Initial Environmental Examination

April 2021

Uzbekistan: Partial Credit Guarantee Facility for Uzbekistan Solar PPP Program

Annexure 1: Biodiversity Monitong and Evaluation Plan
Annexure 2: Biodiversity Action Plan
Annexure 3: Terms of Reference Bird Survey

Prepared by the Ministry of Energy of the Republic of Uzbekistan for the Asian Development Bank.

Biodiversity Monitoring and Evaluation Plan for the Smooth Even-fingered Gecko and other Key Reptiles

for the

Utility-Scale Solar Photovoltaic PPP Project in Sherabad District, Surkhandarya Region of the Republic of Uzbekistan

Project no.: 54056-001

September, 2020

Version 1

THE REPUBLIC OF UZBEKISTAN

MINISTRY OF ENERGY

SHERABAD SOLAR INDEPENDENT POWER PRODUCER PROJECT UZBEKISTAN

Biodiversity Action Plan for the Smooth Even-fingered Gecko and other key Reptiles, September 2020

Version	Date	Created by	Reviewed by	Checked by	Approved by
V1	29.09.2020	AC (STR)	TS (STR)	SAS, SC (ADB)	SAS, SC (ADB)
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ACRONYMS USED IN THE TEXT

Acronym	Description
ADB	Asian Development Bank
AoI	Area of Influence
BAP	Biodiversity Action Plan
CHA	Critical Habitat Assessment
CR	Critically Endangered with extinction, a threatened status of the IUCN Red List of Threatened Species
DoE	Uzbekistan Department of Environment
EAA	Ecological Area of Analysis
EN	Endangered with extinction, a threatened status of the IUCN Red List
GN6	PS6 updated guidance notes (revised 27 June 2019)
IBAT	Integrated Biodiversity Assessment Tool
IPP	Independent Power Producer
IUCN	International Union for the Conservation of Nature
NL	Not evaluated (not listed)
PIC services	Project Implementation Consultancy services
PIU	SPV Project Implementation Unit
PMU	Project Management Unit
PS6	IFC Performance Standard 6
QPRs	Quarterly Progress Reports
ROW	Right of Way for the Transmission Line
SLG	IUCN Species Survival Commission (SSC) Snake and Lizard Group
SPV	Special Purpose Vehicle for the Uzbek Government Ministry of Energy
SSC	IUCN Species Survival Commission
TL	Transmission line
URDB	Red Data Book of the Republic of Uzbekistan (2019)
VU	Vulnerable, a threatened status of the IUCN Red List of Threatened Species

BIODIVERSITY MONITORING AND EVALUATION PLAN

INTRODUCTION

1. This document presents the Biodiversity Monitoring and Evaluation Plan (BMEP) which accompanies a Biodiversity Action Plan (BAP) to guide mitigation actions to address impacts to the Smooth even-fingered gecko (*Alsophylax laevis*) and other key reptiles through actions to avoid, minimise and restore impacts. The BAP and this BMEP are prepared based on findings of the Critical Habitat and Impact Assessment (CHA report), and there is no framework action plan associated with either document.

BACKGROUND TO THE PROJECT.

2. A Utility-Scale Solar Photovoltaic PPP Project is planned in the Sherabad District, Surkhandarya Region of the Republic of Uzbekistan. This Project is developed to align with the environmental assessment requirements under the Asia Development Bank (ADB) Safeguard Policy Statement (SPS) 2009[1], which requires consideration for biodiversity, critical habitats, and legally protected areas. Development of the biodiversity components take guidance from the IFC Performance Standards[2], particularly the Performance Standard 6 (PS6) on Biodiversity Conservation and Sustainable Management of Living Natural Resources and the updated guidance note (GN6, June 2009).

3. Field visits to the project site and along the proposed transmission alignment were conducted by Anna Ten (team leader), Timur Abduraupov, Natalya Beshko and Valentin Soldatov between 6 and 13 March 2020, and baseline reports were compiled. Three sub-reports were compiled following the field visits and were attached as annexes to the critical habitat assessment (CHA report).

