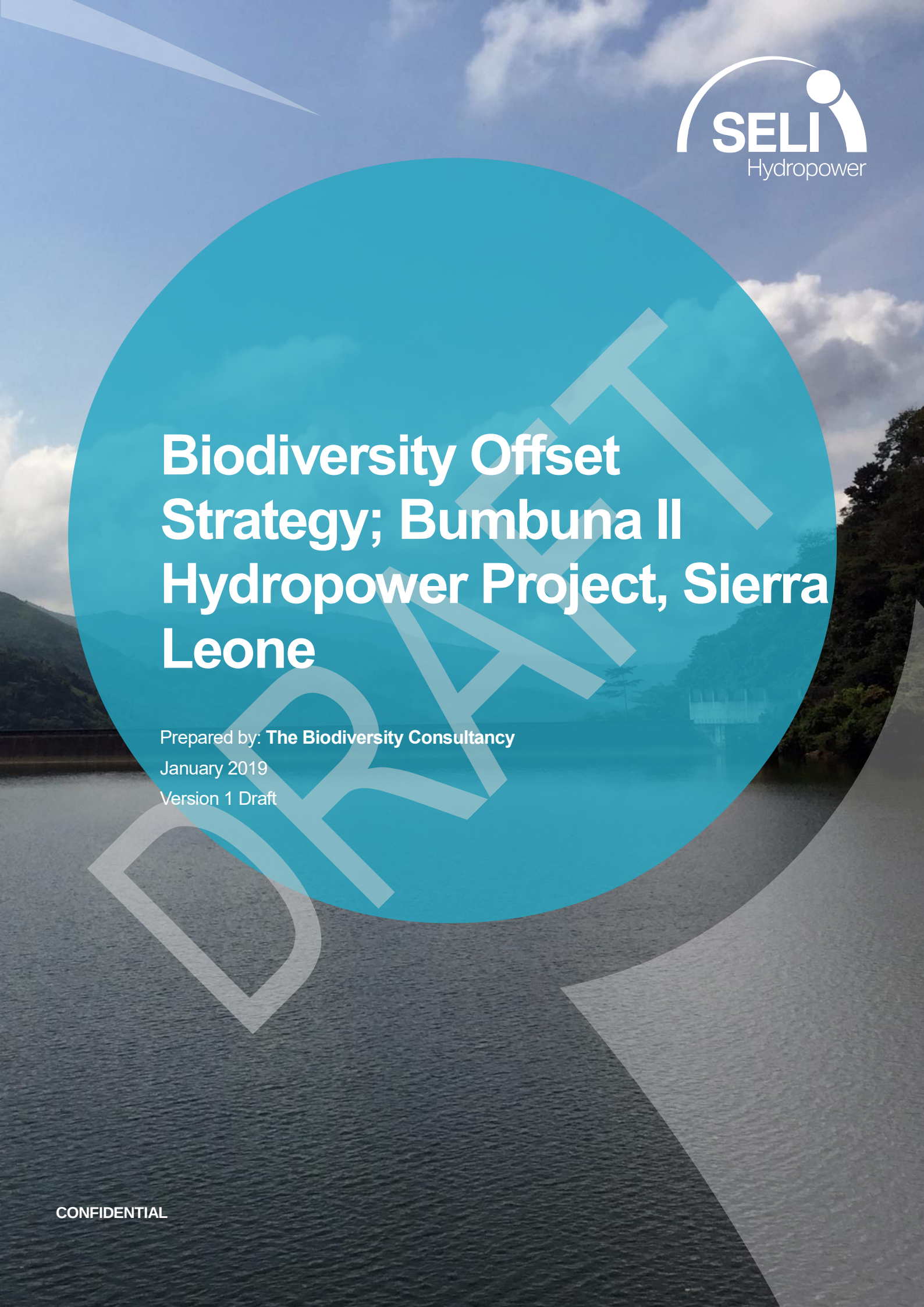

SELI Hydropower

Biodiversity Offset Strategy; Bumbuna II Hydropower Project, Sierra Leone

Prepared by: **The Biodiversity Consultancy**

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Version 1 Draft

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TABLE OF ACRONYMS AND ABBREVIATIONS

Acronyms and abbreviations	
AC	Action Category
AOP	Annual Operating Plan
ASM	Artisanal and Small-scale Mining
BAP	Biodiversity Action Plan
BHP-I	Bumbuna Hydroelectric Project Phase 1
BMEP	Biodiversity Monitoring and Evaluation Plan
SLBCP	Sierra Leone Biodiversity Conservation Project
CBO	Community-Based Organisations
CCC	Community Conservation Committee
CDAP	Community Development Action Plan
CH	Critical Habitat
CHA	Critical Habitat Assessment
CI	Confidence Interval
CR	Critically Endangered
EIA	Environmental Impact Assessment
EPA	Environmental Protection Agency
FD	Forestry Division
FOA	Freshwater Offset Action
GEF	Global Environment Facility
GMA	General Management Action
Ha	Hectare
HP	Hydropower Project
IEP	Independent Expert Panel
IFC	International Finance Corporation
IUCN	International Union for Conservation of Nature
Km	Kilometer
LMNP	Loma Mountains National Park
MP	Management Plan
NBSAP	National Biodiversity Strategy and Action Plan
NFTP	Non-Forest Timber Product
NG	Net Gain
NGO	Non-Governmental Organisation
NNL	No Net Loss
NP	National Park
NPAA	National Protected Areas Authority
NTFP	Non-Timber Forest Product
ÖBf	Österreichische Bundesforste
PA	Protected Area
PS	Performance Standard
QH	Quality Hectare

Q km	Quality Kilometer
REDD	Reducing Emissions from Deforestation and Degradation
RIA	Residual Impact Assessment
SH	Seli Hydropower
SLBCP	Sierra Leone Biodiversity Conservation Project
TA	Technical Advisor
TOA	Terrestrial Offset Action
ToR	Term of Reference

1 Executive summary

The Bumbuna II Project has committed to a suite of mitigation actions to avoid, minimise and rehabilitate impacts (Seli Hydropower 2019a). Biodiversity offsets will be necessary to compensate for residual impacts and achieve a net gain.

This offset strategy sets out how the Project will develop, implement and monitor biodiversity offsets to achieve a net gain for Critical Habitat-qualifying biodiversity and no net loss for Natural Habitats. Two types of offset are planned; for terrestrial biodiversity and for aquatic biodiversity (Figure 1). Preliminary forecasts of biodiversity gains based on the planned offset activities indicate that the Project can achieve an overall net gain.

Figure 1: Overview of the Project offset strategy

Type	Terrestrial		Aquatic	
Target biodiversity	• 2 Critical Habitats (gallery forest, hillslope forest) • 1 Natural Habitat (wooded savannah) • Western Chimpanzee		• 1 Critical Habitat (freshwater) • *Enteromius* sp. aff. *trispilos*, *Chiloglanis* sp. OTU3 (fish)	• *Ledermaniella yiben* (plant)
Approach	Site-based conservation management	Community-based conservation management	Targeted sustainable development activities	Species-specific activities to translocate and protect locations
Location	Loma Mountains National Park	Wankako forest patch	Upper Seli river and tributaries	Multiple rivers and tributaries in the Seli catchment and other catchments
Net gain mechanism	Conservation management activities to avert loss of forest habitat and species and restore degraded habitat		Activities with artisanal miners to restore and maintain freshwater quality	Establish new populations through translocation

Establishing conservation programmes is challenging in any environment and biodiversity offsets are no different. The offsets planned for Bumbuna II are complex and involve multiple conservation actions with many different stakeholders, in multiple sites over a long period of time. This offset strategy draws on years of experience (including from the establishment of offset sites and actions during Bumbuna I), to mitigate risks during offset design and implementation. Key risk mitigation components to the strategy include:

- The use of multiple offset sites and approaches to increase the likelihood of achieving net gain outcomes for priority species/habitats;
- Establishment of clear governance and management mechanisms to oversee offset implementation;
- Institutional capacity building to enable offset oversight and implementation; and
- Realistic estimates of offset costs and long-term funding approaches.

This offset strategy has received preliminary endorsement from key government stakeholders in Sierra Leone. The next step will be to undertake social and biological ground surveys and further stakeholder consultation to refine approaches and enable the development of offset management plans. This is planned for the Project construction period (i.e. after financial close). The actions necessary to further develop and implement this offset strategy are mapped out in Section 8, and repeated in the Project Biodiversity Action Plan (Seli Hydropower 2019a).

It is currently estimated that offset programmes (Terrestrial, Freshwater and for *Ledermaniella yiben*) will require $19 million (direct costs) and $14.6 million (costs budgeted in the Community Development Action Plan (CDAP) and ASM Livelihood restoration programme) of funding up to the end of the Project's concession period. Cost estimates are only preliminary and will be refined through further field assessments and detailed planning of offset actions.

2 Introduction

The Bumbuna II Project (the Project) aims to manage impacts on biodiversity according to the mitigation hierarchy. Where residual biodiversity impacts occur, the Project aims to deliver a net gain for Critical Habitat-qualifying features and no net loss for Natural Habitat.

The residual impact assessment estimated the residual impacts and offset targets. This Offset Strategy presents the Projects overall approach to achieve these targeted biodiversity outcomes. Throughout it is assumed that the Project will be under construction from 2020-2023, and start operation in 2024 – until 2049, when the Project will be handed over to the government.

The Project will undertake a three-phased approach to scope, design and implement a suite of offset activities that will meet its offset targets (Section 2.3). This Offset Strategy presents the overall approach (Figure 2) and the results of Phase 1: Offset scoping and desk-based feasibility assessment. Phase 2 and 3 are planned for post financial close; phase 2 for the construction phase of the Project, leading into the operational phase, and phase 3 for most of the operational phase of the Project. In this strategy, Phase 3 is considered the 'main offset period' when it is likely that gains can be achieved, although – all going well – gains may well be achieved earlier.

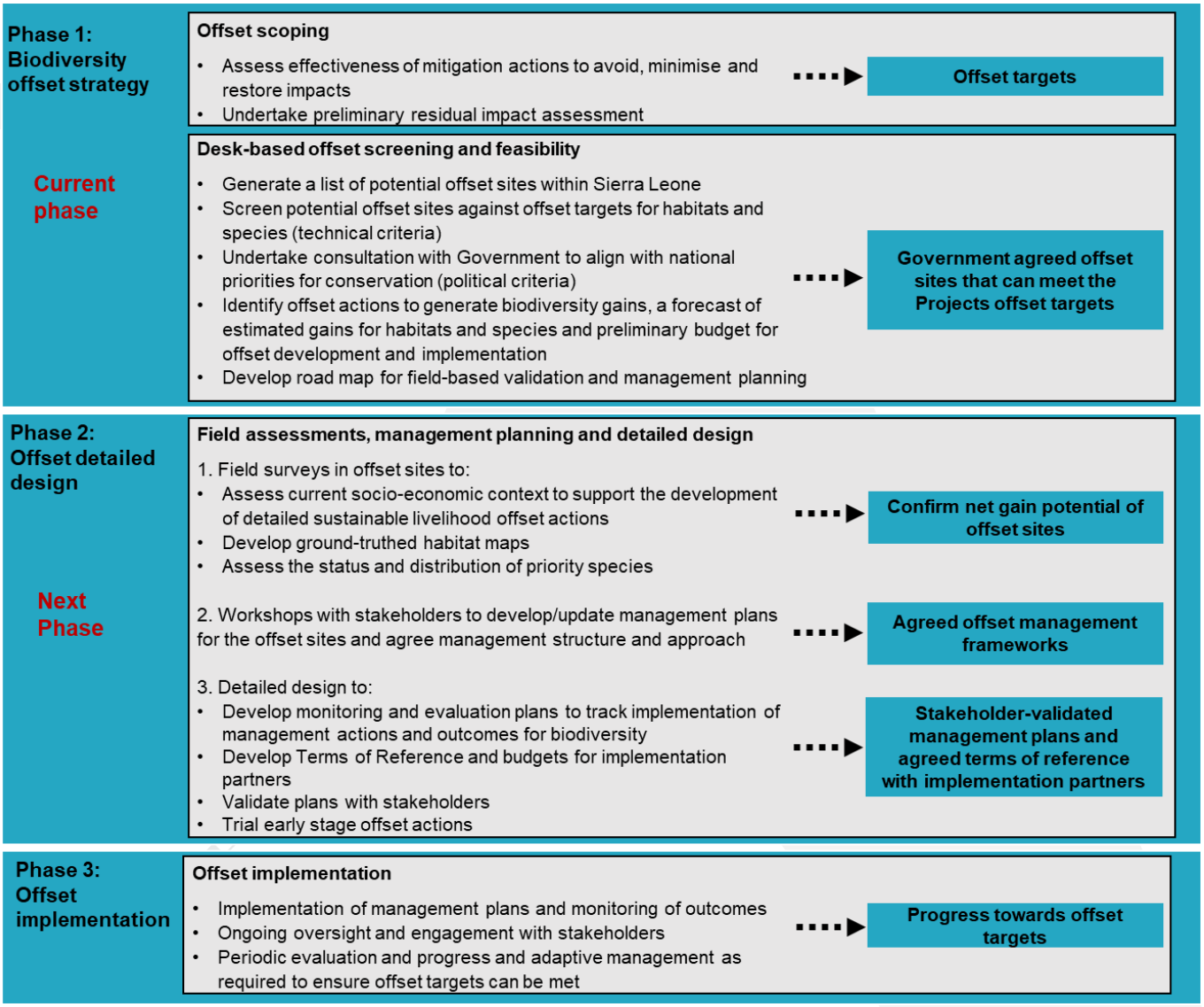

Figure 2: Overview of the offset development process for the Project

2.1 Offset principles

A set of offset principles has been developed for this Project to ensure offsets appropriately take into account the expectations of its potential lenders, the State and major stakeholders.

1. **Offsets are the last stage of the mitigation hierarchy**

The Project aims to avoid, minimize, and restore impacted features where possible. Project offsets are designed to compensate for the anticipated residual impacts of the Project, only after these other mitigation actions described in the Biodiversity Action Plan (BAP) have been applied (Seli Hydropower 2019a).

2. **In situ offsets will be designed to fully compensate for significant residual impacts on high value biodiversity, including both direct and indirect impacts**

Planned project offsets involve real on-the-ground conservation, of sufficient magnitude to compensate for significant residual Project impacts on Natural Habitat (thus ensuring no net loss) and to more than compensate for residual Project impacts on Critical-Habitat qualifying biodiversity (thus ensuring an overall net gain). Appropriate metrics will be used to forecast and demonstrate this level of compensation. Offset gains will be of similar or higher conservation priority biodiversity, i.e. "like-for-like or better". The Project Critical Habitat Assessment (CHA; TBC 2017) identified priority biodiversity (i.e. habitats and species) in the Project area of influence, and residual impacts have been described and (where possible) quantified.

3. **Offsets will be designed within a landscape context**

Project offset plans consider habitat integrity and contiguity, watershed function, and maintenance of viable populations of species (Seli Hydropower 2019b) (Section 4.2.1).

4. **Offsets will be aligned with Government plans and strategies for biodiversity conservation**

The Government is ultimately responsible for the conservation of the country's natural heritage, biodiversity and natural resources. The Project can be a partner in this process and will therefore align offset plans with existing Government plans and strategies (Sections 4.2.1 and Appendix 1).

