

Annex 11: Monitoring and Evaluation Plan for the Programme “Climate Change: The New Evolutionary Challenge for the Galapagos”

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1 MONITORING AND EVALUATION PLAN

Data/Source	Collection Tool	Frequency	Responsible	Indicator
<i>Fund-level impacts</i>				
<i>Energy generation recorded by energy meters</i> Baseline information and endline - Independent audit for verification	<i>Energy records</i> <i>Survey/questionnaire</i> <i>Field observation visits</i>	<i>Before and after project implementation</i>	Gransolar/TotalEren / CFN / Local banks / CAF / Evaluation	<i>1.1 Tonnes of carbon dioxide equivalent (t CO2eq) reduced or avoided as a result of Fund funded projects/programmes –gender-sensitive energy access power generation</i>
<i>Number of deficient equipment replaced; power and efficiency of each replacement; historical electricity consumption of beneficiaries</i> Baseline information and endline – Independent audit for verification	<i>Replacement records;</i> <i>Energy consumption records.</i> <i>Survey/questionnaire</i> <i>Field observation visits</i>	<i>Before and after project implementation</i>	ELECGALAP AGOS /CFN/Evaluation	<i>3.1 Tonnes of carbon dioxide equivalent (t CO2eq) reduced or avoided as a result of Fund funded projects/programmes – buildings, cities, industries, and appliances</i>

Baseline information and endline – Independent audit for verification	<i>Survey/questionnaire Field observation visits</i>	<i>Before and after project implementation</i>	FAO/Local Banks/Evaluation	<i>4.1 Tonnes of carbon dioxide equivalent (t CO₂eq) reduced or avoided (including increased removals) as a result of Fund-funded projects/programmes – forest and land-use</i>
Baseline information and endline – Independent audit for verification	<i>Livelihoods assessment reports Survey/questionnaire Field observation visits</i>	<i>Before and after project implementation</i>	FAO, WWF / Evaluation	<i>A1.2 Number of males and females benefiting from the adoption of diversified, climate resilient livelihood options (including fisheries, agriculture, tourism, etc.).</i>
Baseline information and endline – Independent audit for verification	<i>Report of Scalesia forest restoration practices, that includes a high-resolution map plus a carbon and a biodiversity assessment. Spatially explicit assessment of the new marine zoning. Reports of coral restored areas, diving sites and</i>	<i>Before and after project implementation</i>	FAO, WWF / Evaluation	<i>A4.1 Coverage/scale of ecosystems protected and strengthened in response to climate variability and change</i>

	<i>turtle nesting and feeding sites. Field observation visits</i>			
<i>Fund-level outcomes</i>				
M&E Project Reports	<i>Construction reports; Energy records; Survey/questionnaire Field observation visits</i>	<i>Before and after project implementation</i>	PV Solar plant developer, local banks, with CFN/CAF oversight	6.3 MWs of low emission energy capacity installed, generated and/or rehabilitated as a result of GCF support.
M&E Project Reports	<i>Replacement records; Energy consumption records. Survey/questionnaire Field observation visits</i>	<i>Before and after project implementation</i>	CFN	7.1 Energy intensity/improved efficiency of buildings, cities, industries and appliances as a result of Fund support.
M&E Project Reports	<i>Survey/questionnaire</i>	<i>Before and after project implementation</i>	FAO, WWF	9.1 Hectares of land or forests under improved and effective management that contributes to CO2 emission reductions
M&E Project Reports	<i>Survey/questionnaire</i>	<i>Before and after project implementation</i>	WWF and FAO	A6.1 Use of climate information products/services in decision-making in climate sensitive sectors

M&E Project Reports	<i>Records of approved subprojects; Survey/questionnaire</i>	<i>Before and after project implementation</i>	WWF and FAO	A7.2 Number of males and females reached by climate-related early warning systems and other risk reduction measures established/strengthened
M&E Project Reports	<i>Workshops and capacity building assistance records and capacity assessment; Survey/questionnaire</i>	<i>Before and after project implementation</i>	WWF	A8.1 Number of males and females made aware of climate threats and related appropriate responses
<i>Programme performance</i>				
M&E Project Reports	<i>Energy meters and records of the energy injected to grid by winning company with CFN/ CAF oversight. Financial Reports</i>	<i>Annually</i>	Gransolar/TotalEren	1.1.1.1 Centralized energy generation and storage project - <i>MW installed</i> - <i>kWh injected to the grid</i>
M&E Project Reports	<i>Energy records provided by PV panels measured</i>	<i>Annually</i>	CFN/Local banks	1.1.1.2 Renewable distributed power generation projects - <i>Financing volume of loans provided for the installation of distributed energy.</i>

	<i>by local meters at each location – to be gathered by local banks through self-reporting of companies and complemented with audits</i>			<ul style="list-style-type: none"> - <i>b. Number of loans provided for the installation of distributed energy (gender-disaggregated data). Number of MWh generated with distributed energy.</i>
M&E Project Reports	<i>The electricity company ELECGALAPAGOS must register the monthly consumption of the beneficiaries, which will show the consumption behaviour before and after the replacement of inefficient equipment. The replaced A/C and refrigeration equipment represents more than 60% of the</i>	<i>Annually</i>	ELECGALAPAGOS and LFIs with CFN/ CAF oversight	<p>1.2.1.1 Efficient energy consumption of the Galapagos' livelihoods</p> <ul style="list-style-type: none"> - <i>Financing volume of loans provided for energy efficiency investments.</i> - <i>b. Number of beneficiaries of loans for energy efficiency investments (gender-disaggregated data)</i> - <i>c. Number of MWh saved through energy efficiency investments.</i>

	<i>users' consumption, in some cases up to 70%. With this, the traceability and recording of savings will be seen from this baseline for all beneficiaries.</i>			
M&E Project Reports	<i>Training records with lists of participants disaggregated by gender Survey/questionnaire</i>	<i>Annually</i>	CFN	<p>1.3.1.1 Technical Assistance facility for energy investments</p> <ul style="list-style-type: none"> - <i>Number of participants at matchmaking events (gender disaggregated)</i> - <i>IFIs and CFN personnel trained for the development and implementation of mitigation projects.</i> - <i>Number of beneficiaries trained in mitigation projects development</i> - <i>Number of women-led businesses trained in green businesses</i> - <i>Number of beneficiaries supported with pre-investment activity</i> - <i>Number of local people trained in the installation and preventive maintenance of ER and EE technologies (gender-disaggregated).</i>
M&E Project Reports	<i>Training records with list of participants disaggregated by gender</i>	<i>Annually</i>	FAO	2.1.1.1. Implement a capacity building program for government technical staff for dissemination of practical information, knowledge and training about climate change and climate resilient agricultural practices

	<i>Framework document approved and validated</i> <i>Semi-Annual Project Progress Report</i> <i>Annual Project Progress Report</i> <i>Survey/questionnaire</i>			<ul style="list-style-type: none"> - <i>Number of specialists from key local agencies and organizations trained (disaggregated by gender)</i> - <i>Framework to include climate change capacity building for extension and rural advisory services for farmers</i>
M&E Project Reports	<i>Hydro-agro meteorological system managed by</i> <i>FAO/GSC/INHAMI</i> <i>Training records with list of participants disaggregated by gender.</i>	Annually	FAO	<p>2.1.1.2. Install a hydro/agro-meteorological monitoring system to inform and tailor the information to the needs of vulnerable smallholder farmers</p> <ul style="list-style-type: none"> - <i>Number of hydro/agro-meteorological monitoring information systems in place</i> - <i>Number of technical staff trained for implementation of sensors and management of the information system (disaggregated by gender)</i>
M&E Project Reports	<i>Delivery/reception acts</i>	Annually	FAO	<p>Activity 2.1.2.1. Develop a physical and knowledge network for conservation and use of phytogenic resources through in-situ and ex-situ conservation activities.</p> <ul style="list-style-type: none"> - <i>Financing volume of loans provided under Output 2.1.2</i>

	<i>Semi-Annual Project Progress Report</i> <i>Annual Project Progress Report Survey/questionnaire</i>			<ul style="list-style-type: none"> - Number of farmers provided with loans (disaggregated by gender) - Number of community-based “in-situ” seed banks at farm level implemented. - INIAP existing infrastructure improved (%)
M&E Project Reports	<i>Rural participatory assessment results</i> <i>Semi-Annual Project Progress Report</i> <i>Annual Project Progress Report</i> <i>Field schools reports</i>	Annually	FAO	<p>2.1.2.2. Implement an Integrated climate-resilient crop management system at farm level</p> <ul style="list-style-type: none"> - Number of hectares covered by ICM practices. - Number of medium and small-scale farms with ICM practices implemented. - Number of large-scale farms with ICM practices implemented.
M&E Project Reports	<i>Training records</i> <i>Carbon Organic soil monitoring results at farm level</i>	Annually	FAO	<p>2.1.2.3. Implement silvopastoral practices at the farm level</p> <ul style="list-style-type: none"> - Number of farmers trained to implement silvopastoral systems on farms (disaggregated by gender) - Number of farms with an Agroecological Silvopastoral System implemented. - Number of beneficiaries (disaggregated by gender).