4. The CHA report was compiled in July 2020, with an assessment of impacts and an overview of mitigation requirements. The objectives explain that a BAP is required to guide the implementation of mitigation outlined in the CHA report, which is supported by this BMEP.

BRIEF PROJECT DESCRIPTION.

5. The project site is geographically situated between 37°35'37"N and 37°31'6"N Latitudes and 66°50'42"E and 67°24'10"E Longitudes in the Surkhandarya region of Uzbekistan. Figure 1 illustrates the location of the proposed project. The project consists of the following components:

- Solar PV plant (200 MW) covering in excess of 400 ha and a transformer (pooling) substation covering 20 ha, located in Karakyr Uplands.
- 220 kV proposed transmission line for approx. length 52 km. The line alignment will follow an existing 110 kV line for a length of 49.2 km and overlap with an extensive area of irrigated agricultural land in the Sherabad valley; it crosses the Shuratakum Gorge, the Karasu River (a branch of the Sherabad River), and the Khaudag Ridge (with a maximum altitude of 553 m above sea level) before reaching the Surkhan substation, an existing facility north of the city of Jarkurgan. The Transmission line route comprises the following habitat lengths:
  - Agrolandscape (Solar PV site to 9 km);

[1] ADB Safeguard Policy Statement (June 2009): Online Link
[2] IFC Performance Standards: Online Link

- Shuratakum Gorge (9 to 13.3 km);
- Agrolandscape (13.3 to 23.5 km at Karusu River);
- Agrolandscape (23.5 to 36.2 km); and
- Khaudag Ridge (36.2 to 52 km at Surkhan substation)

6. An initial screening of biodiversity features associated with the project was conducted with supporting data from the Integrated Biodiversity Assessment Tool (IBAT)[3] and the Global Biodiversity Information Facility (GBIF). IBAT delineates a 50 km radius around the Project site and transmission line route. This zone, covering 12,600 km² (Figure 1) has been used the Project Ecological Area of Analysis (EAA) to compile: (i) a list of species with distributions overlapping the EAA; and (ii) an overview of nearby protected areas and Key Biodiversity Areas (KBAs).

7. The impact of the project is assessed over the Project Area of Influence (AoI) which as generated from a 200 m buffer around the transmission line ROW centre line, and a 50 m buffer around the Solar PV site including common facilities, new substation and solar PV plant. The combined area of the Project AoI covers 2,688 ha.

INSTITUTIONAL ARRANGEMENTS.

8. The Government Ministry of Energy will be the executing agency responsible for overall supervision and monitoring of project implementation and a Private Partner (private-developer-investor) through a Special Purpose Vehicle (SPV) will be the implementing agency.

[3] IBAT Online Link.