5. **Offsets will provide additional conservation outcomes**

The Project offsets involve actions that are additional to existing management practice, and will achieve a net gain prior to any transfer of operations to the Government in the future. Only the gains in biodiversity that would not have occurred in the absence of conservation activities directly linked to the offset qualify as a biodiversity offset. This gain, called additionality, arises from either restoring currently degraded biodiversity or averting the loss of threatened biodiversity. In both cases, offset gains accrue over time. Importantly, the offset must not duplicate or replace an existing and adequately functioning restoration or conservation project/programme. However, an averted-loss offset may support an existing protected area, when the area is chronically underfunded and threatened with degradation (Section 3.2.1).

4. **Project offsets will involve local communities, and will respect the need for multi-stakeholder consultation and transparency**

Local communities are the long-term stewards of land and biodiversity. Local people in Sierra Leone rely to a great extent on the natural environment for their livelihoods, including food, firewood, medicine and cultural activities. Their involvement is therefore not optional but fundamental to ensure success of any conservation project such as a biodiversity offset. The Project, in collaboration with Government representatives, and where appropriate other development agencies and/or community-based organisations (CBOs) and non-governmental organisations (NGOs), will work with local communities to identify and develop sustainable alternative livelihood initiatives. These initiatives will seek to have strong support from communities and be community-driven, while simultaneously providing livelihood benefits and - where possible - generating conservation value and encouraging sustainable use of natural resources. This will involve making full use of local knowledge in land management and historical tenure issues. The Project will establish appropriate collaborations with community-based organisations and the government to ensure long term sustainable outcomes.

The Project will engage international, national and local stakeholders in offset design, paying particular importance to the technical validity of offsets for conservation, the political appropriateness of the offsets for Sierra Leone, and the local situation and needs of local communities (Section 5).

5. **Offsets are long term investments that will require appropriate and guaranteed financing arrangements in order to ensure long-term sustainable outcomes**

Offsets will be put in place to ensure biodiversity gains can sufficiently accrue to offset residual losses, which in most cases may be over several decades. Management responsibilities for the offset may in the future be transferred to a State or NGO partner for long-term management, as part of a handover strategy. Sustained management of this sort requires continuity in legal authority and in availability of human and financial resources. Offset funding therefore always needs to be kept separate from annual budgeting cycles and provided in such a way that offset gains can be sustained as long as Project impacts. To achieve this latter aim, and recognising the limited ability of the government to take responsibility for funding any offset sites fully in the near- or medium-term, various funding options are under consideration to ensure gains are maintained in perpetuity. Any funding arrangement will be subject to regular third-party verification to ensure appropriate use of funds and adequacy of long-term financial commitments (Section 7).

2.2 Offset risks and mitigation

Establishing conservation programmes is challenging in any environment and biodiversity offsets are no different. The offset programme for Bumbuna II is complex, involving multiple conservation actions with many different stakeholders, with multiple sites and a long programme duration. In addition, the programme is located in both a protected area and on community lands, and depends on the voluntary participation of local communities. Years of experience (including from the establishment of offset sites and actions during Bumbuna I; BHP-I), highlights the key risks and lessons learned which can be applied during current offset development.

Table 1: Project approach to mitigate key offset risks

Key risk and underlying issues	Project approach to mitigate risks	Offset strategy section
On-the-ground implementation: site-based conservation is challenging, and fraught with risks on the ground. Reliance on a single site or management approach magnifies these risks ("putting all your eggs in one basket").	The Project has two terrestrial offset sites which will apply different management approaches (one within a protected area and one in community lands) and a freshwater offset. This approach will ensure that offset actions address all priority biodiversity with residual impacts via at least one offset site. Many species are found in multiple sites which ensures a "bet hedging" approach to achieving gains – if one site is less successful than anticipated, the likelihood of success in other sites is less likely to be correlated. Desk-top technical feasibility has been assessed for terrestrial and freshwater offset activities, with a review of the management actions to deliver biodiversity gains. Planned offset field assessments will provide additional information to further reduce technical uncertainties. An overarching monitoring and evaluation plan will track progress on delivering biodiversity gains across all sites and activities, and will include thresholds to enable adaptive management of offset actions.	Sections 3 and 4
Community engagement: offsets require management on land that is not owned or managed by the Project and where local people may depend on ecosystem services. Success of offsets in such circumstances depends largely on acceptance and understanding of offset activities by communities. Expectations of communities regarding timing and benefits are a serious risk if not well managed. Stops and starts in community engagement result in mistrust and so reduce the likelihood of achieving social and environmental objectives.	The Project will take a partnership approach to management, including local communities, the government and other stakeholders. Communities will be involved closely with the development of offset activities (especially in sites outside of protected areas) and the objectives will be transparently communicated. Offset field assessments will include consideration of natural resource use and dependencies, and will take a participatory approach to the development of realistic livelihood incentives with clear benefits to local people (which is essential for programme success). Continual sustained engagement with communities will be supported by reliable long-term funding.	Section 5
Wider stakeholder engagement: offset success is largely a political and social challenge and buy-in is required from diverse stakeholders.	The Project will engage stakeholders with relevant knowledge, experience, skills and rights to help determine appropriate and effective offset activities and their best means of implementation. Pro-active engagement with relevant government agencies will continue to build robust trusting relationships that provide a foundation for developing mutually-beneficial agreements for the long-term management of sites.	Sections 5 and 6
Governance/management: a structure is necessary to enable and guide progress of offset actions, with appropriate checks and balances in place to ensure financial responsibility. If roles and responsibilities are not clearly established from the start there is a risk of poor management and offset outcomes.	An overarching agreement between key parties will be established to clearly set out the joint vision, terms and roles and responsibilities of each party. To ensure effective implementation of activities management oversight will be provided by a Steering Committee who will be supported by an independent expert panel. The Implementation Team on the ground will regularly report progress to the Steering Committee and funding will be released subject to approval by the Committee. The Implementation Team will regularly liaise with regional, local and traditional authorities through a Conservation Site Management Committee to ensure offset activities are aligned with local development and expectations.	Section 6

Key risk and underlying issues	Project approach to mitigate risks	Offset strategy section
Capacity and technical support; many projects struggle due to lack of capacity for the management and oversight of offset activities, resulting in poorly implemented activities and unclear outcomes.	Recognising capacity limitations in environmental management within Sierra Leone, and limited in-country experience of biodiversity offsets, technical support, guidance and capacity building will be provided from the start of offset development and during implementation. Support will continue as long as required through, for example, the employment of technical advisors to build capacity of national protected area staff in the Implementation Team and the use of an independent expert panel to review and provide recommendations to improve offset implementation.	Section 6
Finance: offset budgets are frequently underestimated, based on protected area budgets rather than the more demanding requirements of offset implementation, and do not consider long-term financing arrangements to ensure biodiversity gains last as long as impacts – often in perpetuity. Financing is required for offset development and offset implementation.	Offset costs are broken down into development costs and implementation costs for terrestrial and aquatic offsets, to provide a transparent estimate of overall offset delivery costs. The Project will evaluate which funding approach will best ensure that long-term funding is available for operational costs for, and beyond, the 25-year lifetime of the Project.	Section 7

2.3 Offset targets

The Project's offset targets are based on the residual impact assessment and apply a quality hectare metric to estimates of habitat loss to ensure there is equivalency between impacts and offsets (Seli Hydropower 2019b). The results are summarised in Table 2 for terrestrial biodiversity and Table 3 for freshwater biodiversity.

For terrestrial biodiversity, significant impacts are anticipated for chimpanzees, gallery forests and hillslope forests; these latter two are Critical Habitats for the Project as they are key habitats for chimpanzees and other species that qualify the area as Critical Habitat.

For freshwater biodiversity, significant impacts are anticipated for an undescribed species of fish, *Enteromius* sp. aff. *trispilos*, that is endemic to the river Seli, as well as for the freshwater habitat that supports it and other Critical Habitat-qualifying freshwater species.

Significant impacts will also occur to the freshwater plant, *Ledermanniella yiben*. The residual impact and actions to achieve a net gain for *Ledermanniella yiben* are very specific to the species and captured in the Project Residual Impact Assessment (Seli Hydropower 2019b) and Biodiversity Action Plan (Seli Hydropower 2019a); they are not repeated here to avoid duplication.

Table 2: Offset targets for terrestrial biodiversity

Feature	Residual impact	Offset target
	Area (ha)/Number	Quality Hectares (QH)
Western Chimpanzee	44 to 70 individuals	
Gallery forest	2,307 ha	1,384 QH
Hillslope forest	1,504 ha	902 QH
Natural savannah / woodland	3,327 ha	1,996 QH
Habitat was used as a proxy for the following Critical Habitat-qualifying species; no significant residual impacts are anticipated for these species and therefore any gain created by offset actions would be sufficient to achieve a net gain: ▸ Action Category (AC) 1: *Ptychadena* cf. *submascareniensis* 2 (a frog), ▸ AC 2: Ziama Horseshoe Bat, Slender-snouted Crocodile, ▸ AC 3: Western Black-and-White Colobus, Pygmy Hippo, White-backed Vulture, Hooded Vulture, Freetown Long-fingered Frog, *Ptychadena submascareniensis* (a frog), Cameroon Grassland Frog, *Vepris felicis* (a tree), ▸ AC 4: Diana Monkey, Western Red Colobus and Yellow-fronted Threadtail.		

Table 3: Offset targets for freshwater biodiversity

Feature	Residual impact	Offset targets
	Kilometres (Km)	Quality Kilometres (QKm)
The fish *Enteromius* sp. aff. *trispilos* and *Chiloglanis* sp. OTU3	Maintain known distribution in the Upper Seli river and tributaries	
Freshwater habitat (main stem)	39 km	21 QKm
Freshwater habitat (tributary)	123 km	66 QKm

Habitat was used as a proxy for the following Critical Habitat-qualifying species; no significant residual impacts are anticipated for these species and therefore any gain created by offset actions would be sufficient to achieve a net gain:

- AC 1: *Ptychadena* cf. *submascareniensis* 2 (an amphibian)
- AC 3: Freetown Long-fingered Frog (*Arthroleptis aureoli*), *Ptychadena submascareniensis* and Cameroon Grassland Frog (*Ptychadena retropunctata*) (three species of amphibians), *Marcusenius meronai, Scriptaphyosemion* cf. *chaytori, Epiplatys* sp. aff. *njalaensis, Epiplatys* sp., *Archiaphyosemion* cf. *guineense, Scriptaphyosemion wieseae, Amphilius* cf. *platychir or A. platychir,* OTU2, *Amphilius* sp. aff. *rheophilus, Chiloglanis* sp. OTU2, *Rhexipanchax kabae* and *Raiamas scarciensis* (eleven species of fish), and *Ledermanniella aloides* (a plant)
- AC 4: *Enteromius liberiensis*, *Epiplatys lokoensis* and *Synodontis tourei* (three species of fish)

2.4 Offset site selection process

Offset site selection involves filtering potential sites based on technical, political and social criteria to select the most appropriate site(s) that will enable a Project achieve its offset targets (and therefore net gain and no net loss objectives, Figure 3).

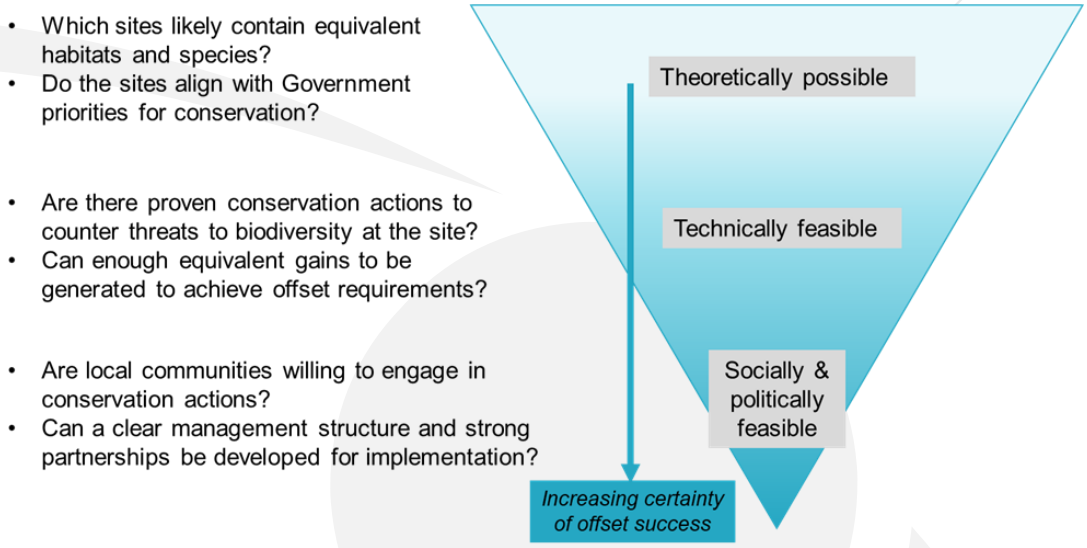

Figure 3: Overview of site selection

2.5 Approach to estimate offset gains

There are two broad strategies for achieving biodiversity gains at offset sites:

1. Averted loss of habitats and/or species; and

2. Restoration of degraded habitats or reduced species populations.

1. **Averted loss** offsets deliver biodiversity gains through actions that prevent loss that is predicted to happen in the future. Actions can either prevent further harm, e.g. by removing existing sources of biodiversity loss, or guard against future threats, e.g. by averting known future risks (BBOP 2012a). For example, if the selected offset site is facing deforestation, a project can implement actions to avoid or reduce deforestation. If hunting is anticipated to increase in the future (because, for example, cultural beliefs preventing the hunting of some species are being eroded), actions can be developed to promote the conservation of the targeted species or to tackle hunting in the offset site. Averted loss offsets are often preferred in developing countries because they can be used to protect high quality habitats from impacts, resulting in higher conservation gains than many restoration offsets. Gains are calculated by estimating the difference between the predicted loss of biodiversity (without Project actions) and the estimated gains (or the reduced loss) that can be reached with the actions implemented by the Project.

2. **Restoration** offsets deliver net gains by remediating non-project damage that has occurred at an offset site. For example, river banks can be revegetated to prevent erosion and sedimentation, which will in return improve water quality. Restoration offsets are often preferred in developed countries as there are more opportunities for conservation gain from restoration (owing to habitat degradation), they deliver a more tangible gain, and they avoid issues of predicting potential future loss. Gains are calculated by estimating the increase in habitat quality multiplied by the area over which the action is undertaken.

3 Terrestrial offset

3.1 Desk-based offset screening and feasibility

The following steps were applied to select the terrestrial offset site for the Project:

1. **Desk-top screening**: Identification of a short-list of potential offset sites that can theoretically meet Project offset targets;

2. **Engagement with Government:** Selection of the sites from the short-list that align with national conservation priorities.

Based on the selected offset sites, the Project has identified potential **offset actions** (Section 3.2) that can create the required gains for habitats and species and has undertaken a forecast to **estimate the gains** (Section 3.3) that will be created over the main 25 year offset period.

3.1.1 DESK-TOP SCREENING

In order to ensure the offset site has similar habitats and species to the Project area (i.e. the offset site meets the principle of equivalency), a 10km buffer was drawn around the forest-savannah ecoregion (the ecoregion the Project area is based in) and patches of Natural Habitat over 8,500 ha[1] in size. As a result of this exercise, one large patch of Natural Habitat was found on the border of the forest-savannah ecoregion – for the purpose of this strategy, this is called the "Wankako forest patch". Other patches of Natural Habitat, e.g. to the east of Farangbaia Forest Reserve, were too small in size (~3,000 ha) and highly fragmented, and therefore not included.