				<ul style="list-style-type: none"> - Number of livestock production farms with biodigesters.
M&E Project Reports	<p>Survey/questionnaire</p> <p>Field observations</p>	Annually	FAO	<p>2.1.2.4. Develop and implement water collection and water management systems for climate-resilient food production</p> <ul style="list-style-type: none"> - Number of water sources and intakes implemented. - m3 of water storage needs covered by green and grey water storage infrastructure. - Km of water distribution systems installed. - Number of irrigation systems installed. - Number of beneficiaries of the water systems (disaggregated by sex). - Number of hectares with enhanced water supply
M&E Project Reports	<p>Studies, reports.</p> <p>Spatially explicit assessment of the new marine zoning.</p> <p>Endorsement letters from authorities and local stakeholders.</p> <p>Survey/questionnaire</p>	Annually	WWF	<p>2.1.3.1 Improve the design and management effectiveness of Galapagos marine zoning, based on conclusive scientific evidence on the impact of climate change on fishery resources, marine biodiversity, and fishers' livelihoods.</p> <ul style="list-style-type: none"> - Number of high ecological value areas (HEVA) effectively protected of all marine macro-habitats (e.g., corals) at each of the five marine bioregions of the GMR. - Number of No take zones (NTZ) strategically distributed to protect at least 30% of the breeding stock and critical recruitment and nursery habitats for sea cucumbers, spiny lobsters and sailfin groupers. -
M&E Project Reports	<p>Reports on decision making processes / Meeting reports.</p>	Annually	WWF	<p>2.1.3.2 Design and implement an advanced data system for the adaptive co-management of the Galapagos marine zoning.</p>

	<p><i>Reports delivered by Subtidal Ecological Monitoring” module</i></p> <p><i>Skills and competences assessment reports</i></p>			<ul style="list-style-type: none"> - “Subtidal Ecological Monitoring” module in place and integrated into the “Sistema Único de Información Ambiental (SUIA)”. - At least 60% of GNPD and CGREG management authorities and other relevant stakeholders trained for the integration of the framework in decision-making process and ongoing monitoring programs. -
M&E Project Reports	<p><i>Reports derived from the MSC’s Benchmarking and Tracking Tool (BMT)</i></p> <p><i>Monitoring and Traceability system reports</i></p> <p><i>MoU between GNPD and vessel owners.</i></p> <p><i>Monitoring and Traceability system reports</i></p>	Annually	WWF	<p>2.1.4.1 Management conditions of small-scale tuna fisheries, strengthened to reduce the ecological impact of the fishery over secondary and endangered, threatened and protected (ETP) species.</p> <ul style="list-style-type: none"> - Level of sustainability of Galapagos tuna fisheries derived from the MSC’s - BMT tool. - Tuna landings. - Number of ship-owners have implemented in their fishing vessels an electronic monitoring system and they are part of a blockchain traceability system. - Number of fishing organizations has designed and implemented a code of good fishing practices and a manual of best practice handling techniques for target and bycatch species.

	<i>Code of conduct endorsement letter</i>			
M&E Project Reports	<i>C-FIP for sailfin grouper document.</i> <i>Endorsement letters from authorities and fishers organizations.</i> <i>Reports derived from the MSC's Benchmarking and Tracking Tool (BMT)</i>	<i>Annually</i>	WWF	<p>2.1.4.2 Management of sailfin groupers fishery strengthened to mitigate climate change impacts while restoring the species ecological role.</p> <ul style="list-style-type: none"> - <i>Level of sustainability of sailfin grouper fisheries derived from the MSC-BMT tool..</i> -
M&E Project Reports	<i>Sea cucumber stocks assessment</i> <i>Rearing data report</i>	<i>Annually</i>	WWF	<p>2.1.4.3 Small-scale aquaculture and experimental allocation of Territorial Use Rights for Fishing (TURFs) implemented to rebuild sea cucumber stocks and diversify fishers' livelihoods.</p> <ul style="list-style-type: none"> - <i>Sea cucumber stocks size.</i> - <i>Number of larvae have been reared locally, and number of sea cucumbers have been released in specific TURF to accelerate stock rebuilding across the GMR.</i>

	<p><i>Official TURF allocation agreement.</i></p> <p><i>Income assessment of households with allocation of TURF</i></p>			<ul style="list-style-type: none"> - <i>Number of households receiving economic benefits from the successful allocation of TURF.</i>
M&E Project Reports	<p><i>Survey/questionnaire</i></p> <p><i>Monitoring reports</i></p> <p><i>Bank records</i></p>	<i>Annually</i>	FAO	<p><i>2.1.5.1 Implement strategies to improve the livestock/meat and milk value chain</i></p> <ul style="list-style-type: none"> - <i>Number of livestock production systems strengthened.</i> - <i>Number of slaughterhouses with management plan, traceability standards and reliable cold transport chain</i> - <i>Total of credit provided to farmers to improve their dairy processing plants.</i> - <i>Number of documents describing the results of the positioning of the local market.</i> - <i>Number of farmers with strengthened capacities related to management, use and conservation of pastures and forages, meat processing practices and the production of pasteurized milk, cheese, yogurt, and caramel (disaggregated by gender)</i>
M&E Project Reports	<p><i>Survey/questionnaire</i></p>	<i>Annually</i>	FAO	<p><i>2.1.5.2 Implement strategies to improve the Galapagos coffee value chain</i></p> <ul style="list-style-type: none"> - <i>Number of farmers strengthened on post-harvest strategies (disaggregated by gender)</i> - <i>Number of farmers strengthened on mobilization of productions with biosecurity measures (disaggregated by gender)</i>

				<ul style="list-style-type: none"> - Number of wet processing centers constructed. - Number of dry processing centers. - Number of hectares benefitted by strategies to improve the coffee value chain.
M&E Project Reports	<p><i>Survey/questionnaire</i></p> <p><i>Monitoring reports</i></p> <p><i>Field observations</i></p> <p><i>Delivery/reception acts</i></p> <p><i>Bank records</i></p> <p><i>Income analysis reports</i></p>	Annually	FAO	<p>2.1.5.3 Implement strategies to improve the Galapagos vegetables value chain</p> <ul style="list-style-type: none"> - Number of farmers strengthened on agroprocessing of banana, plantain, and cassava (disaggregated by gender) - Number of agro-processing plants constructed. - Number of public policies to position brand of cassava, banana and plantain chips and flours. - Number of farmers strengthened on agroprocessing of preserves and pulps of citrus fruits, pineapple and tomato (disaggregated by gender) - Number of agro-processing plants constructed. - Number of public policies to position brand of preserves and pulps of, at a minimum, pineapple, citrus and tomatoes. - Number of farmers strengthened on agroprocessing of aromatic and medicinal herbs (disaggregated by gender) - Number of agro-processing plants constructed. - Number of public policies to position brands of preserved aromatics.
M&E Project Reports	<p><i>G-Lab reports</i></p> <p><i>Enterprises legal constitution</i></p> <p><i>Enterprises assessments</i></p>	Annually	WWF	<p>2.1.5.4 Promotion of a blue circular economy through new sustainable and socially responsible seafood enterprises</p> <ul style="list-style-type: none"> - Number of local seafood enterprises with technical assistance from the “Galapagos Virtual Innovation Lab”. <p><i>From which:</i></p> <ul style="list-style-type: none"> - % of women-led enterprises

				<ul style="list-style-type: none"> - Number of entrepreneurs that have received sustained institutional and financial support by the G-Lab. - Number of value-added products are offered by the new socially responsible seafood enterprises.
M&E Project Reports	<i>Survey/questionnaire</i> <i>Loan approval document</i> <i>Bank records</i>	Annually	WWF	<p>2.1.5.5 Put in place a long-term financing mechanism to improve sustainability and competitiveness of Galapagos small-scale fishing sector.</p> <ul style="list-style-type: none"> - Number of soft loan credit programs established. - Number of entrepreneurs that have received credits from the Galapagos' Climate Credit Line for fisheries (disaggregated by gender).
M&E Project Reports	<i>Report from Early Detection and Rapid Response (EDRR) protocol</i> <i>Risk assessment reports</i> <i>Decision-making platform reports</i> <i>Training workshops reports.</i>	Annually	WWF	<p>2.2.1.1 Strengthen marine biosecurity programs in the GMR, to prevent and control marine bioinvasions by Nonindigenous Species (NIS) that could proliferate because of climate change.</p> <ul style="list-style-type: none"> - Number of Early Detection and Rapid Response (EDRR) protocol for marine invasive species is created and under implementation for the GMR. - Number of decision-makers from the GNPD and ABG consuming and incorporating information from the Decision Support System platform - Number of Countries of the ETP are aware and interested in the Galapagos Early Detection and Rapid Response (EDRR) system.