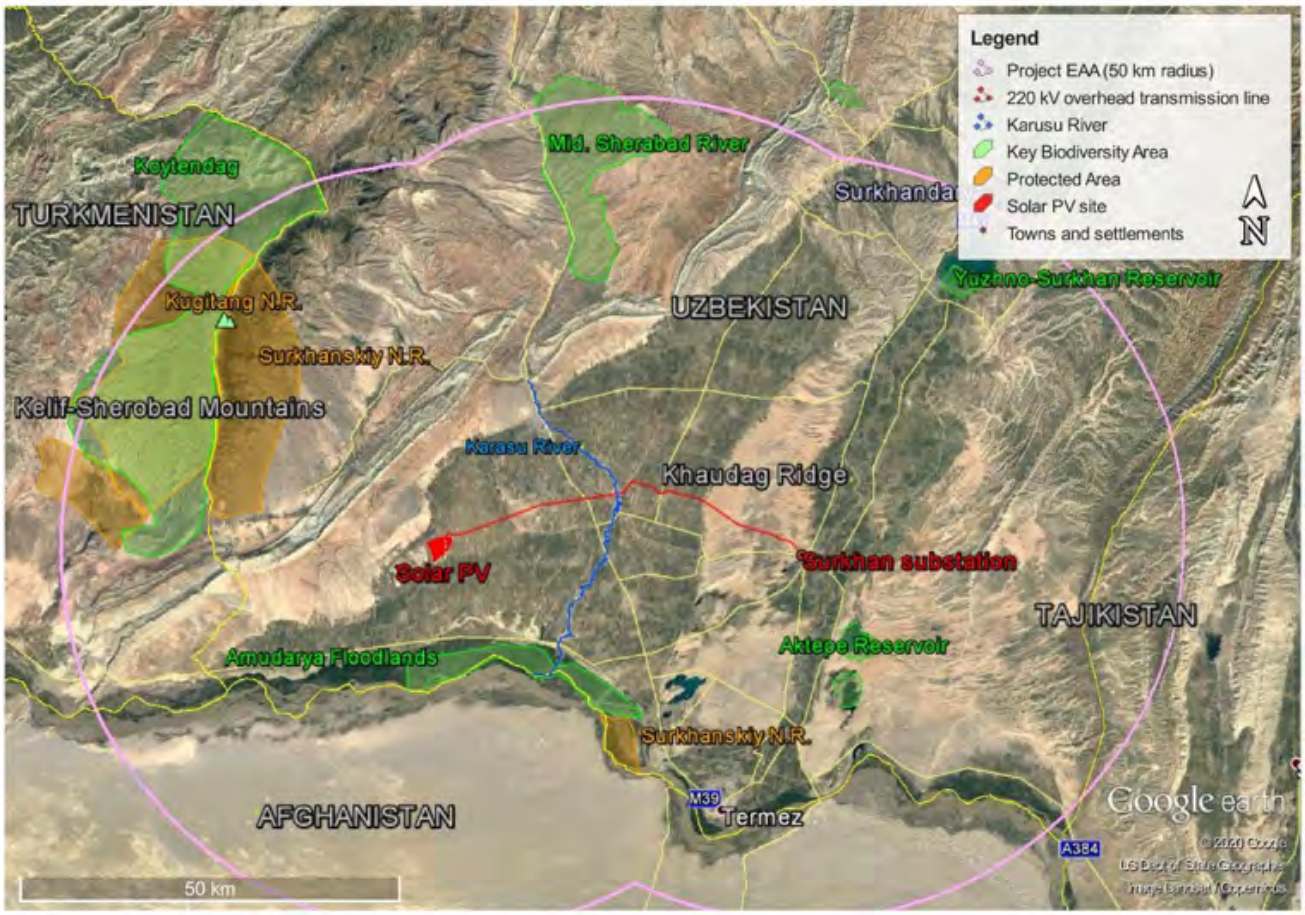

Figure 1: Location of the proposed Solar PV Site and Transmission Line relative to Protected Areas and the Ecological Area of Analysis (EAA), defined by a 50 km radius (pink line) around the Project Developments

9. The NENU will utilize the Project Management Unit (PMU) set up for current ADB funded energy projects in the region.[4] Responsibilities of the PMU (relevant to this document) will include supervision and overseeing compliance with (i) environmental safeguards requirements, engaging the Project Implementation Consultancy (PIC) services, (v) supervising the procurement process, and (vi) reporting to the ADB. The PMU will assign one staff person as an safeguards manager and one staff person as a safeguards officer (PMU-SS), on full time basis.

10. The SPV will set up a Project Implementation Unit (PIU) at the Sherabad district with the responsibility for day to day activities and compliance with safeguards during project implementation.

11. The PIC services will be engaged to assist the PMU and SPV PIU with the implementation of the project, the Environmental Management Plan and oversight of the contractors. At the end

[4] The NENU functions through the NENs office Main Power Network (MPN) in Surkhandarya Region.

of PIC services contract, PMU and SPV PIU will be directly responsible for ensuring compliance with safeguards.

12. Updating the BAP, BMEP, and overseeing their implementation (after obtaining ADB's approval) shall be the responsibility of the SPV PIU, assisted by PIC.