In order to identify offset sites aligning with national conservation priorities, all protected areas in Sierra Leone were also selected (34 sites) and screened based on the 8,500 ha size requirement (25 sites removed) and the likely presence of a chimpanzee population containing 70 individuals or more (a further five sites removed) (Appendix 2).

As a result of the above two desk-top screening steps, four potential offset sites were identified: Wankako forest patch; Outamba-Kilimi National Park; Loma Mountains National Park; and Gola Rainforest National Park (Figure 4).

[1] Based on an early estimate of Project residual impacts to Natural and Critical Habitat.

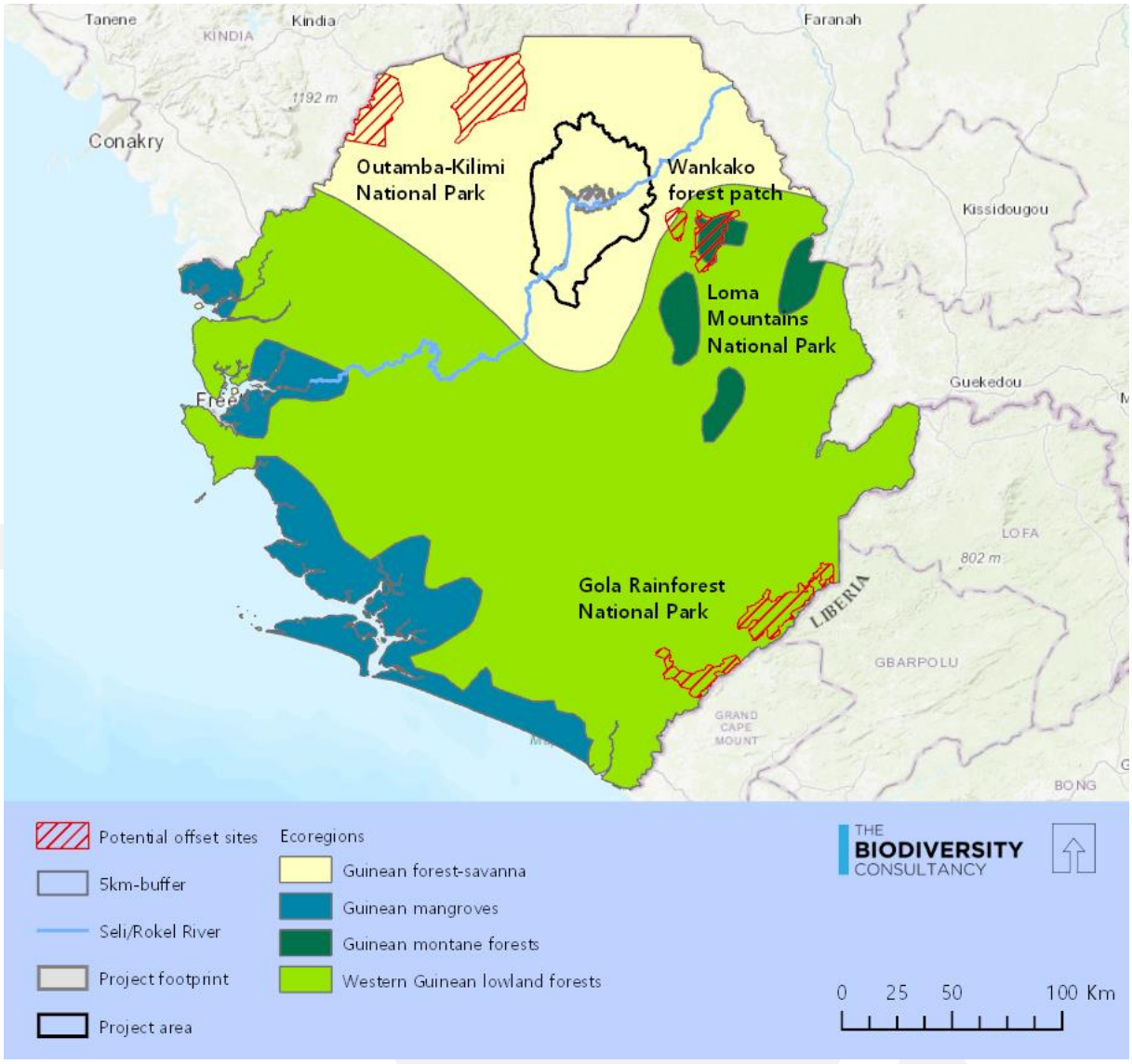

Figure 4: Potential offset sites identified by a desk-top screening based on size and chimpanzee populations

3.1.2 ENGAGEMENT WITH GOVERNMENT

A meeting was held with the National Protected Areas Authority (NPAA), the Government agency responsible for protected areas in Sierra Leone, to discuss the Project offset targets and assess which of the short-listed sites align with Government conservation priorities. The outcome of the discussion is presented in Table 4.

The discussion included a focus on the technical feasibility of the short-listed sites to meet the Project's good practice offset principles (Section 2.1), specifically, whether the biodiversity present in the sites was **equivalent to or better than** biodiversity impacted by the Project and whether offset actions in the sites could be considered **additional** to ongoing management practices.

- Equivalence[2] for habitat type: Impacted terrestrial Critical Habitats are gallery forest and hillslope forest. The only significantly impacted Natural Habitat is savannah/woodland habitat. The offset site should therefore contain habitats that are considered to be equivalent to or better than gallery forest and hillslope forest.
- Equivalence for species: As a priority, the offset area should contain forest habitat that supports chimpanzee populations, which are predicted to be significantly impacted by the Project. Habitat has been used as a proxy to quantify residual impacts for some Critical

[2] Biodiversity gains from offsets should be 'like for like (i.e. equivalent) or better (i.e. trading up is possible where it is justified)' (BBOP 2012).

Habitat-qualifying species where it was appropriate to do so (Seli Hydropower 2019b), Table 4. The offset site should contain these species in order to ensure that a net gain is achieved.

- Additionality: Conservations gains need to be clearly attributable to Project offset actions and not have occurred without offset projects. If a site is already well managed there is unlikely to be scope for additional conservation actions that would create an offset gain.

Result

As a result of discussions, Gola Rainforest National Park was excluded as the site because it already receives significant support including funding through the Gola Reducing Emissions from Deforestation and Degradation (REDD) project and donor funding (and therefore additional offset actions were not considered possible). Although Outamba-Kilimi National Park also meets the key Project offset targets, it was excluded as it is somewhat distant from the Project area and was considered less of a priority as an offset site for the Project by government authorities during consultations, owing to the support initiated (but not sustained) by BHP-1 in the Loma Mountains. **Loma Mountains National Park** was upgraded to National Park status as part of BHP-I and there are stakeholder expectations for further conservation and sustainable development initiatives to be undertaken with forest edge communities (TBC 2019). Loma Mountains National Park is therefore selected as an offset site along with the **Wankako forest patch** (subject to ground assessments, Section 3.2.2). Wankako forest patch lies between the Project area and the Loma Mountains National Park and will therefore support habitat connectivity across the wider landscape. By selecting two offset sites the Project is reducing on-the-ground implementation risks and technical uncertainties (Section 2.2).

Table 4: Summary of discussions with the NPAA and outcome of site selection; colours highlight whether the site meets offset design requirements (green – yes, amber – potentially, red – unlikely)

Name of the short-listed site	National status and IUCN management category	Size of site) (ha)	Estimated size of chimpanzee population	Feasibility of the site to meet key offset design requirements		
				Equivalence for habitat type	Equivalence for species	Additionality and alignment with national priorities
Kilimi section of the Outamba-Kilimi National Park	National Park, no reported IUCN category	38,900	74 individuals[3]	Kilimi is in the same eco-region as the Project area, however, the habitats present are mainly savannah/woodland habitat with little forest habitat present (Appendix 2, Figure 6).	4/14 confirmed (Outamba-Kilimi National Park 2018). Given proximity to the project area, ground surveys may well encounter further priority species. While good populations of chimpanzees remain in Outamba, numbers in the Kilimi section are likely to now be below those necessary to compensate for Project residual impacts.	Although this park is part of the protected area network for Sierra Leone, its integrity is threatened by illegal logging and agricultural encroachment, and large mammal species are threatened by illegal hunting (Carlsen *et al.* 2012). Management effectiveness was ranked as low (Koker 2011), likely as a result of long-term underfunding for the area. Offset actions would thus likely be additional to ongoing management measures. However, during consultations, government authorities noted that Outamba-Kilimi was a lower priority for a Project offset than Loma Mountains National Park, owing to the support initiated, but not sustained, by BHP-1 in Loma (see Loma box below).
Outamba section of the Outamba-Kilimi National Park	National Park, IUCN category II	73,800	950 individuals	Outamba is in the same eco-region as the Project area, and whilst there are large areas of savannah/woodland habitat there is also gallery forest and some forest patches (Appendix 2, Figure 6).		
Gola Rainforest National Park	National Park, IUCN category II	71,100	270 individuals	Gola National Park is in the Western Guinean lowland forest ecoregion, the habitats present consist mainly of evergreen forests. While habitats are not fully equivalent to those impacted, lowland forests are of higher conservation priority so could be considered trading up.	7/14 confirmed. The Park contains many of the priority species for the Project (as well as other species of conservation priority (Klop *et al.* 2008), however, it is unlikely to contain terrestrial species that have a limited range such as the newly described species of amphibian recorded in the Project area, *Ptychadena* cf. *submascareniensis* 2.	The Gola forest is managed through a partnership approach between the NPAA and civil society (the Conservation Society of Sierra Leone and the Royal Society for the Protection of Birds, from the UK). Funding is secured through the sale of carbon credits (certified by the Verified Carbon Standard and the Climate, Community and Biodiversity Standard) and via donor funding. It would be difficult to demonstrate that Project offset funding could create additional biodiversity gains to those already being undertaken by the existing management measures.

[3] The national chimpanzee census was undertaken in 2010, due to habitat conversion and hunting pressure, the population may now be far lower

Name of the short-listed site	National status and IUCN management category	Size of site) (ha)	Estimated size of chimpanzee population	Feasibility of the site to meet key offset design requirements		
				Equivalence for habitat type	Equivalence for species	Additionality and alignment with national priorities
Loma Mountains National Park	National Park, no reported IUCN category	33,200	1065 individuals	Loma Mountains National Park overlaps with both the Guinean Montane forests and the Western Guinean lowland forests ecoregions. Habitats present consist of forests, small areas of savannah/wooded habitat and montane grassland. While habitats are not fully equivalent to those impacted, lowland forests are of higher conservation priority so could be considered trading up.	8/14 confirmed. The area is already known to contain many of the priority species (including the primates, Pygmy Hippo and amphibians), (Forest Division 2012). It is likely that further priority species would be recorded if targeted surveys are undertaken.	As part of offset actions for BHP-1, Loma mountains was upgraded to National Park status and an interim Management Plan was developed (TBC 2019). However, for Loma Mountains but its implementation requires additional funding and capacity (Forest Division 2012).
Wankako forest patch	None	9,100[4]	Potentially more than 70 individuals[5]	The Wankako forest patch overlaps with both the Guinean forest-savanna ecoregion and the Western Guinean lowland forest eco-region. Habitats present consist mainly of forest (which is likely to support chimpanzees) and savannah/wooded habitat.	Although surveys have not yet been undertaken, the proximity of the area with the Project area (and Loma Mountains where many species have been confirmed) suggests that most priority species are likely to be present.	The forest patch has been identified through satellite images and through discussions with people who are familiar with the area. The area is not currently part of the national protected area network and no conservation management measures are therefore being undertaken. If local communities and Chiefs agree to measures to manage the area, they would be additional to current practices.

[4] As the forest patch is not a recognised protected area its size was estimated using ArcGIS.

[5] Chimpanzees are known to be present in the forest patch but no surveys to estimate the size of the population have been undertaken. Based on size of the area and known density from Loma Mountains, this area may contain more than 70 chimpanzees.

3.2 Management activities to generate biodiversity gains

3.2.1 BACKGROUND INFORMATION ON LOMA MOUNTAINS NATIONAL PARK

The Loma Mountains are located in the Koinadugu District in the Northern Province of Sierra Leone. They are one of seven key Guinean Montane Forests in West Africa consisting of scattered mountains and high plateaus, covering areas of Guinea, Cote d'Ivoire, Liberia and Sierra Leone (Forest Division 2012). Mount Bintumani is the highest peak in Loma Mountains National Park (LMNP) (1,947 m) and in West Africa (west of Mount Cameroon).

LMNP supports many different flora associations and a wide diversity of species, and the mountains have high plant endemism. There are three main plant communities present: closed forests and Guinea savannah (from 460 to 915 m), sub-montane shrub savannah and sub-montane gallery forest (915 to 1,700 m), and montane grassland (above 1,700 m). The fauna includes ten species or subspecies of primates, including the Critically Endangered Western chimpanzee (reported in high numbers) and Black and White Colobus, plus several Endangered and Vulnerable mammals such as Leopard (*Panthera pardus*), Pygmy Hippopotamus and Jentink's Duiker (*Cephalophus jentinki*). A total of 245 bird species have been recorded, including two near-endemics (the Sierra Leone Prinia *Schistolais leontica* and the Emerald Starling *Lamprotornis iris*). Many more species are endemic to this ecoregion as a whole, including several small mammals, a leaf-nosed bat, ten species of amphibians and many invertebrates. Despite the anthropogenic influences, Loma Mountains is one of the few areas in the region with a large area of intact habitats.

The area was designated as a Non-hunting Forest Reserve in the 1970s, prohibiting hunting without a licence. The Loma Mountains reserve was proposed as a National Park in 2002. Biodiversity experts recommended creation of an offset conservation area to compensate for the loss of biodiversity for BHP-I in 2006, and put forward Loma Mountains as the offset site. Biodiversity surveys were subsequently conducted at Loma by BHP-I, confirming its suitability as an offset (Jenness *et al.* 2007). In March 2010 a survey of the boundary of the existing Loma Mountains Non-hunting Forest Reserve was made, along with a study of the most appropriate boundaries for a national park (Forest Division 2012).

It was originally envisaged that the LMNP could be established with funds from the Bumbuna Trust[6], but the Trust has never been functional and no funds have been available for activities. The initial park establishment was eventually funded by the World Bank Bumbuna Hydroelectric Environmental and Social Management Project (which ended in 2012), and the Global Environment Facility (GEF)-supported Sierra Leone Biodiversity Conservation Project (SLBCP) (which ended in 2014) including the development of the Loma Mountains National Park Preliminary Management Plan (2013-2017) (Forest Division 2012). This was carried out by a team of consultants of Österreichische Bundesforste (ÖBf) under the supervision of the Ministry of Agriculture, Forestry and Food Security. LMNP was proclaimed in the Sierra Leone Government Gazette of 6 December 2012.

LMNP is now administered by the NPAA and provides funding for park staff covering salaries for 15 staff members deployed to Loma, including one Conservation Officer (the person in charge of Loma), and 14 game guards and rangers, who are currently still in place. Park activities completed between 2012-2014 included infrastructural development (building of headquarters and ranger outpost buildings), park boundary demarcation, some community livelihood activities, production of the management plan, and improvements to some access roads. Unfortunately, there has been no other available funding for implementing activities or day-to-day running costs of the LMNP Management Plan (MP) since 2014.