	<i>Skills and competences assessment</i> <i>Outreach materials</i> <i>Report on audiences exposed to the material.</i>			
M&E Project Reports	<i>Assessments reports</i> <i>Site and identification and selection report</i> <i>NSU exchange and training workshops reports.</i> <i>Experiments reports</i> <i>Nurseries implementation report.</i>	Annually	WWF	<p>2.2.1.2 Restore high ecological value coral reefs through coral planting and exclusion areas, to enhance their ecological role in the GMR.</p> <ul style="list-style-type: none"> - <i>Number of coral nurseries implemented in a site (in-situ) approved by the GNPD to grow new corals that will be transplanted to selected degraded areas.</i> - <i>Number of sites in selected islands (Darwin, Wolf and Floreana) under restoration schemes through transplanted corals from the nursery developed in collaboration with the GNPD.</i> - <i>Number of small-scale sea urchin removal plan experiment implemented to minimize reef damage and assist recovery of coral reefs.</i> - <i>Number of small-scale sea urchin removal plan experiments implemented to minimize reef damage and assist recovery of coral reefs.</i>

				<ul style="list-style-type: none"> - Number of tourism operators participating in coral restoration processes. - Percentage of coral areas in the GMR with improved health status. - Number of long-term monitoring systems in place, for the adaptive management of active and passive coral restoration actions under current and future climate scenarios. - .
M&E Project Reports	<p><i>Categorization system and management protocols document</i></p> <p><i>Diving monitoring reports</i></p> <p><i>Training workshops reports</i></p> <p><i>skills and competences assessment</i></p> <p><i>Decision Support System (DSS) portal reports</i></p> <p><i>Official Bank document with credit adjudication.</i></p>	Annually	WWF	<p>2.2.1.3 Reduce the impact of diving, anchoring and pollution related to tourism operations in selected marine HEVAs, to enhance ecosystems resilience and adaptive capacity to the effects of climate change.</p> <ul style="list-style-type: none"> - Number of conservation categorization system and management protocols for diving visitor sites implemented. - Number of Diving Tourism Best Practices adopted. - Number of capacity building activities for dive guides and GNP technicians implemented. - Number of monitoring systems implemented for underwater diver behavior and the associate impacts. - Decision Support System (DSS) portal developed that includes the control and monitoring of pollution levels from boats. - Number of workshops on Digital Positioning Systems (DPS) (disaggregated by gender). - Percentage of boats that have been granted with a credit for the installation of the DPS.

M&E Project Reports	<p><i>Studies reports</i> <i>Training workshops reports</i> <i>Skills and competences assessment</i> <i>Nesting beaches selection report</i> <i>Monitoring system reports</i></p> <p><i>Official document with regulations</i> <i>Assessment report</i></p>	Annually	WWF	<p><i>2.2.1.4 Improve surveillance and control measures for adequate sea turtle nesting and foraging in the GMR, to counteract potential effects of climate change in their reproductive success.</i></p> <ul style="list-style-type: none"> - . - <i>Number of nesting beaches selected by the GNPD translocated</i> - <i>Number of monitoring systems for translocation effects and impacts, implemented.</i> - <i>Number of regulations in place, including the monitoring of regulations compliance, to avoid boat strikes in turtle nesting and feeding sites.</i> -
M&E Project Reports	<p><i>Climate change distribution models and report</i> <i>Restoration monitoring reports</i> <i>GNPD restoration planning</i></p>	Annually	WWF	<p><i>2.2.2.1 Strengthen control programs for guava and blackberry, in areas inside and outside the GNP, based on their projected dynamic expansion under climate change scenarios.</i></p> <ul style="list-style-type: none"> - <i>Number of hectares of prioritized areas within the GNP under innovative control schemes.</i> - <i>Terrestrial invasive species program of the GNPD strengthened.</i> - <i>Conservation status index of 750 ha of Scalesia forest in the agricultural area (includes species diversity, AGB stocks, and</i>

	<i>instruments improved.</i> <i>Training workshops reports</i> <i>Skills and competences of GNPD assessments</i> <i>Restoration monitoring reports</i>			<i>soil properties). Number of hectares with strengthened active agricultural practices to control invasive species.</i>
M&E Project Reports	<i>Assessment report</i> <i>Reports on nurseries improvements</i> <i>Nurseries provision reports</i> <i>Restoration monitoring reports</i> <i>Training workshops reports</i> <i>Skills and competences of</i>	Annually	FAO-WWF	<p>2.2.2.2 Restore key remnant forest fragments inside and outside the GNP, to enhance ecosystems adaptive capacity and provision of environmental services.</p> <ul style="list-style-type: none"> - <i>Number of assessments of the conservation status of 750 ha of Scalesia forest fragments within the GNP.</i> - <i>Number of nurseries of the GNPD on the three islands strengthened to provide native species seedlings to implement restoration activities.</i> - <i>Number of hectares of key Scalesia forest fragments within the GNP under restoration schemes.</i> - <i>Number of hectares of agricultural land restored with Scalesia spp. And other native tree species.</i> - <i>Number of farmers trained in restoration practices (disaggregated by gender)</i> -

	<i>local authorities and farmers assessments. Knowledge products</i>			
	<i>Studies reports</i> <i>Data management and information systems</i> <i>Digital platforms reports</i>			2.2.2.3 Monitor success and impacts of invasive species control and restoration measures. <i>Number of decision-makers from the GNPd; Ministry of Agriculture and ABG consuming and incorporating information from a digital platforms under a "Social-Ecological System Knowledge Node" format</i>
M&E Project Reports	<i>Certification plan document</i> <i>Training workshops reports</i> <i>Skills and competences of local authorities and farmers assessments.</i>	<i>Annually</i>	WWF	3.1.1.1 Implement an ecotourism certification scheme to adopt best practices across the tourism value chain. - <i>Number of staff trained on the management of the certification scheme (disaggregated by gender).</i> - <i>Number of tourism businesses with certifications awarded (disaggregated by gender).</i>

	<i>Certification verification reports</i> <i>Official document awarding certification</i>			
M&E Project Reports	<i>Evaluation of competences for education</i> <i>Evaluation children's literacy</i> <i>Minutes from meeting of the Intersectoral Board for Educational Articulation.</i> <i>Agenda document</i> <i>WWF training reports with evaluated competences and abilities.</i> <i>Printed and audiovisual pedagogical resources</i>	Annually	WWF	<p><i>3.1.2.1 Strengthen the educational system to provide quality education to face climate change and promote sustainable development.</i></p> <ul style="list-style-type: none"> - <i>Board of Education for Climate Change (MECC) created.</i> - <i>Agenda for Climate Change Education at a provincial level is developed and implemented.</i> - <i>Number of teachers and school principals of all school levels and sub-levels of the 20 educational establishments of Galapagos, trained on climate change education, within the Teacher Professional Development Program of Mineduc (ESG Program).</i> - <i>Number of climate-friendly pilot projects implemented in different Galapagos educational establishments.</i> - <i>Number of immersive and experiential educational experiences on climate change designed and implemented into the educational system.</i> - <i>Number students trained through technical education programs (second and third level) with a focus on sustainable value chains and climate change.</i>

	<i>WWF reports on pilot projects WWF report CFN / CAF reporting</i>			
M&E Project Reports	<i>Interview CFN/ CAF reporting Digital platform monitoring report Printed and audiovisual content and material. WWF reporting on activities. Monitoring report based on the behavioral insight analysis.</i>	<i>Annually</i>	WWF	<p>3.1.2.2.Strengthen knowledge and foster engagement of public and key stakeholders on climate change impacts and solutions.</p> <ul style="list-style-type: none"> - <i>Number of knowledge management and outreach digital platform on climate change, designed and implemented.</i> - <i>c) Number of behavioral change campaigns designed and implemented in the four populated islands.</i>
M&E Project Reports	<i>Survey/questionnaire</i>	<i>Annually</i>	WWF-FAO-CAF	<p>3.1.2.3 Create non-formal education and outreach opportunities, to encourage local community's interest and active involvement in addressing climate change.</p> <ul style="list-style-type: none"> - <i>Number of participants on a training program on climate change for facilitators designed and implemented in Santa Cruz and San Cristobal Islands.</i>

				<ul style="list-style-type: none"> - Number of non-formal educational and immersive field-based experiences on climate change in the four inhabited islands - Number of citizens of the four inhabited islands have been trained and are part of the working platform on collective climate action (disaggregated by gender). - Number of independent youth and community-based projects or initiatives are initiated and have been successfully completed or are still under development.
M&E Project Reports	<p><i>Evaluation of competences</i></p> <p><i>Program monitoring reports</i></p> <p><i>Participants lists and learning monitoring reports.</i></p> <p><i>Climate change content, lessons, and resources for educational experiences (non-formal)</i></p> <p><i>Participants list and learning monitoring reports.</i></p>	Annually	WWF-FAO-CAF	<p>3.1.3.1 Mainstream climate change into regulatory frameworks and planning instruments</p> <ul style="list-style-type: none"> - Climate Action Plan designed and socialized. - Financial sustainability strategy developed. - Financial mechanisms functioning.

