL	UNIT	QUANTITY	UNIT PRICE	TOTAL
* Savings in renting 1 vehicle in Baltra.	Price/rental day	750	\$120.00	\$90,000.00
*Savings in renting 1 vehicle in Floreana.	Price/rental day	750	\$200.00	\$150,000.00
Saved time for 4 technicians in monitoring and inspection activities, considering 1 daily hour of savings	Price/hour per technician	750	\$120	\$90,000.00
TOTAL				\$330,000.00

\* Availability of vehicles has been considered, even though it is an aspect which cannot be guaranteed all of the time.

In the cost/benefit analysis we can see that the cost of acquiring and maintaining the vehicles for 30 months comes to approximately \$95,000, considering the price of the asset, fuel, preventive maintenance, and the cost of tire consumption.

Regarding the monetary benefit translated into financial savings, we see that the opportunity cost of renting a vehicle with the required characteristics in Baltra Island is \$ 120 per day, while in Floreana, it is approximately \$200 per day. We must take into consideration the availability and existence of said vehicles in those islands, since this is not always possible due to the reduced number of the



vehicle fleet. Consequently, the opportunity cost may be higher or nonexistent, creating problems when performing the technical activities due to lack of work tools.

We have also considered the time saved when not having to rent a vehicle, which is 1 hour per day for 4 technicians, because when renting there will be delays caused by unavailability at the right time or in the required schedule.

The cost/benefit analysis clearly demonstrates that it is cheaper (financially) to acquire the vehicles rather than renting them.

It can also be concluded that since a vehicle is an asset that depreciates in at least 5 years, it will generate an extra return at the end of the project for the beneficiary entity, supporting directly the project's sustainability.

Finally, a long term asset correctly oriented to the required activities generates synergy with other processes, and by itself is a catalyst for improvements in a project.