The demarcation study created a new park boundary in 2010. The demarcation process followed an extensive participatory process and was finalised in a Reserve Settlement Court procedure. The new boundary excluded human settlements (30 communities are recognised around the boundary), and concrete pillars were erected along the boundary. The planting of native trees also serves as living markers in some parts of the park boundary. As a result of the boundary re-demarcation, the size of the proposed Loma National Park reduced to 28,731 ha (the size before the re-demarcation was 33,021 ha). Approximately 11 villages, although now outside the reserve, had fields in the reserve or were likely to encroach in the future. It will be important to avoid any new encroachment into LMNP by effective law enforcement. The LMNP Preliminary Management Plan aimed to work in partnership with village communities in the surrounding Chiefdoms to ensure protection and sustainable resource use of the Park over a 5-year period.

The main household income from communities surrounding the park is generated by farming activities (90% of households derive their main income from farming), which demonstrates the importance of subsistence farming in the area. Protein demand is met by bushmeat (60%), followed by fish (30%) and small livestock (10%). In a socio-economic study in communities around the park conducted in 2011 and 2012 (EEMC 2012), 89% of the respondents disclosed that the Loma Mountains area was their primary source of bush meat. Honey is an important resource for most households and beekeeping is commonly practiced as well as the harvesting of wild honey. Most farming activities are for subsistence purposes, although some crops are predominantly cash crops, such as groundnuts. Livestock production is more market orientated and used for wealth accumulation. There are almost no formal employment opportunities available in the area, except for a few opportunities in public service. Due to high transport costs as well as general high costs of manufactured goods, people are completely dependent on the forest to meet their building material demands (e.g. poles, timber, thatching grass, reeds, etc.).

[6] The Bumbuna Trust was set up for BHP-I to accrue revenue from Bumbuna electricity tariffs to cover recurring costs of a number of social and environmental activities including the functioning of the Bumbuna Watershed Management Authority and operations of LMNP. However, it was never properly set up (still unregistered in 2013) and there were concerns that, if it was set up, it would not function effectively (Jenness *et al.* 2013).

The most serious existing threats in the park have been identified as illegal hunting (for bushmeat), bush fires and encroachment of agricultural farming. Some other threats, such as fishing, livestock grazing and logging occur in the area but are not thought to be as detrimental to the integrity of the protected area. Other threats that are currently not occurring in the area were also listed, such as commercial mining and construction (including dams, roads, buildings, power lines, etc.). It appears from Brncic *et al.* (2010) that hunting remains intense and, as in most other parts of the region, there has been some agricultural encroachment – which reduced the cover and quality of the habitats in the lower areas of the park. Nevertheless, the LMNP is much less disturbed and fragmented that other areas in the region (S.R. Livingstone and E. Tatum-Hume, pers. obs. 2018).

The Loma Mountain Biodiversity studies, commissioned by BHP-I in 2008, estimated Chimpanzee density to be between 5.75 and 7.41 weaned individuals per km^2. Highest chimpanzee density was recorded in gallery forest habitat and this is one of the highest Chimpanzee densities recorded in West and Central Africa (Brncic *et al.* 2010). There is, however, evidence of threats to chimpanzees in the park from illegal hunting (with guns) and habitat degradation as a result of agricultural encroachment (Brncic *et al.* 2010).

3.2.2 WANKAKO FOREST PATCH

The Wankako forest patch was identified as a potential offset site through studies of satellite imagery and discussions with people who know the area (conducted by TBC and Seli Hydropower 2018). The size of the forest patch is estimated to be approximately 9,100 ha. The forest patch straddles the Guinean forest-savanna ecoregion and the lowland forest ecoregion. It is in close proximity to LMNP (less than 5 km) and the Bumbuna II Project area (approximately 20 km). The area appears to consist largely of forest and wooded savannah habitat, although field assessments have not yet taken place to ground truth existing habitat types, species present, community land use activities and existing threats to the area (planned for the first year of Project construction). Due to its proximity to (and potential connectivity with) LMNP and the Project area, it is assumed that most priority species will be present in the forest patch and existing threats will be similar to other nearby areas. Chimpanzees are known to be present within the forest patch, although the population size is currently unknown. From other population estimates in the region, there could be more than 70 chimpanzees present. The most significant existing threats to the forest patch are likely to be hunting (for bushmeat), bush fires and agricultural activities. Livestock grazing and logging are also likely to occur in the area.

Working with communities and authorities in this area (plus a 5 km buffer area) is considered as an offset in combination with LMNP in order to generate the gains necessary to achieve no net loss (NNL)/net gain (NG) for priority biodiversity (Section 3.3.1). Including Wankako forest patch as an offset site will also help maintain habitat connectivity between LMNP and other areas of Natural Habitat in the region. Increasing habitat connectivity in the region will be key for achieving long-term conservation goals and ensuring the viability of chimpanzee populations in the region (Forest Division 2012).

There is currently no formal protection of this forest patch and therefore no conservation management measures in place. The land use of the area is thought to be under control of the Chiefdom authorities and used by the local communities (although details of specific activities are not known at this time). Management options for the area as an offset site would be different from LMNP, as there is no existing mechanism or framework to support this from a legal perspective. The recommendation would be for the area to be protected and managed as a "Community Forest", created through engagement and agreements with the communities and Paramount chief who control land tenure. The area would be designated as Community Forest through a participatory land use planning (and zoning) process. The management plan would include biodiversity conservation measures designed to both protect the forest patch for priority biodiversity, as well as a livelihood programme with incentives that would benefit the local communities. It will be important to ensure that opportunity costs incurred by local people for agreeing to no longer use the area for certain activities (e.g. conversion of Natural Habitats for agriculture, and some hunting activities) would be offset by other livelihood benefits outside of the sensitive area. Since the forest patch is not within a protected area, it falls under the jurisdiction of the Forestry Division (Community Forest Unit) within the Ministry of Agriculture, Forestry and Food Security and they are thus an important stakeholder. It will also be important for the Forest Division and the NPAA to communicate on the management of the nearby LMNP and the forest patch due to their proximity, and to employ a similar monitoring programme in order for joint reporting on biodiversity gains.

3.2.3 ACTIONS TO CREATE BIODIVERSITY GAINS

As part of the offset for BHP-I, a Preliminary Management Plan was development for LMNP (Forest Division 2012). There was extensive consultation with the communities around the park, and a set of management actions were identified in order to reduce the existing threats negatively impacting the biodiversity (habitats and species) within the park boundaries. These conservation measures have been reviewed, and a number of the proposed actions are expected to create biodiversity gains for the terrestrial biodiversity offset targets which have a residual impact from Bumbuna II (Section 3.2, Table 3). The actions included below are based on the most serious existing threats to the offset targets and which will provide the largest gains if managed, and are proven elsewhere to result in effective conservation management.

Conservation actions will be undertaken in LMNP, in the forest patch and with forest edge communities adjacent to the offset sites (within a 5 km buffer of both sites). Close engagement and agreements with the local communities are essential in order for these actions to be successful. Only through achieving a net benefit to local communities will the conservation actions and interventions be achievable.

LMNP

Land management within and around the park boundaries and buffer zone:

- Removal of existing agricultural fields within the park boundaries;
- Controlled early burn practices in agricultural areas outside of the park boundaries;
- Reforestation of degraded areas to restore biodiversity, including areas where there has been encroachment of agriculture within park boundaries; and
- Tree planting in degraded areas.

Enforcement within the park boundaries and buffer zone:

- Reduction of illegal hunting (use of guns and snares), particularly of chimpanzees, through enforcement by park rangers;
- Reduction of destructive activities within LMNP and its buffer, e.g. park ranger enforcement against conversion of Natural Habitat for agriculture, fires, animal grazing, logging, and unsustainable use of Non-Timber Forest Products (NTFPs).

Livelihood development strategy and actions (which serve as the incentive for behaviour change, ensuring that the conservation actions are socially, politically and economically feasible, and sustainable in the long-term):

- Improvement of agricultural production in suitable areas outside the park boundaries in order to reduce expansion of farmland into LMNP;
- Livelihood development to compensate for loss of income from stopping unsustainable collection of NTFPs inside LMNP;
- Livelihood development to compensate for loss of source of protein from hunting within LMNP.

Awareness raising is required to increase knowledge and recognition of both the ecological and social impacts of particular natural resource use practices:

- Education and awareness raising on ecological impacts of uncontrolled fires;
- Education and awareness raising on ecological impacts of unsustainable agricultural and NTFP collection practices;
- Education and awareness raising on ecological impacts of unsustainable hunting of wildlife.

The Wankako forest patch

The forest patch is currently not within a protected area and therefore the management approach needs to be based on community management of their land and natural resources. The main actions for this offset area would be through zoning the area as a Community Forest, agreeing restrictions on use of that area, and adopting a sustainable livelihoods approach to natural resource management. A detailed field assessment will be needed to identify livelihood issues faced by communities, in order to develop broad livelihood development activities with potential to bring about positive livelihood change and improve the protection status of existing natural habitat and species.

Land management in and around the proposed Community Forest zone (the forest patch):

- Zoning of a conservation area within community lands – agreements made with communities to protect the area;
- Prohibition of identified destructive activities within the area, e.g. conversion of Natural Habitat for agriculture, fires, animal grazing and unsustainable logging;
- Controlled early burn practices in agricultural areas outside of the conservation area boundaries;
- Reforestation of degraded areas.

Enforcement of agreed prohibited activities within the zoned conservation area:

- Community rangers to enforce agreements made for land management in conservation zone;
- Implementation of timber permit system in conservation zone;
- Enforcement of prohibition of hunting of chimpanzees (and other offset target species).

Livelihood development strategy and actions (which serves as the incentive for behaviour change, ensuring that the conservation actions are socially, politically and economically feasible, and sustainable in the long-term):

- Improvement of agricultural production in areas outside the zoned conservation area in order to reduce expansion of farmland into ecologically sensitive areas;
- Improvement of grazing areas outside of the conservation area;
- Livelihood development to compensate for loss of income from restrictions on agriculture and hunting in the conservation area.

Awareness raising is required to increase knowledge and recognition of both the ecological and social impacts of particular natural resource use practices:

- Education and awareness raising on ecological impacts of uncontrolled fires;
- Education and awareness raising on ecological impacts of unsustainable agricultural and NTFP collection practices;
- Education and awareness raising on ecological impacts of unsustainable hunting of wildlife.

3.3 Forecast of terrestrial offset gains

Forecasts of biodiversity gains (technically “averted losses”) assume that the Project is able to work with forest edge communities living adjacent to the offset sites, with traditional authorities and with the NPAA to introduce the above actions to reduce deforestation rates in Loma Mountains, the Wankako forest patch and a 5 km buffer surrounding both offset sites (Figure 6 in Appendix 3). A reduction in the background deforestation rate will create gains through avoided habitat loss (Section 2.5). Actions to restore areas of forest that have been degraded by agricultural encroachment in LMNP would also create restoration gains. These gains have not been accounted for in this forecast but potentially could be in the future.

The Bumbuna II Project will be operated by Seli Hydropower for 25 years, so offset activities should achieve net gains before the end of that 25-year period. Offset activities will, however, need to be implemented over a much longer period as offset gains have to be maintained for as long as the Project impacts – in effect, in perpetuity for this Project (long-term options for sustainable financing will be considered by the Project: Section 7). Gains are forecast by assessing the difference between the amount of forest that would be lost following current management practices over 25 years and the reduced forest loss that could be achieved through improved habitat management. The calculation and the assumptions made to enable the forecast are presented in Appendix 3.

3.3.1 HABITATS

The estimated offset gains are presented via a quality hectares metric[7] for each habitat type to ensure that gains are comparable to offset targets (Table 5). The habitat types within the offset areas consist mainly of contiguous lowland and hillslope forest and therefore greater gains are predicted for these habitat types than natural savannah/woodland. Current remote sensing analysis has not distinguished between gallery forest and lowland forest, so these are lumped in Table 5 – but the vast majority of such forest is likely to be contiguous lowland forest (given the limited savannah/woodland within which gallery forest can occur). Gallery forest and hillslope forest are considered to be Critical Habitats for the Project as they support a wide-range of Critical Habitat-qualifying species. Lowland forest is also a Critical Habitat in this area, as it supports many of the same species in globally-significant numbers. All three types of Critical Habitat are under threat in Sierra Leone due to timber extraction and conversion to agriculture (Seli Hydropower 2019b) and are therefore considered to be of high conservation priority. Lowland forest is under more threat than gallery or hillslope forest, and so is an even higher conservation priority – conservation of this habitat could thus be considered trading up. Natural savannah/woodland is a widespread habitat type and is considered to be Natural Habitat by the Project rather than Critical Habitat as it is not a priority habitat that supports Critical Habitat-qualifying species. Generating gains in Critical Habitat instead of solely Natural Habitat can therefore be considered to be "trading-up". The offset targets can be met by working with communities and authorities to implement conservation and sustainable development management in both offset sites and the 5 km buffer area.

Table 5: Forecast of offset gains (presented in Quality Hectares, QH)

Habitat type	Offset target	Loma Mountains	Wankako Forest Patch	5 km - buffer	Total forecast gain
Critical Habitat	**2,286**				**4,074**
Lowland/gallery forest	1,384	399	559	522	1,480
Hillslope forest	902	1,900	330	364	2,594
Natural Habitat	**2,124**				**349**
Natural savannah/woodland	1,996	77	12	206	296
Inselberg	18	32	0	13	45
Swamp	110	1	3	3	8
	4,410				**4,422**

3.3.2 CHIMPANZEES

Currently, chimpanzee populations are estimated to be slowly declining in the offset areas due to hunting pressure and agricultural encroachment; the loss is assumed to be 1% per year (Appendix 4). Forecasts of chimpanzee gains assume that the Project will support actions to reduce threats and, as a result, chimpanzee population declines will be much reduced (to just 0.003% per year). The population of chimpanzees in the Loma Mountains was estimated to be 1,065 individuals (CI 95%: 572-1986) in 2010 (Brncic *et al.* 2010). Applying the chimpanzee loss rate, the population is estimated to be 925 individuals (CI 95%: 497-1,725) in 2024. Based on this population estimate, and the implementation of offset actions over 25 years, offset actions will prevent further loss of approximately 131 chimpanzees (Appendix 4).

4 Freshwater offset

4.1 Site selection

The Project's freshwater offset target includes the generation of biodiversity gains for freshwater habitat and for *Enteromius* sp. aff. *trispilos* and *Chiloglanis* sp. OTU3. These two fish species are endemic (or potentially endemic) to the river Seli (above Bumbuna I reservoir) and

[7] Assumptions to define habitat quality are presented in Appendix 3; habitat quality is higher at the offset sites (90% for Loma Mountains National Park and 70% for Wankako Forest Patch and the 5 km buffer) than in the Project area (60% quality).

therefore the upper Seli catchment is the only suitable site for a freshwater offset (otherwise a net gain cannot be achieved for this species). The upper Seli consists of the Mawaloko river (and tributaries) and the river Seli (and tributaries) upstream of the Yiben reservoir.