	<i>Community-based projects planning an implementation report.</i>			
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Evaluations:

Type	Timing	Independent/Self-evaluation
<i>Process</i>	Yearly	Self-Assessment
<i>Formative</i>	Mid-term	Independent
<i>Summative</i>	End of project implementation	Independent

For indicative budget for Monitoring and Evaluation activities, please refer to the AE fee in Annex 12.

○ 1.1 Monitoring and Evaluation Arrangements

1.1.1 Institutional Arrangements

The Programme Management Unit (PMU) in coordination with the EEs M&E Specialist is responsible for planning and developing the activities necessary to comply with the monitoring, supervision and evaluation of the Programme included in the M&E Plan, the requirements of the GCF and the provisions of the AMA and the FAA.

The PMU, through the M&E Specialist, shall follow the progress of the Programme and ensure that the Platform for Information Management to be developed through Activity 3.1.2.2 complies with all the needs required for the registration of required information to ensure appropriate monitoring of the Programme through the system.

Prior to Implementation

The PMU in coordination with the EEs must develop different registration tools and practical guidelines to correctly record the progress of activities and compliance with the indicators. An MRV framework will be further developed and incorporated in the Platform for Information Management to be used by the Executing Entities and CAF. During the first years, the beneficiaries and the local banks will be trained in the MRV framework, definition of baseline and reporting; Programme eligibility criteria, Project evaluation criteria, monitoring actions and evaluation to ensure an adequate understanding of the mitigation projects and ensuring the monitoring of outcomes.

Furthermore the PMU will provide ongoing support to the local banks and beneficiaries in order to improve the capacities related to monitoring and evaluation of the Projects throughout the implementation.

During the Implementation of Projects

PMU:

The PMU is responsible for ensuring that regular visits to local banks and programme intervention sites and beneficiaries are carried out subject to budget availability, to provide support in the implementation of the Programme and to monitor the overall progress of operations, as well as to verify Projects implementation. The EEs shall coordinate and share information with the PMU about the Projects visited.

The PMU through the Environmental and Social Safeguards Specialist is responsible for guaranteeing the monitoring and evaluating of environmental and social risks during the implementation of the Project maintaining close collaboration with the LFI in order to guarantee the appropriate monitoring of E&S risks by these institutions.

For the mitigation investments, the PMU will contract a specialized consultancy firm to audit a sample of energy projects on site and verify the emission reduction as well as the agreed upon climate change mitigation indicators. In the case of land use investments, FAO in coordination with the PMU will organize site verifications of reduced emissions of low carbon land use interventions (Ex-Act methodology) and implementation of the technologies (The emission reduction assessment for this case is the same place where resilient agricultural practices are implemented.).

For the adaptation investments, FAO and WWF in coordination with the PMU will organize site verifications of the adaptation investments.

The monitoring process intends to follow up the execution of the Programme to identify the intermediate milestones achieved in each phase and evaluate its outcomes and fulfilment of proposed targets. The indicators to be monitored are those included in section 1 of this M&E Plan.

If it is determined that a visited project is not eligible based on the investments made or non-eligible activities are found, the PMU will declare that the investment is not eligible and will not be considered part of the Program. The Executing Entities will have to reallocate the funds in another investment and allocate the justified credit or grant with resources from other programs or with their own financing.

Role of the local banks:

It will be the responsibility of participating local banks and CAF, through the PMU, to ensure that the sub-borrower is eligible for funding from the programme in accordance with the programme's eligibility criteria, as defined for clean energy and sustainable land use. Monitoring of disbursements for eligible expenditures will be reviewed by CAF. In coordination with participating local banks, CAF may schedule supervision visits to monitor and verify the proper use of resources and compliance with contractual conditions of the Programme with regards to the use of funds.

Operations approved by participating local banks and presented to CAF to be part of the Programme must be properly identified in the local banks' accounting systems and be in compliance with what is stated in the specific loan agreements. These records should allow for identifying financial conditions of each transaction (e.g., currency, maturity, and interest rates), the value of the contract, loan proceeds and eventual use of proceeds for monitoring purposes, Programme funds balances and default rates, if necessary.

1.1.2 Presentation of reports

Reporting from Executing Entities (Ees) to CAF

In coordination with CAF, the EEs will compile and maintain all information, indicators and parameters necessary for the preparation of programme reports, including annual reports, midterm review and final evaluation. To this end, an Information Platform Management will be developed as part of Activity 3.1.2.2 of the Programme.

EEs will collect the necessary data for monitoring and present annual reports to CAF. In some cases, CAF will make calculations required for some indicators, based on the information provided by the EEs in the annual reports.

EEs will deliver these annual reports within thirty (30) calendar days after the end of each year of the Programme's implementation. The M&E Specialist will develop a standardized template for the annual reporting of EEs on each of the sub-projects funded with the Programme, which will include information regarding:

- The evolution of the indicators,
- Financial information regarding the use of the resources
- E&S Mitigation Plan progress, when applicable.
- Additional information, to be determined.

CAF will be entitled to request additional information, if necessary. EEs will present a final report to CAF up to six (6) months after the day of the last disbursement and CAF will contract an independent final evaluation. The EEs final reports shall contain all relevant information to assess if objectives of the programme and targets for each indicator have been met. Based on this report CAF will also prepare a Project Completion Report (PCR), which evaluates the fulfilment of targets, reviews the overall results of the operation and describes lessons learned, among other relevant aspects.

Reporting from CAF to GCF

During the Program implementation period, the OT is responsible for the preparation of reports compiling information provided by EEs and additional internal dependencies of CAF, when applicable. The OT must ensure that the reports comply with the guidelines established in the AMA and the FAA, and that the templates provided by GCF are used for reporting, in accordance with the GCF procedures and guidelines.

The PMU is responsible for filling in the Annual Performance Reports (APR), according to the format established by the GCF with information on the evolution of the projects, expected results included in the logical framework, description of the different activities carried out, difficulties experienced within the period among others. The E&S Specialist within the PMU will be responsible to prepare the Annual Gender Report, complying with the conditions established by the GCF. This report shall be submitted to the GCF annually 60 days after the end of the corresponding annual period.

In addition to the above-mentioned a mid-term evaluation review will be contracted at mid-term within thirty (30) months from the effective date of the loan contract or when 50% of the programme resources have been disbursed – whichever occurs first. The mid-term evaluation will be carried out by an independent consultant and will be based on a participatory and inclusive process, and will involve the following:

- Review of the institutional, technical, environmental, social, economic and financial aspects of the program
- Review of the portfolio of sub-projects, including activities, planned outputs, expected impacts, cost and financing
- Review of the achievement of planned impacts and indicators (according to the Logframe)
- Assessment of the need to restructure or reformulate the program.

At the Programme's end, a final evaluation will be carried out by an independent consultant and will be submitted to the GCF up to six (6) months after the day of the last disbursement of a participating LFI.

Methodologies to be used in the evaluations shall make use of qualitative and quantitative data, including interviews with all key stakeholders, analysis of monitoring reports and data from the M&E System, together with participatory tools to promote participatory learning.

The final evaluation of the general performance of the Program shall review the intervention against the international criteria for program evaluation (OECD standards), as well as the GCF investment criteria, in accordance with the evaluation policy and guidelines of the GCF. Unexpected results and the co-benefits achieved, the best practices, as well as the replicability and sustainability of the actions shall be considered. Evaluations will ensure learning and knowledge management among stakeholders and dissemination of lessons learned.

2 MRV PROPOSED FRAMEWORK

In accordance with GCF's MRV requirements, CAF will set up a monitoring framework at Programme level that will apply to all EEs and beneficiaries.

All specific MRV actions and steps described in the following subsections for clean energy, land use, fisheries and ecosystem reinforcement will be undertaken by the EEs,

which will compile information from the beneficiaries; and will be reported to CAF according to the described processes in section 1.

For climate benefits monitoring at sub-borrower level (projects), differentiated approaches will be implemented for energy investments and land use, fisheries and ecosystems respectively at the beneficiaries/ground level. An outline of these approaches is described in the following sections.