13. All contractors will be responsible for implementing the mitigation measures during construction and operation under the direct supervision of the PIC and SPV PIU and overall supervision of the PMU. The PMU will ensure that safeguards requirements are included in all bids, contracts and tender documents including the provision to apply penalties in case non-compliances to safeguards are encountered repeatedly.

14. The PMU will be responsible for safeguards reporting. The SPV PIU, assisted by the PIC, will conduct monitoring for the project and provide the environment input based on site visits, compliance checks and prepare the subproject Quarterly Progress Reports (QPRs) for submission to the PMU. The PIC will support the PMU to use the information from the project QPRs and prepare a safeguards monitoring report for submission to ADB quarterly and semi-annually during construction stage and annually during operation stage. The safeguards monitoring reports will be publicly disclosed on the ADB website. Reporting to ADB will continue until project completion report is issued.

15. The SPV PIU will be responsible for safeguards monitoring. The SPV PIU, assisted by the PIC, will coordinate and interact with the PMU on compliance to ADB safeguards requirements and with relevant government agencies and local authorities on permits and clearances and national environmental requirements, update and finalize the IEE and EMP, BAP and BMEP as needed.

PURPOSE, AIMS AND OBJECTIVES

Purpose

16. The Purpose of the BAP and this BMEP is to align with requirements of the ADB SPS (2009).

17. Critical habitat was identified in the CHA report, and the SPS Safeguard Requirements 1: Environment (Appendix 1) presents the requirements for critical habitat in paragraphs 27 and 28 (Box 1).

Box 1 Extracts from the ADB Safeguard Policy Statement (June 2009) relevant to critical habitat (paragraphs 27 & 28)

> 27. Mitigation measures will be designed to achieve at least no net loss of biodiversity. They may include a combination of actions, such as post-project restoration of habitats, offset of losses through the creation or effective conservation of ecologically comparable areas that are managed for biodiversity while respecting the ongoing use of such biodiversity by Indigenous Peoples or traditional communities, and compensation to direct users of biodiversity.
>
> 28. No project activity will be implemented in areas of critical habitat unless the following requirements are met:
>
> (i) There are no measurable adverse impacts, or likelihood of such, on the critical habitat which could impair its high biodiversity value or the ability to function.
>
> (ii) The project is not anticipated to lead to a reduction in the population of any recognized endangered or critically endangered species or a loss in area of the habitat concerned such that the persistence of a viable and representative host ecosystem be compromised.
>
> (iii) Any lesser impacts are mitigated in accordance with para. 27.

Aim

18. The Aim of the BAP and this BMEP is to provide guidance to avoid measurable adverse impacts, to avoid a net reduction, and to achieve No Net Loss (NNL) for the designated critical habitat biodiversity feature, namely the Smooth even-fingered gecko (*Alsophylax laevis*).

Objectives

19. The above aim guides the Objectives of the BAP, which is to present the actions and procedures necessary to demonstrate how NNL can be achieved for the Smooth even-fingered gecko, based on mitigation measures provided in the Critical Habitat Assessment report. Mitagation measures are expanded to include a diversity of species to the likelihood of achieving NNL for the designated critical habitat feature.

20. This BMEP guides the monitoring and evaluation procedures, which are conducted over a longer time period than is applicable to the BAP.

BASELINE AND CRITICAL HABITAT STATUS

SENSITIVE REPTILE SPECIES.

21. The BAP presents an ecological understanding of nine reptile species listed in Table 1. These species were recorded or are expected to occur within the Project EAA and may be impacted by the Project.