4.2 Management activities to generate biodiversity gains

4.2.1 BACKGROUND INFORMATION ON THE UPPER SELI CATCHMENT

Within a catchment, the quality of freshwater habitats and, therefore, the suitability of freshwater habitat for fish species, is largely dependent on the land use activities occurring around the rivers and tributaries. In alluvial rivers[8] like those in the Seli catchment, activities in riparian areas which remove vegetation (such as farming, logging or artisanal mining) result in erosion and sedimentation – this decreases freshwater habitat quality. Removal of vegetation also affects food availability for fish (as many species, including *Enteromius* sp. aff. *trispilos*, feed on insects that fall into the water from surrounding vegetation), results in increases in water temperature, and reduces availability of places to hide from predators, to breed and/or to spawn.

Artisanal and small-scale mining (ASM) is highlighted as a particular threat to freshwater habitats and species as it involves surface excavation which results in high levels of sediment release that can affect the entire length of a river or tributary (Mol & Ouboter 2004). Sediment from ASM has been shown to significantly reduce fish species diversity and is a threat in particular for restricted-range species (such as *Enteromius* sp. aff. *trispilos* and *Chiloglanis* sp. OTU3) (Wantzen & Mol 2013). ASM is not only a threat for fish species but also aquatic plants (e.g. those in the Podostemacea family such as *Ledermaniella yiben*) as the additional sediment load in the water settles onto the plants preventing photosynthesis and respiration (Wantzen & Mol 2013; Lebbie 2018). The Project has undertaken a detailed artisanal mining study within the Yiben inundation area (SRK Consulting 2018) which found that the majority of ASM activities are occurring along rivers rather than in alluvial terraces (e.g. in inland valley swamp areas). In the Yiben inundation area there is variability in the type of miners undertaking ASM. Some are transient miners (i.e. they move their mining activities across multiple locations in the Northern Province or throughout Sierra Leone), whilst others only mine at one location. Miners may also work independently or as part of informal groups, with the number of miners and groups of miners varying at each ASM site (from three individuals up to 200 groups). ASM mining was also found to be a largely a seasonal activity, limited to the dry season when water levels are low enough. In the wet season, miners that live locally will return to agricultural activities. It is likely that a similar situation exists further up the river Seli, beyond the Yiben inundation area. ASM activities are largely unregulated by the state, as the remoteness of ASM sites makes monitoring and controlling activities very difficult. “Informal” permission is however granted by Paramount Chiefs for mining activities in return for a payment by the miner or group of miners (SRK Consulting 2018). ASM is considered to be a significant health and safety risk, with large numbers of workers reporting injuries, lost time and earnings (SRK Consulting 2018).

Once an ASM site is exhausted of resources, it is abandoned and restoration is rarely undertaken as it is not economic to do so (and as authorities are not monitoring ASM activities), resulting in ongoing erosion and sedimentation.

4.2.2 ACTIONS TO CREATE GAINS IN FRESHWATER HABITAT QUALITY

Due to the significant impacts that ASM has to freshwater habitats, actions to work with miners at ASM sites in the upper Seli catchment to either decrease the occurrence of ASM or to promote a more environmentally responsible approach to ASM would improve freshwater habitat quality and create offset gains. The complete removal of an ASM activity would clearly result in the biggest gain for freshwater habitat quality, however, this may not be a viable option in all instances where ASM is occurring. A careful evaluation, similar to the approach used within the Yiben inundation area SRK Consulting 2018), would be required to assess ASM in the upper Seli catchment and determine the most appropriate approach to reduce environmental impacts and improve social outcomes for miners.

ASM sites where the majority of miners are individuals or informal groups from local communities (rather than transient miners), are likely to be more suitable locations for either stopping ASM or developing a sustainable ASM approach. Actions to improve the sustainability of ASM have been identified for the Yiben inundation area (SRK Consulting 2018), some of which are likely to be appropriate for the offset actions including:

- Support to the development and transformation of existing subsistence agriculture to make it more productive;
- Diversification of existing livelihoods to increase non-farming income generation;
- Improve institutional accountability of ASM activity through identifying local mechanisms to incentivise the formalisation of existing ASM groups; and
- Provision of technical skills development, health and safety awareness and environmental stewardship training and skills development to ASM workers.

As the Project will be developing the above types of action for ASM activities within the Yiben inundation area. Once a tried and tested approach is in place, the program of work will be extended to the catchment area beyond Yiben to identify ASM activities, the stakeholders involved and select ASM sites for offset actions.

Further actions that would improve freshwater habitat quality in the upper Seli catchment include:

- Promoting the importance of riparian vegetation to communities to encourage natural vegetation to be left intact; and

[8] Rivers which have beds and banks made up of mobile sediment and soil.

- Supporting rehabilitation of riparian vegetation in areas where it has been removed or degraded by farming or ASM activities.

The Project is developing a Catchment Management Plan that will identify the management measures required to promote sustainable use of the Yiben reservoir and wider catchment area. Actions to promote environmental stewardship of sensitive habitats including riparian areas, and to support rehabilitation of riparian vegetation, will be part of the plan.

4.3 Forecast of freshwater offset gains

Forecasts of biodiversity gains assume that the Project will work with local miners at nine ASM sites in the upper Seli catchment to improve the sustainability of ASM mining and that the sites will be monitored to ensure the sustainable approaches implemented are maintained. This will result in a "restoration" gain for freshwater habitat and associated freshwater species (including *Enteromius* sp. aff. *trispilos*). If ASM miners decide to give up mining activities altogether, in return for the provision of livelihood diversification and transformation packages, the gains would be higher than those assumed below.

Gains are forecast by assuming that freshwater habitat quality in ASM areas is low (20%) and that downstream of ASM sites water quality remains low for 20 km (Mol & Ouboter 2004)[9]. Actions to implement sustainable ASM is predicted to result in an increase in freshwater quality (from 20 to 75%) at the ASM site and downstream, equivalent to a 55% increase in habitat quality. If sustainable ASM is implemented at nine sites, this would result in a 99 Q km gain.

Table 6: Forecast of freshwater offset gains

Habitat type	Offset target (Q km)	Gain from sustainable ASM (Q km)
Critical Habitat	**87**	**99**
Freshwater habitat (main stem)	21	99
Freshwater habitat (tributaries)	66	

The terrestrial offset sites (LMNP and the Wankako forest patch) are located in the upper reaches of the Sewa catchment. The Project has undertaken a series of fish surveys in catchments adjacent to the Seli/Rokel catchment (where the Project is located), including the Sewa, and the Little Scarcies, to understand the distribution of Critical Habitat-qualifying species. The highest fish diversity was found in the Sewa catchment, including several undescribed species that are likely to be endemic to the Sewa. Although not all of the species that qualify the Project area for Critical Habitat are found in the Sewa catchment, there is approximately a 75% overlap. Offset actions to protect habitats in the terrestrial offset areas will also benefit freshwater habitat and the fish species they support. The Project has not included quantification of freshwater habitat gains from terrestrial offset actions as it will instead undertake a specific freshwater offset, but it is noted that there will be additional gains in terrestrial offset areas for freshwater habitats and species.

5 Stakeholder engagement

Pro-active and transparent stakeholder engagement and consultation is a key component of any biodiversity offset programme. This extends to direct partners within the offset governance and management structures (e.g. the NPAA and Forestry Division), supporting stakeholders (e.g. regional and local government council), and direct recipients of biodiversity benefits (local communities with whom agreements have been made and are directly involved in supporting livelihood programmes). The involvement of stakeholders who have knowledge, experience, skills and rights to help determine what may be appropriate and effective offsets and how they may be delivered is fundamental to the success of the offset programme.

Communities

The Project's approach to offsets is one of partnerships and agreements. This is crucial because the proposed offsets involve land management, and the project does not have the right to make conservation decisions on land it does not own, lease or control. This is of particular importance for the Wankako forest patch and freshwater offset site which are on community lands; conservation actions will be dependent on communities agreeing and adhering to particular land use activities (or prohibition of others).

Conservation experience shows that sustainable biodiversity gains are best achieved when the long-term stewards of the area (the communities living in the areas) benefit from the conservation interventions. Extensive stakeholder engagement with communities was previously carried out for the offset planned for BHP-I at LMNP, and it was of high quality, but due to challenges from financing and implementation, the offset plans stalled and actions and benefits developed with the communities did not happen. Such stalled implementation impacts the trust of communities and, due to these legacy issues, local people may be sceptical of current plans. It will be of

[9] The paper referenced found ASM mining affected the entire length of a tributary. As part of the establishment of sustainable ASM activities, monitoring will be undertaken to establish downstream sediment levels from current ASM activities.

importance to give the communities the opportunity to discuss past issues, but also to move on with future plans, and manage expectations going forward.

Engagement with communities will be carried out initially through detailed feasibility assessments of the offset sites, and then throughout the set-up and implementation stages of the project. An ongoing mechanism for engagement with involved communities will be designed into the governance and management structure, with clear roles and responsibilities.

Government

Engaging with Sierra Leone institutions is of primary importance when developing the offset programme. Offset success is largely a political and social challenge, and therefore politics and culture need to be considered carefully and integrated from the start. This includes engagement at all levels, from Ministries sitting in Freetown to district councils and Paramount Chiefs at the local level.

Government agencies that have been identified as offset governance and management partners are the Forestry Division (Community Forestry Unit), for forested offset sites outside of protected areas, and the NPAA, who are responsible for managing a suite of existing protected areas. The Environmental Protection Agency (EPA), which sits under the Ministry of Lands, Country Planning and Environment, will also be an important stakeholder, particularly for the freshwater offset actions. The EPA has the mandate to coordinate, monitor and evaluate the implementation of national environmental policies, programmes and projects. Sierra Leone's National Biodiversity Strategy and Action Plan (NBSAP) identifies the conservation objectives and intended outputs for Sierra Leone (Environment Protection Agency 2017). The Project can contribute towards the States intended conservation outputs in multiple ways, from providing direct support towards the protection of nationally important areas for biodiversity, to establishing a mini seed bank to store seeds of rare and threatened species and building capacity of rangers and communities to protect wildlife. Appendix 1 provides an overview of the Project actions that feed into the objectives of the NBSAP.

To support the selection of an offset site that aligns with national conservation strategies (as well as technical and social criteria), meetings were held with both the EPA and NPAA to discuss the rationale for site selection and agree which sites should be a focus for phase 2 of offset development. Engagement with government stakeholders by Seli Hydropower has already started and will continue through the detailed feasibility and design of the offset development programme. The governance and management structure will define clear roles and responsibilities for national and local government partners and stakeholders as the detailed design of the offsets programme progresses.

Other interested parties

The Project's offset programme is likely to be of interest to a range of other stakeholders as it relates to sustainable development, forestry, species and habitat conservation, carbon and local livelihoods. These parties will be identified and integrated into a stakeholder engagement plan which will outline how the Project will manage their regular and transparent proactive engagement (supported by the offset Implementation Team).

6 Governance and management

The overall approach to implementing the offset programme is development of a participatory approach to natural resource management and biodiversity conservation that is adapted to the context of Sierra Leone and, more specifically, to the context of the proposed offset sites. The governance structure and management of the programme is the driving force, and is responsible for ensuring the smooth implementation and operation of the offset sites. It is thus planned that this governance structure will continue for the life of the offsets.

Important design principles for establishing this type of management system approach are:

- Use existing governance structures wherever feasible;
- Ensure any new structures that are created are appropriate to the scale and stakeholders involved;
- Develop downward as well as upward accountability (implementation and financial) for all management structures;
- Ensure there is sufficient capacity and technical assistance within the governance and management structures to function efficiently.

The following provides a proposed offset governance management structure following these principles, which will cover both the terrestrial offset sites, one outside of a protected area (Wankako forest patch), and LMNP (an existing protected area, designated as a national park in 2012 via support from the BHP-I project offset programme). The freshwater offset in the Upper Seli catchment (above the Yiben reservoir) will be managed by the Project, but will also receive guidance and review of activities from the Independent Expert Panel.

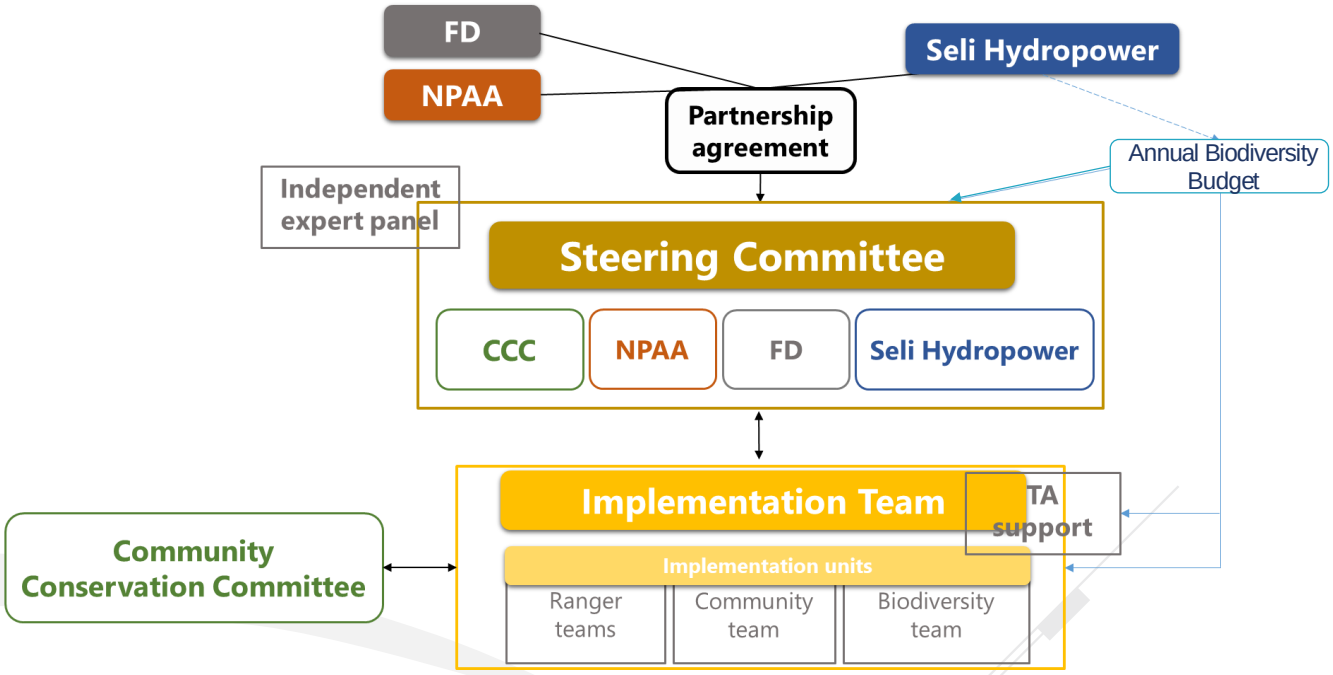

Figure 5: Suggested Governance and management structure for Loma Mountains NP and the Wankako forest patch.

Overview of the governance and management structure

Partnership agreement: will be signed between Seli Hydropower, the Forestry Division (FD) and the NPAA to establish the joint vision for managing Loma Mountains and the Wankako forest patch as offset sites, and the roles and responsibilities of each party. It should outline the proposed management structure and role of the steering committee, the terms of the agreement, exit strategy, and process to resolve any conflicts.