2.1 MRV proposed framework for Energy investments

2.1.1 Introduction - GCF requirements for Clean Energy MRV

The MRV component for estimating the mitigation benefits of energy investments is aligned with the approach set out in the GCF performance management Framework.

The GCF core expected result and Indicator relevant to clean energy are:

- Expected result 1.0: Reduced emission through increased low-emission energy access and power generation.
 - Indicator: Tonnes of carbon dioxide equivalent reduced or avoided from gender sensitive energy access and power generation.
- Expected result 3.0: Reduced emissions from buildings, cities, industries and appliances.
 - Indicator: Tonnes of carbon dioxide equivalent (t CO₂ eq) reduced or avoided - buildings, cities, industries, and appliances.

The GCF sets out that methods used should be informed by multilateral development banks/the international financial institutions (MDB/IFI) GHG accounting harmonisation work on energy efficiency and renewable energy. Where feasible gender-disaggregate data should be collected.

2.1.2 Proposed approach

For energy efficiency and renewable energy projects, MRV and due diligence processes should be in proportion to the size of the project in order to avoid disproportionately increased costs. Different approaches are recommended for centralized renewable energy projects (medium/large size) and distributed energy and energy efficiency projects (small size). Robust MRV procedures are important to ensure projects are delivering the expected impacts, however, overly complex MRV requirements for small projects can cause the local banks and beneficiaries to lose interest in such project or can cause high transaction costs to increase meaning that the projects lose some of their economic benefit for the bank and/or the client.

Small projects (distributed energy generation and energy efficiency)

For small projects, it is recommended that monitoring and evaluation process should primarily be conducted at the local bank level, supported by PMU's Mitigation Specialist. For small projects, it is important that due diligence or MRV costs do not overshadow the benefits of providing credit, or unduly increase the cost of the credit.

For small projects, MRV processes should be simple, and should integrate into the existing processes and procedures of the banks. It is recommended that the process for small projects is integrated into the credit evaluation process of the LFI. Gender data can also be incorporated into the credit evaluation process.

Certain industry specific baselines will be defined as part of the technical assistance project component, as per the methodology outlined below, and certain energy savings values can be allocated based on project typologies. The project will involve the development of a positive list of approved technologies and project types. This will enable simplified and consistent energy savings values to be determined. A sample of these small projects should be audited annually to verify that the assumptions are in the correct range.

Large projects (centralized RE projects)

For medium and large projects, a more rigorous process is recommended. The evaluation should be outsourced to experts who would conduct specific studies to determine an appropriate baseline based on the methodology set out below, and verify specified factors including a) the project and technology suppliers capacity to deliver the project, b) correct project installation, c) annual and final monitoring and verification of energy savings / generation compared to the baseline.

2.1.3 Methodology for Clean Energy

The methodology for estimating baselines, energy savings, and greenhouse gas emissions reductions should be based on the International Financial Institutions (IFI) Framework for a Harmonized Approach to Greenhouse Gas Accounting, with the exception of the emission factors that will be used.

The IFI approach for energy efficiency and renewable energy are included in the documents: *IFI approach to GHG Accounting for Energy Efficiency Projects* and *IFI Approach to GHG Accounting for Renewable Energy Projects*. These documents set out harmonized approaches for assessing the mitigation benefits, or net GHG emissions reductions for energy efficiency and renewable energy projects. However, the use of the IFI grid emission factors for MRV purposes would not be adequate because IFI factors generally reflect GEFs for national grids, not for isolated grids such as in the case of the Galapagos islands. Therefore, the IFI methodologies will be used applying, specifically for this project, the emission factors of each isolated system (Baltra-Santa Cruz, San Cristobal, Isabela and Floreana), that will be calculated by IRENA applying the CDM methodology TOOL07.

The emissions from fuel transport from the continent, will be calculated in accordance with the Guidelines for Measuring and Managing CO₂ Emission from Freight Transport

Operations (ECTA CEFIC, 2011). The emissions have been calculated from maritime transport of fuel to the islands. PUNA ship transports fuel to the islands, which transports 2,400 tons of Diesel.

2.1.3.1. Annual monitoring of emission factors.

The follow-up of the emission factors for each year, during the term of the Programme will follow the steps determined in Tool07¹. Ex post considers emission factors for each year that the project activity displaces grid electricity, annual update needed.

The baseline has been developed for each of the electrical systems in the Galapagos Islands, following steps showed below:

Step 1: Identify the relevant electricity systems.

Step 2: Choose whether to include off-grid power plants in the project electricity system (optional)

Step 3: Select a method to determine the operating margin (OM)

Step 4: Calculate the operating margin emission factor according to the selected method.

Step 5: Calculate the build margin (BM) emission factor.

Step 6: Calculate the combined margin (CM) emission factor.

The procedure is indicated at Appendix of emission factors for all systems of the islands. After the application of the steps, it has been obtained the combined margin emission factor to be used as base line for each of the four Galapagos Island isolated systems for the year 2020 is shown in the table below.

Table 1. Combined margin (CM) CO₂ emission factor per Galápagos Island System.

System	<i>EF_{grid, CM, 2020}</i> (tCO ₂ /MWh)
Santa Cruz Baltra	0.82759
San Cristóbal	0.72817
Isabela	0.76721
Floreana	0.80580

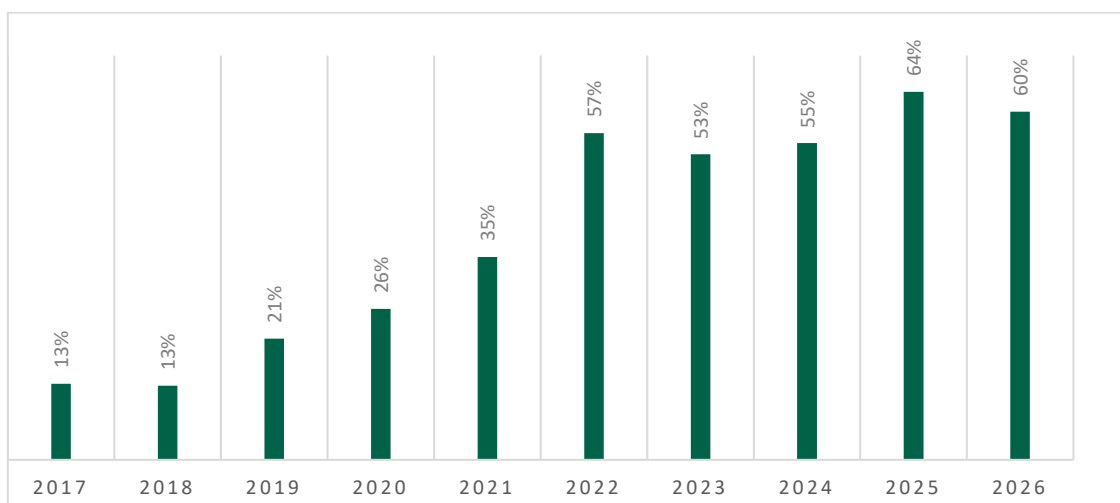
Source: (IRENA, 2021)

¹ Methodological tool
Tool to calculate the emission factor for an electricity system.
Version 07.0

a) Operating margin emission factor OM

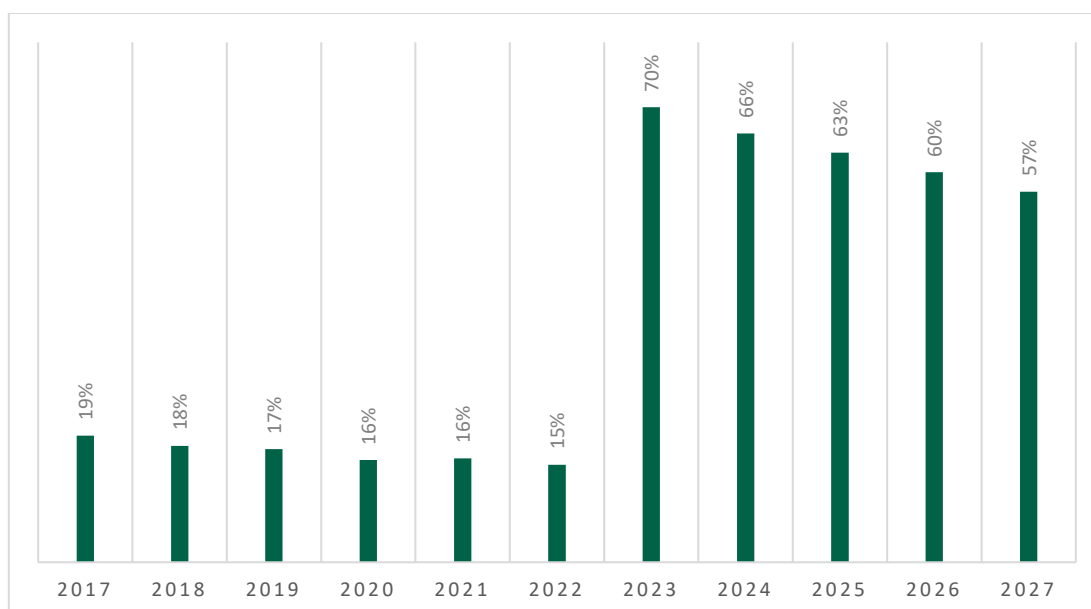
Share of renewable sources in each of the isolated systems will influence to determine the Operating Margin Emission Factor OM, when the 50% of LCMR is exceeded, this causes OM to be established for each year. The graphs below show the expected participation of LCMR for each year of each of the systems and the OM method to be applied.