Table 1: Reptile Species of Conservation Concern addressed in the BAP

FAMILY and Species names	English Name	Global Threat Status (IUCN)	National Threat Status (URDB)
GEKKONIDAE *Alsophylax laevis*	Smooth even-fingered gecko	CR	2 (VU:D)
TESTUDINIDAE *Testudo horsfieldii*	Central Asian Tortoise	VU	2 (VU)
AGAMIDAE *Phrynocephalus raddei boettgeri*	Boettger Caspian Toad-head Agama	LC	2 (VU:D)
LACERTIDAE *Eremias nigrocellata*	Black-ocellated Racerunner	LC	2 (VU:D)
VARANIDAE *Varanus griseus caspius*	Transcaspian Desert Monitor	Not listed	2 (VU:D)
COLUBRIDAE *Boiga trigonata melanocephala*	Indian Gamma (Common Tree) Snake	LC	2 (VU:R)
COLUBRIDAE *Lytorhynchus ridgewayi*	Afghan Awl-headed Snake	LC	2 (VU:R)
COLUBRIDAE *Lycodon striatus bicolor*	Northern (Barred) Wolf Snake	Not listed	2 (VU:R)
BOIDAE *Eryx tataricus speciosus*	Tartar Sand Boa	Not listed	3 (NT)

OCCURRENCE OF CRITICAL HABITAT.

22. A critical habitat status is recognised for the Smooth even-fingered gecko (*Alsophylax laevis*) following a precautionary principle in favour of protecting this gecko species, as explained in the CHA Report.

23. The ADB SPS (2009) require at least NNL to be demonstrated for this critical habitat species (see Project Purpose). Table 2 presents an overview of the conservation recommendations provided within the IUCN Red List and the Uzbekistan Red Data Book (URDB) for this gecko and the Black-ocellated Racerunner. Likely impacts and appropriate mitigation measures to achieve these recommendations are presented in the BAP. This BMEP presents procedures to monitor and demonstrate the achievement of NNL.

Table 2: Conservation recommendations for affected reptile species provided in the IUCN Red List and the URDB

Species and Recommended Conservation Actions	Mitigation Approach to address the Recommended Conservation Actions
Smooth even-fingered gecko (*Alsophylax laevis*) • Create of a special reserve in the southeast of Türkmenistan (IUCN Red List) • Methods are required to estimate the abundance for this secretive and nocturnal species (URDB) • The taxonomic status of isolated populations needs to be clarified (URDB)	• Involvement of recognised and competent specialist herpetologists and providing sufficient resources and opportunity in the field for assessment and subsequent monitoring. • Specialist herpetologists are encouraged to use these opportunities to further the understanding of taxonomic status and publish their findings. • Avoid and minimise predicted impacts. • Some habitat protection can be provided by the presence of the solar development in the Karakyr habitat and the transmission line within the Kattakum Sands that will guard against further development within the ROW. • These sites will not achieve the status of a special reserve, but onsite restoration of suitable microhabitat conditions can secure habitat to safeguard local populations to a level that is commensurate with expected impacts.
Black-ocellated Racerunner (*Eremias nigrocellata*) • The IUCN Red List recommends that surveys are needed to clarify the population status of this species, and it is not clear whether Iranian and Uzbek populations are truly conspecific (IUCN Red List)	

FRAMEWORK TO ACHIEVE NO NET LOSS

24. The BAP is required to achieve No Net Loss (NNL) for the designated critical habitat feature, namely the Smooth even-fingered gecko (*Alsophylax laevis*). The following definition of No Net Loss (NNL) is provided by the IFC Performance Standard 6:

> No net loss is defined as the point at which project-related impacts on biodiversity are balanced by measures taken to avoid and minimize the project's impacts, to undertake on-site restoration and finally to offset significant residual impacts, if any, on an appropriate geographic scale (e.g., local, landscape-level, national, regional).

25. Impacts can be mitigated, and various conservation actions recommended by the IUCN Red List and URDB (Table 2) can be implemented, with the transmission line right of way serving as an *in situ* offset. This combination of actions can feasibly result in no significant residual impact and achieve NNL for the Smooth even-fingered gecko and associated reptile species affected by the Project.

26. The BAP presents guidance on (i) Involvement of appropriate specialists; (ii) Confirmation of the occurrence of the Smooth Even-fingered Gecko and compiling a quantitative benchmark (preconstruction) state against which the future post construction/operational state can be compared; (iii) Safe translocation of individuals away from construction footprints; (iv) Providing the PIC with appropriate guidance for contractors to avoid and minimise impacts.