Annual Biodiversity Budget: will be administered by SH, with decision making and approval on the use and delivery of funds sitting with the Steering Committee. In case of unusual events, SH will have a veto on the delivery of the funds, should they not be deemed likely to meet offset requirements. The financial inputs to the offset funding are outlined in Section 7 of this report

Steering Committee: will be made up of representatives from the key project partners and stakeholders ensuring all involved have a voice. This includes Seli Hydropower (Environment and Social Managers), a relevant member of the NPAA, a relevant member of the FD and a representative of the Community Conservation Committee. The Steering Committee will meet quarterly or semi-annually to review progress of implementation of management activities and monitoring and evaluation (as per the offsets management plan and Annual Operating Plans (AOPs). The offset programme Implementation Team will develop and implement these plans, and report to the Steering Committee on their implementation. If activities are progressing as planned, the Steering Committee will recommend that funding is released to the Implementation Team for further activities. The Steering Committee will also provide advice and guidance to the Implementation Team, supported by the Independent Expert Panel.

Independent Expert Panel (IEP): will provide independent review and advice to the Steering Committee, to ensure that the offset programme remains strategic, fit-for-purpose and realistic. The IEP will comprise volunteer expert members of varied backgrounds (a mix of national and international expertise), with regional experience in conservation, social and livelihoods developments, primatology, biodiversity offsets and international best practice and academia. The panel will usually meet by phone or video conference to review technical plans and monitoring results, and has an independent oversight role to advice and provide guidance to the Steering Committee, and the Implementation Team where appropriate. To promote transparency, there will be a rotating member of the IEP in Steering Committee meetings.

Community Conservation Committee (CCC): will be comprised of representatives from the local communities, e.g. the district Council, traditional leaders (Paramount Chiefs) and village committees. One rotating representative from this committee will sit on the Steering Committee to ensure that the communities surrounding the offset sites have representation and an opportunity to contribute to the governance of the offsets programme. The CCC will meet quarterly with the Implementation Team to jointly plan community activities, resolve arising issues and plan the next quarter. The current Community Conservation Site Management Committee in the LMNP management plan is extremely complex, and may need to be simplified in order for it to function efficiently. The Implementation Team Community manager will be able to offer this group support in terms of capacity and organising themselves.

The CCC will be a voluntary entity, with agreements made with Seli Hydropower (under the Steering Committee) regarding per diems for meetings, reporting and representation on the Steering Committee.

Implementation Team: will be responsible for developing and implementing AOPs, and reviewing and updating the offset Management Plan. The Implementation Team will report to the Steering Committee on a quarterly basis. The Implementation Team will manage both terrestrial offset sites (LMNP and the Wankako forest patch) and consequently will consist of the Conservation Officer (LMNP), the FD officer (Wankako) and members of the Technical Advisor team (covering relevant areas of expertise, including both environmental and social). The Implementation Team will provide the overall coordination and management of activities across both offset sites to ensure efficient, effective

and coordinated community and biodiversity activities. The Implementation Team will oversee the implementation of activities by three implementation units: (i) Ranger teams; (ii) a Community team; and (iii) a Biodiversity team. The composition of these implementation units will draw in particular from existing staffing of LMNP and the FD, as well as members of the CCC, and will be supplemented by the Technical Advisor team and some personnel hired specifically to ensure the success of this offset programme (e.g., a small administration/human resources/finance team). In effect, rather than being a new institution or having many dedicated staff, the Implementation Team is thus a collaborative framework to bring together LMNP, the FD, local communities, and a TA to implement offsets in a coordinated manner.

There will be two Ranger teams, comprising one of national park rangers at LMNP, and one of community members at Wankako, though sharing of members across teams will be advantageous in ensuring transparency and cross-learning. The Ranger teams will be in charge of patrolling and enforcing agreed prohibited activities within LMNP and Wankako, respectively. As part of routine patrols, they will monitor threats to biodiversity (hunting, timber extraction, agriculture). The Community team will lead activities involving local communities such as the zonation of the LMNP and Wankako, livelihood diversification, sustainable socio-economic development, and environmental education. The Biodiversity team will coordinate with the Community team to ensure environmental sustainability of livelihood activities, support the Ranger teams in planning patrols to address biodiversity threats, coordinate biodiversity research in the offset sites, and design and implement monitoring and evaluation for priority biodiversity (particularly chimpanzees). Some monitoring activities will only be undertaken periodically, e.g. chimpanzee surveys every two years or annual evaluation of deforestation and degradation.

Technical Advisor (TA): will be an international institution (e.g. NGO or company) contracted to provide technical support to the Implementation Team and implementation teams. The role of the TA will be to build the capacity of NPAA and FD staff, and CCC members, to enable effective management of the offset sites. The role of the TA should decrease slowly over time as the Implementation Team and implementation teams become able to develop and implement AOP activities independent of the TA. The strong role of the TA in design of offsets for this Project is based on a key lesson learned from the challenges faced by BHP-I (TBC 2019), that appropriate technical support and capacity-building is essential to success. A suitable TA will be selected, with ongoing involvement regularly reviewed and approved (or replaced), on a five-yearly basis by the Steering Committee. The TA will have:

- Biodiversity expertise, including in site-based conservation planning and management, patrolling, and monitoring and evaluation;
- Natural resource management expertise, including in development of land use planning and management;
- Livelihoods expertise, including in agricultural and livestock systems, community incentives, and livelihood enhancement and improvement;
- Community-led conservation expertise, with an understanding of participatory planning and stakeholder engagement, and expertise in facilitation and conflict resolution; and
- Administrative expertise, in project and financial management, reporting and record keeping.

Overview of the role of Seli Hydropower

Seli Hydropower (SH) (as the Project owner) will be responsible for working with the government to set up the governance and management structure for the offset programme. SH will then be part of the Steering Committee that oversees the implementation of the terrestrial offset activities. Key SH roles and responsibilities will include:

- Overall strategic and management guidance (notably via a veto within the Steering Committee on the approval of workplans and budgets);
- Providing funding and overall financial oversight (with input and guidance from the Steering Committee) to the Implementation Team, and financial support to the Community Conservation Committee;
- Communicating the offset programme objectives to a wider audience (including key government stakeholders e.g. the EPA); and
- Engaging and managing the Independent Expert Panel (to provide timely support to the Steering Committee).

Overview of the role NPAA and FD

The NPAA and the FD will play a partner role in the governance and management structure, as the authorities responsible for such conservation programmes in Sierra Leone. The offset activities are in line with the National Biodiversity Strategy and Action Plan (NBSAP) (Section 5). The NPAA are responsible for managing a sub-set of protected areas, and the Community Forest Unit within the Forestry Division are responsible for working with communities who have established Community Forests. As the two terrestrial offset sites fall into these two categories, both government entities will be involved in offset management and represented on the Steering Committee. They will act on the roles and responsibilities outlined in the partnership agreement between SH, the FD and the NPAA.

The NPAA will continue to fund the 15 employed positions (one Conservation Manager and 14 park rangers) in the LMNP (in order to avoid cost shifting) (Section 3.2.1). These positions will be integrated within the Implementation Team and implementation teams. The FD officer will oversee the implementation of activities in Wankako and be part of the Implementation Team.

7 Financing

The following assumptions were used to estimate terrestrial offset costs:

- A set-up period of approximately 18 months;
- A further establishment phase of three and a half years;

- 25 years of full investment after establishment in order to achieve a net gain;
- Continued investment in perpetuity after this initial 30-year investment to be included in any new PPA/IA agreed with the Government of Sierra Leone post the end of the concession period;
- These costs are actual "on-the-ground" costs and do not consider any cost of management oversight, administration and overhead.

Cost estimates (Appendix 5) were based on the existing Loma Mountains National Park Management Plan (Forest Division 2012), known protected area management costs and offset costs elsewhere, and estimates of the levels and costs of external technical support necessary to deliver not just a functioning protected area but also an offset delivering net gains in biodiversity. These are guideline figures only that will be re-assessed during the set-up period – a key lesson from the BHP-I offset was the risk of underestimating offset costs (Paragraph 37, The World Bank 2014; TBC 2019).

It is currently estimated that offset programmes (Terrestrial, Freshwater and for *Ledermaniella yiben*) will require $19 million (direct costs) and $14.6 million (costs budgeted in CDAP and ASM Livelihood restoration programme) of funding up to the end of concession. Cost estimates are only preliminary and will be refined through further field assessments and detailed planning of offset actions.

Options for providing this funding are still under consideration by the Project and include:

- Contributing up-front capital to an endowment - The endowment then generates annual financing needs, either in perpetuity or on a draw-down basis should replacement funding be planned by government at some time in the future. Typically, endowments are managed in a major international financial centre, and annual funds transferred in country subject to approval of activity reports and plans by a governance committee (the Steering Committee, described above). Typically, such costs can be included in overall project capex finance sought from financial institutions – particularly multilateral or development finance institutions, which have a remit that includes environmental safeguards within projects.
- Finance from on-going revenues - An alternative to up-front capitalisation of an endowment is to contribute ongoing finance to offsets from annual Project revenue or profit. This would have to be carefully structured and monitored to ensure Project risks such as changing prices for the commodity, changes in terms/conditions/regulations associated with changes in government, flaws in models predicting commodity production rates, or issues relating to the operating company (e.g., fraud, mis-management) are appropriately mitigated. The project is investigating whether structuring an annual "ring fenced" Environmental and Social budget from the project revenues that are received through the Power Purchase Agreement (PPA), which will have an associated Partial Risk Guarantee (PRG), can be specially included in the project documentation.
- On-going finance - The last main option for offset financing is to rely on ongoing annual finance, but with financial guarantees. For example, the Project could attempt to obtain insurance that guarantees annual revenues – and, in turn, availability of funds for offsets. Experience suggests, however, that insurance providers are only willing to underwrite specific risks, making such an approach impractical. Other forms of financial guarantee, such as captive insurers or irrevocable letters of credit, are better suited to larger companies than Seli Hydropower.

8 Next steps: BAP offset actions

Overarching actions to implement this strategy are captured in Table 7 for terrestrial offsets and Table 8 for freshwater offsets. These actions are repeated in the Project BAP.

For the terrestrial offset, field assessments and engagement with communities will take place over the first year and a half to two years of the Project construction phase. The information gathered will then be used to work with stakeholders to develop the management plans required for the offset sites and establish the appropriate mechanisms for management oversight. Although offset activities will be started in year one, full offset implementation will be underway in year five. This will be continually monitored and evaluated, applying an adaptive management approach based on monitoring results. As the residual impact assessment and offset strategy have been developed on a precautionary basis, it is hoped that monitoring and evaluation may allow a reduction in offset liabilities over time.

For the freshwater offset, the Project will undertake actions to develop sustainable ASM with miners in the Yiben reservoir area. It will be important to build on this approach for engagement with ASM miners further upriver as part of the offset. Actions for the freshwater offset therefore begin in year two of the construction period and start with the assessment of the ASM context in the upper Seli river (i.e. locations of ASM, the people engaged in ASM). Based on the outcome, an ASM plan will be developed in year three and implementation of the plan will begin in year four.

Table 7: Terrestrial Offset Actions (TOA)

Offset: ID, measure and outline of action required		Applicability	Timeframe	Frequency	Responsibility for ensuring action is implemented	Means of verification
TOA1	Field assessments in LMNP and Wankako forest patch Undertake social and biological surveys to gather baseline data to enable detailed management planning for LMNP Management Plan and the Wankako forest patch	Construction	Construction period (year 1 and 2)	Dry season and wet season surveys	Seli Hydropower	Social and biological synthesis reports for LMNP and the Wankako forest patch
	1. Biodiversity surveys will be undertaken to: (i) provide a baseline for chimpanzee populations in LMNP and Wankako forest patch; (ii) develop ground-truthed habitat maps for Loma and Wankako forest patch; and (iii) assess the likelihood of presence of priority biodiversity species, in particular *Ptychadena* cf. *submascareniensis* 2 (a frog), Ziama Horseshoe Bat, Slender-snouted Crocodile, Pygmy Hippo, White-backed Vulture, Hooded Vulture, *Vepris felicis* and Yellow-fronted Threadtail (a dragonfly). 2. Social surveys will be undertaken: (i) around LMNP, to engage the 30 communities identified in the LMNP Management Plan (Forest Division 2012), to assess current resource use within the Park and to verify if management actions previously agreed to (Forest Division 2012) remain the most appropriate and effective for achieving sustainable development and conservation outcomes for offset target habitats and species; (ii) in and around the Wankako forest patch, to understand the socio-economic context of communities and assess community use of the forest area, to assess community interest in establishing the area as a formally recognised Community Forest, and to understand the terms of a socially-acceptable approach to sustainable community management of the forest patch (i.e. what incentives can be provided to communities to ensure they have a net benefit from engaging in sustainable management practices). 3. A report synthesising the information collected will form the basis for updating the Loma Mountains NP Management Plan and, if socially acceptable, the process to establish Wankako as a Community Forest and a community management plan will be mapped out. The synthesis report will also update forecast estimates of terrestrial offset gains, if ground surveys reveal there may be significant variation from those forecast (Section 3.3).					
TOA2	Detailed management planning for LMNP and Wankako forest patch Hold a series of workshops to update the LMNP Management Plan & develop a Community Forest Management Plan for Wankako forest patch (if appropriate), establish appropriate management and governance structures to enable offset implementation	Construction	Construction period (year 3)	One-off	Seli Hydropower	Updated LMNP Management Plan Establishment of a Community Forest in Wankako and Wankako Management Plan
	1. Engage with appropriate groups of stakeholders to: (i) for LMNP, share findings and agree management actions for the LMNP MP, agree a management structure for implementation of management actions that takes into account Project requirements for checks and balances to ensure offset funding is appropriately and effectively used to reach offset targets; and (ii) for Wankako forest patch, if communities agree to the establishment of a Community Forest in Wankako, establish the Community Forest and develop a Community Forest management plan – this will require its own stakeholder engagement process but also coordination with plans for LMNP (thus the same Biodiversity and Community teams and TA will support offset actions in both LMNP and Wankako Community Forest).					