Figure 1. San Cristóbal LCMR per year



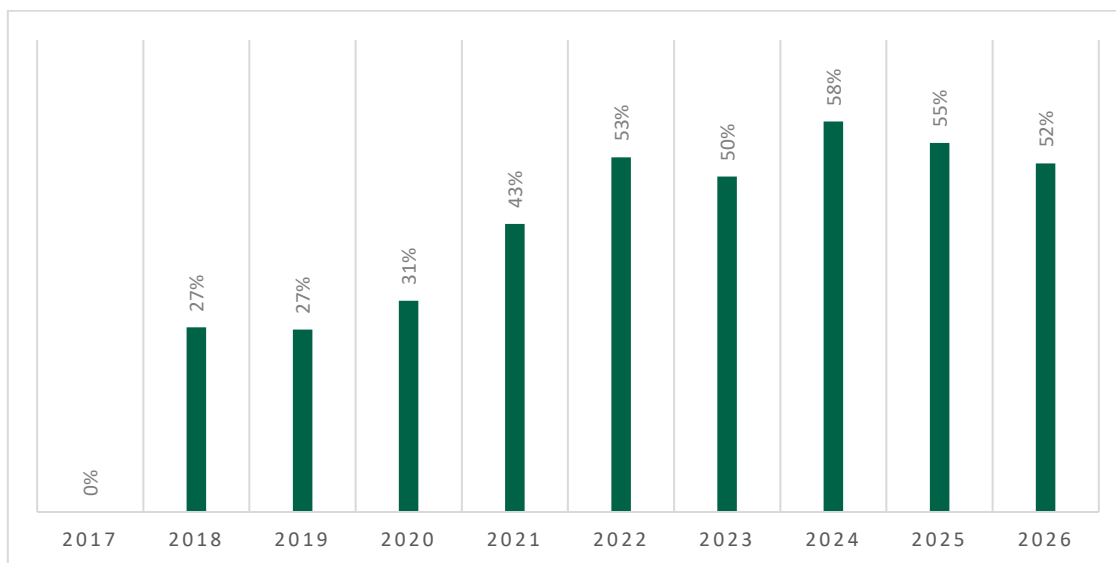
Source: (MERNNR, 2020)

Figure 2. Santa Cruz Baltra LCMR per year



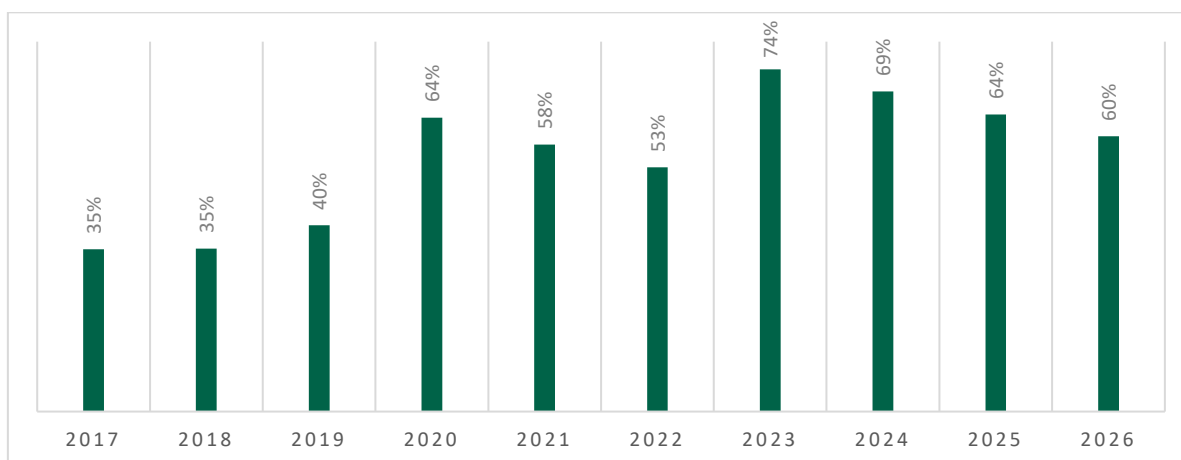
Source: (MERNNR, 2020)

Figure 3. Isabela LCMR per year



Source: (MERNNR, 2020)

Figure 4. Floreana LCMR per year



Source: (MERNNR, 2020)

Based on Flow chart: Overview of the application of OM methods (Figure 3. TOOL07), The conditions of each grid are analyzed, obtaining the following criteria for the selection of the method to determine the operating margin emission factor.

- LCMR share >50% in recent 5 years, the years considered in the following table, the percentage of LCMR is greater than 50% of the total generation.

Table 2. Year of renewable participation greater than 50%

System	From the year
San Cristóbal	2026
Santa Cruz Baltra	2026
Isabela	2025
Floreana	2023

Source: Authors

- An average load by LCMR > average LASL over three years

If the average load by LCMR is greater than the minimum annual demand, of the last three years, the simple Adjusted OM method must be applied, if the case that does not exceed the minimum load in demand will continue to apply the procedure of Simple OM.

The hourly load information on demand (MW) is necessary to compile, must be collected and stored by ELECGALAPAGOS, it is necessary to have the values of the last three years, as of each of the years shown in the table above for Each system.

The ex-post option will be chosen, the emission factor will be determined for the year in which the project activity displaces grid electricity, requiring the emissions factor to be updated annually during monitoring. The information necessary for the determination of the emission factor of the calculated year will be available at least the first six months of next year, for which the Year Factor y-1 may be used.

At the case of the years and the systems that will be calculated with the simple method, the Operating margin for Galapagos isolated systems will be calculated following Option A, since all the necessary data for sits calculation are available.

Information Collection will be the responsibility of ELECGALAPAGOS and its validation by the Ministry of Energy.

Table 3. Responsible for information

INFORMATION NEEDED	DATA BASE
$EG_{m,y}$ Net quantity of electricity generated and delivered to the grid by power unit m in year y (MWh)	ELECGALAPAGOS/SISDAT
$EF_{EL,m,y}$ CO ₂ emission factor of power unit m in year y (tCO ₂ /MWh)	ELECGALAPAGOS/SISDAT

Source: Authors

The net calorific value (energy content) of fuel for each fuel type will be measured by Ministry of Energy (PETROECUADOR), which oversees the fossil fuel data analysis for Ecuador. The emission factor for each fuel type will be the lower limit of the 95% confidence intervals as reported in the IPCC 2006 guidelines in Chapter 1, Table 1.4.

For the case of the years that the application of the simple Adjusted OM (Table 2) will be necessary, the availability of the following information:

Table 4. Needed information for simple Adjusted OM.

λy	Factor expressing the percentage of time when low-cost/must-run power units are on the margin in year y
EGk^2,y	Net quantity of electricity generated and delivered to the grid by power unit k in year y (MWh)
EGm^3,y	Net quantity of electricity generated and delivered to the grid by power unit m in year y (MWh)

Source: TOOL07

The factor λy , must be calculated applying approach 1. Use default values of lambda from Table 1 appendix 2 (TOOL07) based on the share of electricity generation from low-cost/must-run in total generation derived using average of the five most recent years.

b) The build margin emission factor (BM)

To calculate BM emission factor, the data and information regarding the operating projects, annual generation and year of commissioning will be stored, according to the following table:

Table 5. Information needed for calculated BM

System	$\sum_m EG_{m,y}$ (MWH)	SET _{sample}	Commissioning Year
Santa Cruz-Baltra	Generation per year _m	Projects included _m	y
San Cristobal	Generation per year _m	Projects included _m	y
Isabela	Generation per year _m	Projects included _m	y
Floreana	Generation per year _m	Projects included _m	y

² Low-cost/must-run power sources

³ Other power sources

Source: Authors based on TOOL07

The factor must be calculated by the application of the following formula.

$$EF_{grid,BM,y} = \frac{\sum_m EG_{m,y} \times EF_{EL,m,y}}{\sum_m EG_{m,y}}$$

Where:

$EF_{grid,BM,y}$	Build margin CO2 emission factor in year y (tCO2/MWh)
$EG_{m,y}$	Net quantity of electricity generated and delivered to the grid by power unit m in year y (MWh)
$EF_{EL,m,y}$	CO2 emission factor of power unit m in year y (tCO2/MWh)
m	All power units serving the grid in year y except low-cost/must-run power units.
y	Most recent historical year for which electricity generation data are available (year per year)

c) Combined margin emission factor (CM)

The combined margin (CM) emission factor will be calculated for the Galapagos systems based on Option A: weighted average CM, as explained in TOOL07 of the CDM methodology. This emission factor will be calculated with the following equation.

$$EF_{grid,CM,y} = EF_{grid,OM,y} \times w_{OM} + EF_{grid,BM,y} \times w_{BM}$$

Because the project emissions would come from intermittent renewable energy, the weighting factors of $w_{OM}=0.75$ and $w_{BM}=0.25$ should be used. The emission factors of the four systems have been calculated by the development of the matrix indicated in appendices 11.1 to 11.4, these matrices will serve to follow up on the calculation of the emission factors with the updates indicated above.