Offset: ID, measure and outline of action required		Applicability	Timeframe	Frequency	Responsibility for ensuring action is implemented	Means of verification
	2. Update the five-year LMNP MP, share the draft with all stakeholder groups (through community meetings/public consultations) and incorporate feedback as appropriate into the final plan. Apply a similar approach for the Wankako Community Forest MP. 3. Develop (and sign) a joint partnership agreement between the NPAA (and the Forestry Division if Wankako moves forward) and Seli Hydropower to define the vision, the terms, and the roles and responsibilities for the oversight and implementation of offset actions in LMNP and Wankako forest patch. 4. Develop the Terms of Reference (ToRs) for the steering committee, TA organisation (encompassing protected areas management, livelihoods, biodiversity, and operations), Steering Committee and Community Conservation Committee. Begin the recruitment process for a TA organisation to support offset implementation (TOA3).					
TOA3	<u>Offset implementation for LMNP and Wankako</u> Develop and implement Annual Operating Plans to align with the five-year MPs for LMNP and Wankako	Construction and operations	From year one to end of operations	Ongoing	Seli Hydropower	Annual Operating Plans and quarterly reports for LMNP Wankako yearly work plan
	1. Assess the most appropriate offset funding option during year one (e.g., up-front endowment fund, financing of a fund in the early years of operation, annual financing from revenues or profits backed by insurance or other financial guarantees, or a blend of approaches) and establish and capitalise the funding mechanism ready for offset implementation. 2. Once the TA is in place, support will be provided to the Implementation Team to develop Annual Operating Plans (AOPs) and budgets that align with the actions of the LMNP five-year Management Plan, initially aligning with this previous offset strategy before a revised MP is in place. The AOP and budget will be approved by the Steering Committee prior to implementation (based on advice from the Project independent expert panel). Implementation of actions will build up slowly over the first two years whilst the capacity of the Implementation Team and staff develops. 3. Quarterly reports of progress in, and outcomes of, implementation of the AOP will be provided to the Steering Committee for review and to secure the semi-annual release of funds for the next phase of activities. On an annual basis, the independent expert panel will review offset progress and provide recommendations to the Steering Committee to improve offset actions and outcomes. Quarterly or semi-annual reports and meetings will be held with the Community Conservation Committee to coordinate actions involving communities, and to ensure actions are aligned with expectations and with local and regional development plans. 4. Each AOP and budget will be developed sufficiently prior to the end of year, for approval by the Steering Committee, to ensure that the implementation of management actions is continuous. 5. Management of the Wankako Community Forest will be based on a structure agreed following discussions with the communities, traditional and local authorities and representatives of the Forestry Division. A yearly work plan and budget will be developed that aligns with overarching sustainable development actions that are agreed between the communities and authorities.					
TOA4	<u>Monitoring and adaptive management to achieve terrestrial offset targets</u> Monitor and evaluate offset actions to track progress towards offset targets; initiate adaptive management if thresholds are crossed	Construction and Operations	From year one to end of operations	Ongoing (as per the M&E plan)	Seli Hydropower	Annual monitoring reports

Offset: ID, measure and outline of action required	Applicability	Timeframe	Frequency	Responsibility for ensuring action is implemented	Means of verification

1. An overarching Biodiversity Monitoring and Evaluation Plan (BMEP) will be developed as part of the General Management Actions (GMA5, Seli Hydropower 2019a) to track losses (impacts) and gains (offsets). Site-specific monitoring and evaluation indicators that align with the overarching BMEP will be developed for LMNP and Wankako to track (i) the implementation of management actions (response indicators); (ii) changes in threat levels to priority biodiversity (pressure indicators), and (iii) changes in the population and distribution of chimpanzees and other priority species as appropriate, and changes in deforestation and degradation in the offset sites and buffer areas (status state indicators). Key response and pressure (and if appropriate state) indicators will have thresholds associated with them to trigger an adaptive management response if targets are not met.
2. Monitoring and evaluation will be undertaken in accordance with the BMEP and site-specific indicators. Annual monitoring reports will be provided to the steering committee, with the results for each indicator. If monitoring detects that any threshold has been crossed without appropriate adaptive management being put in place, it will be raised immediately with the Implementation Team to undertake an assessment and appropriate adaptive management action.

Table 8: Freshwater Offset Actions (FOA)

Offset: ID, measure and outline of action required		Applicability	Timeframe	Frequency	Responsibility for ensuring action is implemented	Means of verification
FOA1	Extend the ASM study to the upper Seli catchment and develop a sustainable ASM plan Identify ASM sites, miners and activities that will be undertaken to develop more sustainable ASM practices in the upper Seli catchment	Construction	Construction period (year 2)	During dry season	Seli Hydropower	Sustainable ASM plan for the upper river Seli
	1. Undertake a situational analysis of ASM activity in the upper Seli catchment (Mawaloko and upper Seli rivers) to: determine the scale and practice of ASM; identify potential livelihood diversification, approaches to implementing those; and identify a suite of supporting activities to enable sustainable ASM (e.g. capacity building, stakeholder engagement, revegetation of ASM sites, etc.). As part of the situational analysis, survey water quality at the ASM site and at 1 km intervals downstream until the next ASM, or for 10 km (parameters to include sediment load, turbidity, sediment deposition on vegetation/rock surface, heavy metal levels). 2. Based on a "theory of change" or similar conceptual model, determine which ASM sites, miners and other stakeholders will be engaged, and which interventions and activities will be undertaken to reduce environmental impacts and improve social outcomes for miners, in order to achieve the freshwater offset targets. Work with key stakeholders to develop a sustainable ASM plan to deliver livelihood interventions, capacity building actions and other activities required to implement a sustainable ASM approach in the upper Seli river. Assess how the implementation of sustainable ASM in the upper Seli will be integrated into the livelihood actions undertaken with ASM miners in the Yiben reservoir to ensure a co-ordinated approach and efficient use of resources (staff and funding). Update estimates of freshwater offset gains and the sustainable ASM plan, based on water quality data collected at ASM sites, downstream of ASM sites.					
FOA2	Freshwater offset implementation Implement the sustainable ASM plan to improve freshwater habitat quality and social outcomes	Operations	Construction period (year 3) onwards	Ongoing	Seli Hydropower	Bi-annual implementation reports
	1. The sustainable ASM plan will be implemented by the same team undertaking sustainable ASM with Yiben ASM miners. Bi-annual progress reports will be provided to the Seli Hydropower environmental team to track implementation progress. The Project independent expert panel will be engaged on an annual basis (and ad-hoc if required) to review implementation progress and monitoring outcomes of freshwater offset actions (FOA3). They will make recommendations to Seli Hydropower and the implementation team on how to improve offset outcomes for freshwater offset targets.					
FOA3	Monitoring and adaptive management to achieve freshwater offset targets Monitor and evaluate the actions and social and environmental outcomes of sustainable ASM to track progress towards offset targets; initiate adaptive management if thresholds are crossed	Operations	Construction period (year 4) onwards	Ongoing	Seli Hydropower	Annual monitoring reports
	1. An overarching BMEP will be developed as part of the General Management Actions (GMA5, Seli Hydropower 2019a) to track losses (impacts) and gains (offsets). A suite of indicators that align with the overarching BMEP will be developed for sustainable ASM activities to track: (i) the implementation of identified livelihood interventions, capacity building, and rehabilitation of abandoned ASM sites (response indicators); (ii)					

Offset: ID, measure and outline of action required	Applicability	Timeframe	Frequency	Responsibility for ensuring action is implemented	Means of verification
	changes in the approach to ASM which will improve freshwater habitat quality (pressure indicators); and (iii) changes in the quality of freshwater habitat, composition of freshwater species and presence of priority fish species at, and downstream of, ASM sites (state indicators). Key response and pressure (and if appropriate state) indicators will have thresholds associated with them to trigger an adaptive management response if targets are not met.				

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10 Appendices

10.1 Appendix 1: Alignment of the offset strategy with national conservation objectives

The National Biodiversity Strategy and Action Plan (NBSAP) identifies the conservation objectives and intended outputs for Sierra Leone (Environment Protection Agency 2017). The Project can contribute towards the Governments intended conservation outputs in multiple ways, from providing direct support towards the protection of nationally important areas for biodiversity, to establishing a mini seed bank to store seeds of rare and threatened species and building capacity of rangers and communities to protect wildlife. Table 9 provides an overview of the Project actions that feed into the objectives of the NBSAP.

Table 9: Alignment and contribution of the offset programme with national biodiversity conservation objectives and strategic outputs (NBSAP 2017-2026)

NBSAP strategic objectives and actions	Project action that feeds into NBSAP actions
Strategic objective A: Sierra Leone's biodiversity is well conserved through sound and holistic national legislation and policy implementation across all relevant sectors	
A2(i) Monitoring of protected areas	For Loma Mountains NP, monitoring of the status of – and threats to – habitats and a subset of priority biodiversity will be part of offset actions, and these data will be available to the NPAA and the national "clearing house mechanism" when it is established
A3(iii) Monitoring of alignment with Environmental Impact Assessment (EIA) guidelines	Monitoring of Project activities and outcomes, and sharing of data with NPAA and the national "clearing house mechanism" when available
A4(iii) Promotion of private sector in conservation programmes	Private sector investment into conservation via the Projects' offset programme
Strategic objective B: **Practical methods and mechanisms enhanced and functioning to safeguard biodiversity, resulting in improving conservation status of threatened and rare species.**	
B1(i) Enforcement of forest laws and regulations	Support to forest rangers, including training at Loma Mountains NP
B1(ii) Alternative livelihood measures	Support to local communities to develop a suite of livelihood measures that they have actively selected around Loma and Wankako forest patch (if appropriate)

B3(iii) Develop and implement recovery programmes for threatened species	Focused protection of important habitat for chimpanzees (and other threatened species) and actions to reduce other pressures such as hunting
B3(iv) Promote community participation in ecological restoration and species recovery	Offsets work will engage forest edge communities in conservation agreements and forest restoration Work will take place with communities to establish conservation agreements to protect areas where *Ledermanniella yiben* has been translocated
B3(v) Update and keep herbarium, voucher and living specimens of rare and threatened species	The Project will support the establishment and management of a mini seed bank in Sierra Leone to store voucher specimens and seeds of *Ledermanniella yiben* (Critically Endangered - CR). The seed bank could be used by research institutions to maintain collections of seeds for other rare and threatened species
Strategic objective C: Practical and robust conservation actions are significantly enhancing the status of species, habitats, sites and ecosystems in and outside Protected Areas (PAs)	
C1(vi) Establish an effective monitoring and enforcement mechanism for biodiversity and conservation especially in protected areas	As part of offset development, baseline surveys will be undertaken in the offset areas to establish current conditions. Monitoring will then track changes in key habitats and species, as well as the implementation of enforcement and other Project activities over time. This information will be made available to the NPAA and the national "clearing house mechanism"
C3(ii) Conduct a strategic reassessment of the status of existing PAs	As part of offset development, a feasibility assessment will be undertaken and Management Plans developed (or updated) in collaboration with appropriate Government and local stakeholders at LMNP
C5(iv) Promote private sector initiatives and participation in ex-situ conservation activities	The Project has supported Kew Gardens, London to work with Njala University to undertake research in aquatic plant diversity in Sierra Leone. Seeds of *Ledermanniella yiben* (CR) are now stored in the Millenium Seedbank in the United Kingdoms, ensuring that a viable seed collection will always remain safely stored

10.2 Appendix 2: Screened sites for terrestrial offset

Table 10: List of protected areas in Sierra Leone[10] screened as potential offset sites

ID	Name	Official designation and IUCN management category	Official area (km^2)	Presence of chimpanzees
1a	Outamba-Kilimi (Kilimi section)	National Park, no reported IUCN category	389	74 ind. (Brncic *et al.* 2010)
1b	Outamba-Kilimi (Outamba section)	National Park, IUCN category II	738	950 ind. (Brncic *et al.* 2010)
2	Tiwai Island Sanctuary	Game Sanctuary/ non-hunting Forest Reserve, IUCN category IV	12	N/A
3	Lalay	Forest Reserve, no reported IUCN category	5	N/A

[10] From the The World Database on Protected Areas

ID	Name	Official designation and IUCN management category	Official area (km^2)	Presence of chimpanzees
4	No reported name	Forest Reserve, no reported IUCN category	3 *	N/A
5	No reported name	Forest Reserve, no reported IUCN category	8 *	N/A
6	No reported name	Forest Reserve, no reported IUCN category	6 *	N/A
7	No reported name	Forest Reserve, no reported IUCN category	4 *	N/A
8	Tonkoli	Forest Reserve, no reported IUCN category	71	Villagers reported that the species is almost not seen since the war (Brncic *et al.* 2010)
9	Tama	Forest Reserve, no reported IUCN category	170	No specific information available but unlikely since located close to Tonkoli
10	Sankan Biriwa (Tingi Hills)	Non-hunting Forest Reserve, IUCN category II	119	70 ind. (Brncic *et al.* 2010); now presumably less
11	Kuru Hills	Forest Reserve, no reported IUCN category	70	N/A
12	Kambui South	Forest Reserve, no reported IUCN category	9	N/A
13	Nimini South	Forest Reserve, no reported IUCN category	26	No nest found (Brncic *et al.* 2010)
14	Dodo Hills	Forest Reserve, no reported IUCN category	22	N/A
15	Farangbaia	Forest Reserve, no reported IUCN category	13	N/A
16	Wara Wara Hills	Forest Reserve, no reported IUCN category	10	N/A
17	Malal Hills	Forest Reserve, no reported IUCN category	3	N/A
18	Bojeni Hills	Forest Reserve, no reported IUCN category	7	N/A
19	Singamba	Forest Reserve, no reported IUCN category	3	N/A
20	Gboi Hills	Forest Reserve, no reported IUCN category	2	N/A
21	Gori Hills	Forest Reserve, no reported IUCN category	79	N/A
22	Kasewe	Forest Reserve, no reported IUCN category	12	N/A
23	Tabe	Forest Reserve, no reported IUCN category	3	N/A
24	Kambui Hills and Extensions	Forest Reserve, no reported IUCN category	143	No nest found – only few chimpanzee signs (Brncic *et al.* 2010)
25	No reported name	Forest Reserve, no reported IUCN category	6 *	N/A
26	No reported name	Forest Reserve, no reported IUCN category	11 *	N/A
27	No reported name	Forest Reserve, no reported IUCN category	8 *	N/A
28	Gola Rainforest National Park	National Park, IUCN category II	711	270 ind. (Brncic *et al.* 2010)
29	Kangari Hills	Forest Reserve, IUCN category IV	212	No nest found (Brncic *et al.* 2010)
30	Loma Mountains	National Park, no reported IUCN category	332	1,065 ind. (Brncic *et al.* 2010)
31	Western Area Peninsula Forest	National Park, no reported IUCN category	183	55 ind. (Brncic *et al.* 2010)
32	No reported name	Forest Reserve, no reported IUCN category	7 *	N/A
33	Occra Hills	Forest Reserve, no reported IUCN category	2	N/A

* Areas have been measured in ArcGIS as no official area were available.