2.1.4 Methodology for Energy Efficiency

The mechanism defined for reporting the impact of replacement actions for inefficient equipment (refrigerators and air conditioners), adheres to the MRV process established in the National Energy Efficiency Plan (PLANEE 2018), where there is a measurement and verification procedure. Online system for monitoring energy efficiency measures in the electricity sector. The necessary information about the progress of replacement of

equipment will oversee the Electric Company ELECGALAPAGOS, who informed the Ministry of Energy the amount of equipment that has been replaced, and the conditions of energy savings in each of the beneficiaries. This information must be recorded for each of the Islands, being necessary for the corresponding calculation of emission reductions, after applying the emission factors of each isolated network. The information on savings in consumption will be reported annually by the beneficiaries who have changed the equipment in kWh / beneficiary per year of savings.

Following the recommendations of the AMS-II.C. Methodology, for specific technologies applied in the demand, the equipment installed replaces existing equipment, the number and “power” of the replaced equipment shall be recorded in a way that allows for a physical verification by a designated operational entity, in this case ELECGALAPAGOS will report the information about number and power for each device.

For the commercial and tourism sector, the annual energy savings calculation will be applied to the ISO 50001 Energy Management methodology, which will record the savings caused in the energy consumption destined for the replaced equipment. The following variables that influence electricity consumption in refrigeration and air conditioning will be considered.

Tabla 6. Energy consumption parameters.

Variable	Unit
Room temperature	°C
Cantidad de personas en la edificación	# of people
Total área	m ²

The report on compliance with the efficiency range of the replaced equipment in category A must be carried out by the Special Regime Council of Galapagos, having to control the entry of equipment only in this efficiency range.

2.2 MRV - M&E proposed framework for Adaptation investments.

2.2.1 Introduction - GCF requirements for Adaptation MRV

The MRV component for estimating the adaptation benefits investments is aligned with the approach set out in the GCF performance management Framework.

The GCF core expected result and Indicator relevant to adaptation activities of this Programme are:

- Expected result A1.0: Increased resilience and enhanced livelihoods of the most vulnerable people, communities and regions.
 - Indicator: Number of males and females benefiting from the adoption of diversified, climate resilient livelihood options (including fisheries, agriculture, tourism, etc.).
- Expected result A4.0: Improved resilience of ecosystems and ecosystem services.
 - Indicator: Coverage/scale of ecosystems protected and strengthened in response to climate variability and change.

2.2.2 Methodology and process MRV and M&E Land Use

Process

As mentioned in the previous section, the area or territory (farms) where resilient practices are applied will be where the mitigation co-benefit is also measured.

The general procedure for MRV (mitigation) and M&E (adaptation) will be as follows:

1. For all cases, whether with financial mechanisms: grant, private sector or combined, applicants or beneficiaries will meet the requirements established by the LFI or by the executors of the agriculture component of the program (FAO). FAO will provide technical assistance for the fulfillment of all the requirements, in particular those that are general for the territory of Galapagos (land use, type of soil, etc).
2. Once the resilient practices are accepted for implementation on farms or as individual farmers or producer's association; as more than one practice can be applied, a field work document of an integrated management plan of the farm or farms will be requested and developed. This document will also have a technical sheet (compilation of information and indicators) according to each of the practices to be implemented. FAO, MAG and INIAP field technicians will assist in the compilation and recording of information in technical sheets on a regular basis (at least every six months). In this way, it is guaranteed that the monitoring is carried out in a participatory way with the farmers. Farmers by themselves would see the progress on their farms with data analysis and share their lessons on field schools with other farmers.
3. FAO, MAG and INIAP field technicians will compile the information of all the farms through the technical sheets and will be able to carry out an analysis by farm and later a general report. In the case of the bank report, FAO will work together to review the information and make a report. All these reports will be sent to the CAF's program monitoring specialist.

Methodologies

Two methodological tools were mentioned above:

1. Farm Management Plan: this document will provide general information about the farm and the resilient practices that will be applied for each farm biophysical and socioeconomic condition. The final format will be defined jointly with the local partners of the program. At a minimum, it will have this information: general information (location, property registry, names of the owners, etc.), physical characteristics of the farm, production systems (crops, pastures, plantations, other systems, agricultural calendars, livestock, among others.), marketing, financial analysis and technical observations.

2. Resilient practice datasheet: a farm may have one or more of these sheets depending on the resilient practice that it will apply. These files will have general information about the farm and will have information to later translate them into indicators. These indicators will feed into the RMF of the program for this component. These datasheet would be part of the Farm Management plan as well.

The methodologies to collect the information depend on each indicator. The Monitoring and Evaluation Plan, at the beginning of this document shows the collection tool, frequency, indicator and the indicative budget for each activity for the component 2. Agriculture. The collection tool varies from document reviews, field observation visits, interviews, GIS analysis, surveys, among others. This will be determined during the inception workshop once the project starts.

Innovative tools and applications will be used on mobile phones therefore farmers/associations can register the information directly for each resilient practice. This experience has already been applied by the Climate-Smart Livestock project in Ecuador by FAO ([Ganadería Climáticamente Inteligente](#)) to be applied at farm level.

It is expected that all this information and analyzes carried out will also feed the system that the program will develop and later feed national systems such as [SUIA](#), [SIPA](#), domestic MRV and other instruments such as the NDC of Ecuador.

2.2.3 Methodology for Fisheries

This program will develop an advanced data system to improve the accuracy, reporting, analysis, and dissemination of subtidal ecological data. Such a system will reduce costs, facilitate adaptive and responsive decision-making procedures, to improve marine zoning management efficiency. An app, a data repository, and a dashboard will be created to collect, store, and analyse annually updated subtidal ecological data. This advanced data system, called the “Subtidal Ecological Monitoring” module, will be created following the transdisciplinary methodology recommended by Bradley et al. (2019). Such a module will be developed in collaboration with the GNP, universities and

NGOs, and be integrated into the “Sistema Único de Información Ambiental (SUIA)”, which is the national data repository system for environmental data in Ecuador.

To ensure the effective implementation of the program actions for the selected fisheries, the program will update annually the fisheries diagnostics for each fishery intervened. The adapted version of the MSC’s Benchmarking and Tracking Tool (BMT) developed by Castrejon et al. (2015) will be used to update each fishery diagnostic. This fishery diagnostic tool represents a comprehensive and standardized analytical framework to measure periodically the progress and impact of a C-FIP⁴ implementation over fishery improvement. The MSC+ standard encompasses a set of Principles, Components, Performance Indicators (PIs) and Scoring Guideposts (SG) known as “Default Assessment Tree”, which is used as the basis for assessment of the fishery for compliance with the MSC+ standard (Castrejon et al. 2015). The scoring guideposts incorporate all the scoring elements or scoring issues required at each guidepost.

Each of the 43 performance indicators of the MSC+ will be scored annually using the BMT and following the procedures established by the MSC+ standard to determine changes in the sustainability status of the fishery. Each of the performance indicators will be scored on a graded scale, with levels 60, 80 and 100 defining key sustainability thresholds. A BMT index of 1 means that all performance indicators in the fishery are at least in the 80 level, whereas a BMT score of 0 means that all of the performance indicators are at less than the 60 level. These thresholds correspond to levels of quality and certainty of fishing management practices and their probability of generating sustainability. The final overall score resulted in a “pass” in those cases in which the average score for each principle was greater than or equal to 80, and that each PI was greater than 60; anything below this level resulted in a fail. A fishery can pass with some indicators less than 80, in which case the fishery receives a ‘condition’ requiring improvements so that the score can be raised to an 80 level, normally within a five-year period.

Furthermore, a socioeconomic survey will be designed and implemented, at the beginning and end-of-project, to assess the performance of those seafood enterprises supported by the Blue Action Program and G-Lab, including also the wellbeing of Galapagos small-scale fishing sector. The socioeconomic surveys will be implemented in Santa Cruz, San Cristóbal and Isabela. The aim of the survey will be to establish a baseline and monitor progress of seafood enterprises supported by the Blue Action Program and

⁴ A C-FIP is defined as an alliance of diverse actors and institutions, including fishers, managers, traders, scientists, private sector, and NGOs, who join efforts to define and agree on an action plan, which specifies the activities that are required to create ecologically sustainable, economically profitable, and socially fair fisheries. This people-centered approach for the improvement of community-based coastal fisheries combines globally recognized ecosystem-based and human rights-based approaches, including the UN FAO’s Voluntary Guidelines for Securing Sustainable Small-Scale Fisheries, and the Marine Stewardship Council Standard (MSC), in combination with blue finance principles, to promote sustainability of coastal community-based fisheries and benefits they provide to humankind

G-Lab, and determine the socioeconomic conditions of small-scale fishing sector using a wider set of indicators.

2.2.4 Methodology for Ecosystems

Marine ecosystems

Risk assessments will be conducted by the GNPD in coordination with the Charles Darwin Foundation (CDF) and ABG to determine the possible pathways for marine invasions and by modelling dispersal mechanisms of potential invasive species, considering variables such as climatic events and oceanographic circulation. A marine Non-native Invasive Species (NIS) dashboard will be created and uploaded to the web-based platform, that will allow dynamic queries and rapid information exchange. This dashboard will be hosted in the CDF DataZone web-based portal and managed by CDFs knowledge management team in collaboration with CDF scientists, GNPD and ABG technicians.

Additionally, eight assessments over 4 years will be conducted of the natural and restored coral ecosystems and their relationship with oceanographic and climatic parameters in the GMR. This will be done over in the warm and cold seasons each year of the project. For the monitoring of coral communities linear transects will be installed to characterize the benthic structure of the area and collect information on the health of the colonies, permanent plots will be established that allow the replication of monitoring over time on a section of the same community. Although the focus of this activity is on the health status of corals, the fish, invertebrates and algae associated with them will be monitored as well because these can be indicators of changes in the coral reef assemblage.

Diving sites will be monitored ecologically and mapped to identify fragile species and areas (e.g. areas with high coral cover). The monitoring will include fish and other macrofauna (sea lions, marine turtles, etc.), macroinvertebrates and benthic cover components. Fixed plots at visitor sites and control sites will be monitored over time for change detection. The sites will be monitored during the duration of the project, but data will be compared before and after the implementation of Diving Best Practices Toolkit, to detect possible changes due to the intervention.

Complementarily, to implement a pollution monitoring plan at marine visitor sites, quantification of the magnitude of the presence of pollutants (heavy metals, organic compounds (hydrocarbons, Benzophenone-2 and 3, micro plastics) will be implemented. Pollutants presence and quantity will be compared between visitor and control sites and relationships between site use and pollutants concentration will be analysed. Each site will be sampled for water, sediment, and representatives of the food chain (fish, gastropods, sea urchins, algae and corals, three species each). Metals and micro plastics will be analysed in at least 30 sites, organic compounds in 15 sites and organic pollutants (e.g. coliforms) in ten sites. Visitor sites will be chosen by level of use so as to have at least sites with very high and low use (plus control sites with no tourism at all). This sampling design will establish a baseline in pollutants from tourism and evaluate the

levels of pollution by comparison between highly visited sites, sites with low visitation and control sites. Also, the degree of impact from pollutants across the marine food chain will be established.

For sea turtles, monitoring of incubation temperatures in nesting beaches of the archipelago through temperature data loggers to collect data of sand temperature during the nesting season in two beaches with potentially different thermal conditions. Monitoring will also be implemented to provide a permanent update on the boat strike incidence on sea turtles at feeding sites. Annual monitoring of the feeding sites will help to monitor the success of the implementation of marine traffic regulations.

Terrestrial ecosystems:

Restoration success will be evaluated with the help of permanent plots previously established by the Charles Darwin Foundation (CDF) and a vegetation mapping with drones and high-resolution satellite imagery (resolution of 0.5 m x 0.5 m, see section 5.3.5), in close cooperation with the GNPD and other relevant stakeholders.

Monitoring of the plant communities will be continued in at least 150 of the currently 180 permanent plots established by CDF, using the line-intercept method (Kaiser 1983). The diameter at breast height (DBH) will be measured from key endemic species (like *Scalesia* spp) or invasive species (like *Psidium guajava* or *Cinchona pubescens*). For example, we will monitor plant communities in the 44 permanent 20 x 20 m plots (established in 1998), representing untouched (e.g. Los Picachos) to manually and chemically controlled plots (e.g. Media Luna, Puntudo and Cerro Crocker) to be able to disentangle climate impacts associated with El Niño from the impacts of invasive species and management control actions. It is widely acknowledged that long term monitoring is the best way to detect population and community responses to climate change, and our long-term plots represent a “gold mine” of information in this regard. Our work will focus on the key species quinine (*Cinchona pubescens*), blackberry (*Rubus niveus*), bracken (*Pteridium arachnoideum*) and Miconia (*Miconia robinsoniana*). Since blackberry has been detected in the plots during the last couple of monitoring, there is a high probability that it will increase and become dominant with increased El Niño rainfalls in the future (see Appendix 2.4). Therefore, long-term data will be analyzed and related to available weather data. Further, during the monitoring of new and established permanent plots, we will determine the dominant (often introduced) insect species, since these are expected to increase in Galapagos due to climate change (Trueman et al. 2010). This also applies to the agricultural zone, where more species have been encountered that adversely affect crops (Cañarte Bermúdez et al. 2020).

Applied control techniques will be constantly monitored and evaluated to ensure high efficacy, while at the same time minimizing negative impacts on non-target species. The information produced through the monitoring program will inform the GNPD via co-implementing monitoring and restoration actions, training, and outreach. In addition, the project will consolidate a data management and information system where all the information will be uploaded. It is envisaged the information system will inform restoration actions based on an adaptive management scheme.

Further, to document restoration success and changes in the plant and animal communities of the Scalesia forest fragments, a baseline will be established for different species on Santa Cruz, San Cristóbal and Isabela. Prior to the onset of restoration actions, 10 plots on each island will be established to document restoration success and changes in the plant and animal communities, as well as in the composition of agricultural crops. Finally, the program will evaluate the impact of restoration by estimating the above ground stored carbon and CO₂ sequestration rates of the ecosystems under restoration. The activities below will be carried out at the beginning of the project and then again just before it ends, to be able to determine significant changes in the restored ecosystem.

- Measure aboveground plant biomass and nutrient contents

Aboveground biomass will be mainly measured using remote sensing, by the classification of vegetation cover and the generation of a vegetation type map, that would be calibrated, using regional-scale inputs of basal area and wood density of species in permanent plots (Asner and Mascaro 2014). This will partition the spatial variability of vegetation into relatively uniform zones or vegetation classes, which will be used to extrapolate biomass estimates. In addition, indirect estimation of biomass will be used, like quantitative relationship (e.g. regression equations) between band ratio indices (NDVI, GVI, etc.) and direct radiance values per pixel, with direct measures of biomass and parameters related directly to biomass, e.g. leaf area index, which would need to be assessed by this project. Results obtained will be validated by biomass measurements in the field of the live plant mass aboveground and belowground (using standard estimation methods - allometric and linear regression equations method), as well as the herbaceous layer on the forest floor, including the inert fraction in debris and litter (using standard methods, which include gravimetric and chemical analysis). Plant samples will be transported to the UDLA University in Quito, Ecuador, where analysis of the macro- and the main micronutrients will be conducted.

- Measure soil and plant carbon and soil nutrients

SOC stocks will be determined by a regression approach in which SOC densities (mass SOC/area) will be related to a number of auxiliary variables like temperature, precipitation, age class and land-use history. These measurements will be accompanied by a geographic information system (GIS) to calculate SOC densities for each vegetation type from available soil characteristic data and satellite-derived land cover information (Campbell et al. 2008). To validate results obtained, representative soil samples will be collected and transported to the UDLA University in Quito, Ecuador, where analysis of the macro- and the main micronutrients will be conducted.

- Calculate CO₂ sequestration of the ecosystems

We will estimate the amount of carbon sequestration based on wood density and allometric equations of tree crowns based on DBH were estimated. Crown dry weight will be multiplied by the number of trees of each species in different diameter classes. The trunk weight of trees in different diameter classes is calculated using the wood density and stand volume. The biomass weight of standing trees is calculated by total weight of trunk (trunk biomass) and crown dry weight (crown biomass). The weight of carbon dioxide in the trees will be determined by the ratio of CO₂ to C and the weight

of carbon dioxide sequestered in the tree by multiplying the weight of carbon in the tree by 3.671 (IPCC 2005).

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