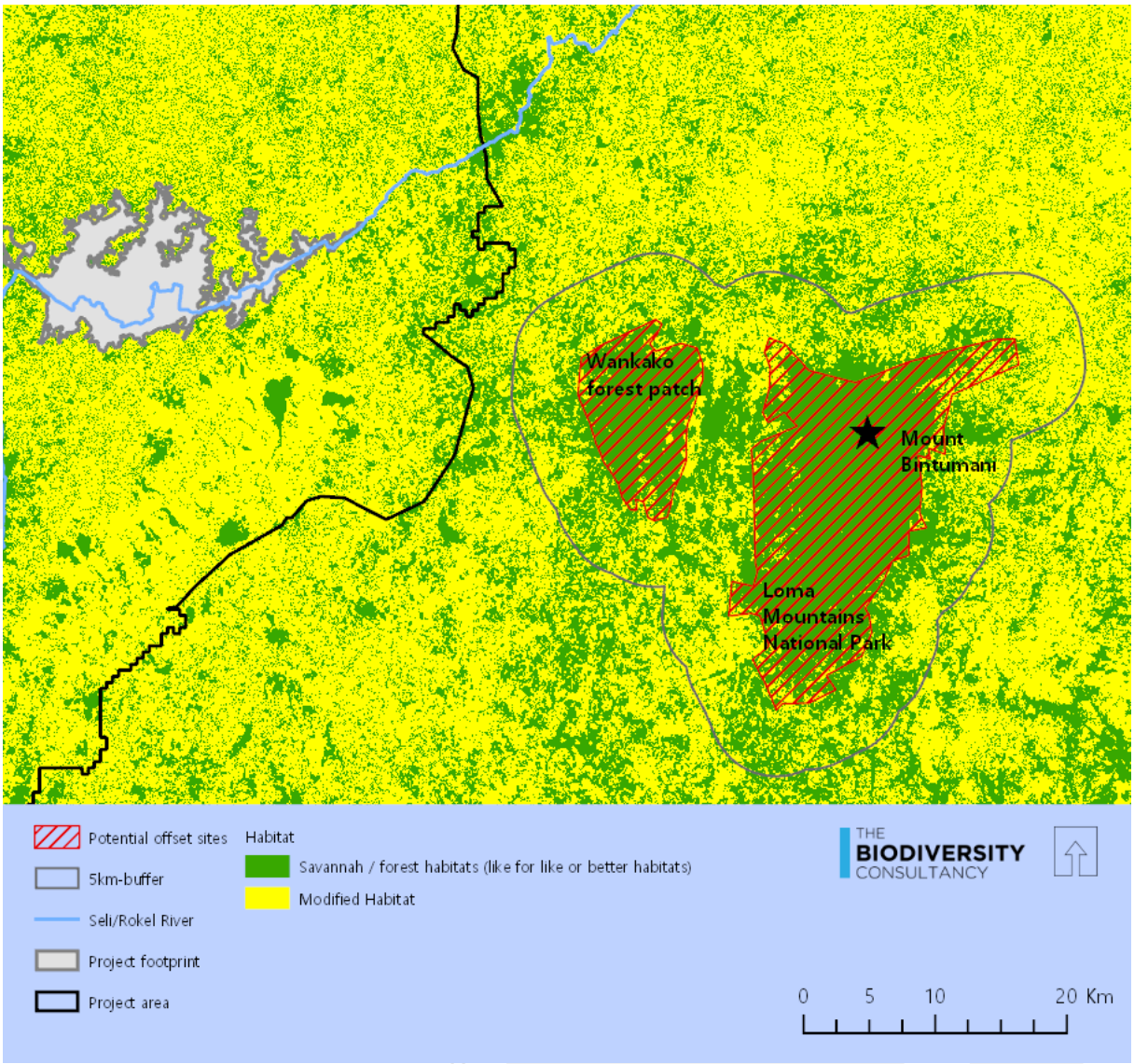

Figure 6: Habitat in selected terrestrial offset sites (this map has not been ground-truthed)

10.3 Appendix 3: Assumptions made to forecast terrestrial offset gains

To forecast offset gains the following information was required:

1. The background deforestation rate for each offset site (Loma and the Wankako forest patch) and the buffer area around the sites;

2. An estimate of the reduction to the background deforestation rate as a result of implementing offset actions;

3. The habitat quality for each habitat type within each offset site and the buffer.

The formula applied to forecast gains was based on the compound interest function, i.e.:

$$Area_n = Area_0 * (1 - r)^n$$

where *r* is the deforestation rate and *n* is the number of years on which the calculation is made (25 years)

The area is converted into Quality Hectares by multiplying the area by its estimate of quality.

10.3.1 ASSUMPTIONS MADE FOR THE DEFORESTATION RATES

- **A background mean compound deforestation rate of 1.03% per year was assumed over the main 25-year offset period for Wankako forest patch and the buffer area**. Information on national deforestation rates shows that it is increasing by 0.01% every year (0.63% in 2000, 0.68% in 2005 (Statistics: Sierra Leone 2006) and 0.73% in 2010 (FAO 2010)). Projecting this deforestation rate forwards, the national deforestation rate would be 0.87% in 2024 and 1.12% in 2049. Averaged out over the 25-year period, the real

compound rate is 1.03%. Therefore, a mean real compound deforestation rate of 1.03% per year can be used over the main 25-year offset period.

- **A background mean compound deforestation rate of 0.52% per year was assumed over the main 25-year offset period for Loma Mountains National Park**. The background deforestation rate was halved within the Park as management activities are already likely to be reducing the deforestation rate there (aligning with field observations).

10.3.2 ASSUMPTIONS MADE TO ESTIMATE THE REDUCTION TO BACKGROUND DEFORESTATION RATES

- **Within Loma Mountains National Park, the background deforestation rate will be stopped**. As a legally protected area, no deforestation is permitted within the Park boundaries. If forest edge communities agree to the boundaries of the protected area, it is assumed that further encroachment (and therefore deforestation) can be halted.
- **Within the Wankako forest patch, the background deforestation rate will be reduced to 0.26%.** The Project will seek to work with forest-edge communities to develop a community-managed area in the Wankako forest patch which will include agreeing actions to protect the forest to reduce habitat conversion. It is assumed that these measures will reduce deforestation but are unlikely to halt it altogether. Therefore, the deforestation rate is estimated to be reduced to 25% of the background deforestation rate, i.e. to 0.26%.
- **Within the 5 km buffer, the background deforestation rate will be reduced to 0.77%.** Actions will be undertaken to reduce deforestation and habitat degradation in the 5 km buffer. However, it is expected that deforestation can only partly be reduced as communities need that area for agriculture. Therefore, the deforestation rate is estimated to be reduced to 75% of the background deforestation rate, i.e. 0.77%.

10.3.3 ASSUMPTIONS MADE FOR HABITAT QUALITY

- Forecasts are based on deforestation only and do not include habitat degradation; on a precautionary basis, **it is assumed that habitat quality will be the same after 25 years.**
- **Within Loma Mountains National Park, all habitat types are assumed to be close to the best quality of habitat possible in the landscape (i.e. 90%).** Although Loma is classified as a National Park, agricultural encroachment is reported to be occurring around the edges, resulting in forest loss (Forest Division 2012). However, based on available information, inside the National Park threats from agriculture or timber extraction are low and a site reconnaissance in February 2018 did not observe signs of degradation in areas to the west of the park (TBC 2018). It was therefore assumed that the habitat quality is close to, but lower than, the best quality of habitat possible in the landscape.
- **Within the Wankako forest patch and buffer area, habitat quality is assumed to be lower and estimated to be 70% of the best quality of habitat possible in the landscape.** A lower quality is assumed as the areas are not currently sustainably managed and deforestation analysis (though believed to be an overestimate) reports 25% loss of forest habitat within the Wankako forest patch over the last 10 years (Space Intelligence Ltd 2018). In the buffer area, habitat quality may be even lower than in the forest patch as more communities are farming there.

10.3.4 HABITAT IN OFFSET SITES

Habitat available in offset sites were estimated for 2024, i.e. the start of Project operation as actions at the main offsets are assumed to start at Project construction and to be effective at the start of Project operation. Numbers are derived from the habitat map (Space Intelligence Ltd 2018), applying a mean real compound deforestation rate of 0.83%/year between 2017 and 2024. As previously, the deforestation rate at Loma Mountains National Park is estimated to be half of the deforestation in the landscape (i.e. 0.42%).

Table 11: Habitat predicted to be present at the offset sites in 2024

	Loma Mountains		Wankako Forest Patch		5km-buffer	
	ha	QH	ha	QH	ha	QH
Critical Habitat						
Gallery forest	3,663	3,297	4,818	3,372	14,393	10,075
Hillslope forest	17,432	15,689	2,842	1,990	10,045	7,032
Natural Habitat						
Natural savannah/ woodland	711	640	105	73	5,678	3,975
Swamps	296	267	1	1	359	252
Inselberg	9	8	28	20	96	67

10.4 Appendix 4: Assumptions made to forecast chimpanzee gains

To forecast chimpanzee gains, two scenarios were identified:

1. **The without-Project scenario**: the expected future change in the population of chimpanzees in Loma Mountains National Park without Project actions;

2. **The with-Project scenario**: the expected future change in the population of the chimpanzees with Project actions to support protection of Loma Mountains National Park from existing and anticipated future pressures, such as poaching and habitat loss through deforestation associated with encroachment.

This approach is very precautionary, as it does not incorporate any potential gains from offset actions at Wankako.

The minimum size of chimpanzee population that would need to be protected to achieve the offset target is estimated based on the following formula which calculates the difference between the above two scenarios:

$$I = \frac{P_i}{(R_1)^n - (R_0)^n} \quad \text{and} \quad R_1 = R_0 + E * (R_2 - R_0)$$

Where:

- *I* is the minimum size of the initial population of chimpanzee in LMNP in 2024 (number of individuals);
- P_i is the population of chimpanzee estimated to be impacted by the Project (i.e. up to 70 individuals, see Seli Hydropower 2019b);
- R_0 is the rate of growth within Loma Mountains National Park in the without-Project scenario;
- R_1 is the rate of growth within Loma Mountains National Park in the with-Project scenario;
- R_2 is the rate of natural growth of chimpanzees with no threats, estimated as 1.65% per year (Walsh *et al.* 2003);
- *E* is the effectiveness of intervention to reduce the existing threats on chimpanzees within Loma Mountains National Park;
- *n* is the number of years to achieve a net gain, i.e. 25 years.

10.4.1 ASSUMPTIONS MADE FOR THE COUNTERFACTUAL SCENARIO (R_0)

Although illegal hunting and habitat degradation is reported (Brncic *et al.* 2010; Forest Division 2012), there is no estimate of the background rate of loss of chimpanzees within Loma or the wider region. A chimpanzee loss rate of 1% per year was estimated based on the following information:

- West African chimpanzees are currently considered Critically Endangered based on an estimated decline of > 80% over three generations or 60 years and scientists have estimated an annual decline of 2.25% for 2015-2029 across West Africa (Humle *et al.* 2016; Kühl *et al.* 2017). However, this number the annual decline is likely to be lower in the Loma Mountains National Park as the area has some level of protection and contains a high density of chimpanzees;
- A study by Junker *et al.* (2012) showed an 11% decline in 'suitable environmental conditions' for West African chimpanzee in 15 years, or slightly less than 1%/year;
- The average rate of deforestation in Sierra Leone is about 0.7%/year (FAO 2010) and so the combined impact of habitat loss and hunting is very likely to be >0.7%.

10.4.2 ASSUMPTIONS MADE FOR THE WITH-PROJECT SCENARIO (R_1)

The effectiveness of the interventions to reduce existing threats to chimpanzees (*E*) was estimated to be low (25%) based on the following information:

- People in the area are highly dependent on subsistence agriculture and bushmeat hunting to maintain their livelihoods (Forest Division 2012). If communities agree to the boundaries of the Park, then it is likely that encroachment can be controlled (Section 3.2), but hunting pressure may be more difficult to reduce due to the size of the Park, the greater ease of covert hunting versus agriculture, and the nature of the terrain (which will make ranger patrols quite challenging). It is therefore likely that some hunting will persist.

10.5 Appendix 5: Preliminary estimate of offset costs

10.5.1 SUMMARY OF OFFSET COSTS

The tables below present an estimate of the costs* associated with the three offset programs (Terrestrial, Freshwater and *Ledermaniella yiben*) and the related Project implementation programmes for the construction and concession periods.

ID	Offset Programme	Estimate of cost
	Terrestrial Offset Direct Activities	$18m
	Terrestrial – CDAP: Conservation and community engagement/sustainable development actions	($13.7m budget included in CDAP related activities)
	Aquatic Livelihood Restoration - ASM Situational analysis in the upper Seli Catchment	($0.05m budget included in Livelihood Restoration)
	Aquatic Livelihood Restoration - Implementation of the sustainable ASM plan	($0.45m budget included in Livelihood Restoration)
	Catchment Management - Monitoring of freshwater quality and distribution of priority species	($0.375m budget included in Catchment Management)
	Ledermaniella yiben	$0.96
	Total	**$33.5m**

*These cost estimates are only preliminary and will be refined through field assessments and detailed planning of offset actions. In addition, they do not include costs associated with the annual maintenance post the end of the concession period – an estimate of these costs is provided below. Estimates for the aquatic offset are based on initial livelihood projections developed during the Resettlement Action Plan process.

10.5.2 TERRESTRIAL OFFSET COST ESTIMATES

Set up, establishment and recurrent annual costs for terrestrial offset actions over the Project's concession period.

Set Up Costs	**Pre FC**	**Construction**	**Operations**	**Total**
Surveys to establish baseline	-	160,000	-	**160,000**
Social feasiblity studies	-	250,000	-	**250,000**
Infrastructure replacement/rehabilitation	-	500,000	-	**500,000**
Update of management plan and zoning	-	250,000	-	**250,000**
Early conservation and community engagement/sustainable development actions	-	210,000	-	**210,000**
Offset design and functioning	-	140,000	-	**140,000**
	-	**1,510,000**	**-**	**1,510,000**
Establishment Costs	**Pre FC**	**Construction**	**Operations**	**Total**
Biodiversity conservation by protection	-	370,000	-	**370,000**
Biodiversity conservation by sustainable use	-	610,000	-	**610,000**
Sustainable socio-economic development	-	440,000	-	**440,000**
An enabling implementation environment	-	300,000	-	**300,000**
Research and monitoring	-	280,000	-	**280,000**
Environmental education	-	270,000	-	**270,000**
Efficient and effective management	-	290,000	-	**290,000**
	-	**2,560,000**	**-**	**2,560,000**
Recurrent Annual Costs	**Pre FC**	**Construction**	**Operations**	**Total**
CDAP - Conservation and community engagement/sustainable development actions	-	-	13,688,333	**13,688,333**
Running costs	-	-	7,225,833	**7,225,833**
Staff costs (those currently unfunded by Government)	-	-	1,744,167	**1,744,167**
Offset specific costs	-	-	4,983,333	**4,983,333**
	-	**-**	**27,641,667**	**27,641,667**

Estimated terrestrial offset costs after the end of the Project's concession period

Annual maintenance (post the end of the Project concession period)		**Low (USD)**	**High (USD)**	**Average (USD)**
Annual maintenance costs in perpetuity	Conservation and community engagement/sustainable development actions	180,000	366,667	270,000
	Running costs	234,240	351,360	290,000
	Staff costs (those currently unfunded by Government)	15,000	130,000	70,000

	Offset specific costs	90,000	170,000	130,000
TOTAL PER YEAR		**519,240**	**1,018,027**	**760,000**

10.5.3 FRESHWATER OFFSET COST ESTIMATE

Establishment and Recurrent Annual Costs	Pre FC	Construction	Operations	Total
Livelihood Restoration - ASM Situational analysis in the upper Seli Catchment	-	50,000	-	**50,000**
Livelihood Restoration - Implementation of the sustainable ASM plan	-	360,000	90,000	**450,000**
Catchment Management - Monitoring of freshwater quality and distribution of priority species	-	-	375,000	**375,000**
	-	**410,000**	**465,000**	**845,000**
Sub-Total	**-**	**410,000**	**465,000**	**875,000**

10.5.4 COSTS OF NET GAIN ACTIONS FOR *LEDERMANIELLA YIBEN**

Establishment and Recurrent Annual Costs	Pre FC	Construction	Operations	Total
Searches for new wild population of L.Yiben	-	100,000	-	**100,000**
Establishment & Maintenance of seedbank in SL	-	38,000	50,000	**88,000**
Establish new locations of L.Yiben through Translocation	-	120,000	-	**120,000**
Monitor translocation sites	-	80,000	500,000	**580,000**
Trial ex-situ propagation of L.Yiben	-	67,000	-	**67,000**
	-	**405,000**	**550,000**	**955,000**

*It is assumed that once self-sustaining populations of *L. yiben* are achieved and maintained over 25 years a Project-funded seed bank for *L. yiben* seeds will no longer be required.