27. The Smooth even-fingered gecko is elusive and quantifying the actual population will not be practical. Confirmation of NNL can therefore be achieved through creation of increased microhabitat to compensate for the habitat lost, and subsequent confirmation that this habitat is used by the affected reptile species.

28. This BMEP presents the procedures to be followed by the specialist team to confirm the achievement of NNL requirements for the affected reptiles. Procedures for appointment of the specialist team are presented within the BAP.

PROPOSED MITIGATION

29. The following mitigation measures are outlined in the CHA report and are presented in the BAP:

Design and Avoidance Measures (Preconstruction and Design Phase)

(a) Solar PV arrays are to be installed with a maximum possible distance from each other (Figure 9). The larger the distance, the less negative impact on reptile, mammals and birds and plants.
(b) Construction footprints are to be planned and minimized in extent. To avoid footprint creep, these areas are to be clearly demarcated on the ground including the construction site, equipment dropdown areas, site office, vehicle parking, worker's rest areas, ablution facilities and any other requirements.
(c) Fencing around the Solar PV site needs to be permeable to small mammals up to the size of a fox, which are able to squeeze through a 12 cm hole.
(d) Construction works for the transmission line are to be well planned in advance so that the construction period is kept to the shortest possible period of time to minimise the duration of disturbance to species in the field.
(e) Preconstruction surveys shall be conducted by the specialist team as described above.

Minimisation Measures (Construction Phase)

(f) Hedges and field margins around the Solar PV site perimeter shall be maintained.
(g) Faunal hazards are to be mitigated, for example: (i) pits and trenches must not be left exposed for long periods; (ii) escape routes for fauna are to be incorporated at regular intervals within trenches and pits that are exposed overnight or longer periods; (iii) appropriate capacity will be available to safely remove and release after translocation any fauna trapped onsite.
(h) The appointed contractor will ensure that construction workers are aware of faunal sensitivities through induction programmes and appropriate media.
(i) The Contractor shall compile and implement a faunal protection policy to avoid unnecessary killing of fauna, ensures vehicle speed limits are controlled, hunting and possession of hunting equipment is prohibited, and taking pets and/or purchase/sale of wild animals or animal products is prohibited.

Habitat Restoration and Rehabilitation Measures (Construction Phase)

(j) Efforts shall be taken to translocate fauna that is unable to escape from construction activities, and transplant important plant specimens based on guidance provided by the specialist team as described above.
(k) Habitat restoration will be applied along the transmission line route and where possible within the Solar PV site based on guidance provided by the specialist team as described above.
(l) Remaining construction sites (other than sites for habitat restoration above) shall be rehabilitated to the extent possible, involving the following: (i) Rehabilitation is to be implemented as soon as practically possible after construction activities end; (ii) All waste and broken equipment is to be removed from construction sites; (iii) Restoring temporary land use (such as material storage) to pre-construction conditions; (iv) Soils are to be returned to excavations in a manner that restores the natural profile of soil horizons; (v) Landscaping of the fenced perimeter of the Solar PV site; (vi) Rehabilitated

sites shall be planted with indigenous plants; and (vii) An invasive alien species control programme will be incorporated into the site rehabilitation plan.

Minimisation Measures (Operations Phase)

(m) Hedges and field margins around the Solar PV site perimeter shall be maintained.

(n) The PMU will ensure that construction operational staff are aware of faunal sensitivities through induction programmes and appropriate media.

MONITORING AND EVALUATION PROCEDURES FOR NO NET LOSS

30. An outline is provided below for monitoring and evaluation of the success of mitigation actions to restore habitat for the affected reptile species, covering details of field surveys, reporting, report submission procedures and additional contributions. Summary details are presented in Table 3, a monitoring schedule is provided in Figure 2 and an indicative annual budget provided in Annex A.

Field Surveys

31. Monitoring surveys will cover the reptile species of conservation concern (Table 1) and will focus on the following aspects:

- Monitoring will be conducted by a lead herpetologist and a support herpetologist as described under the specialist team presented in the BAP.
- Initially, monitoring will be conducted twice a year, in the spring period (April-May) when the reptiles emerge from hibernation, and in the autumn period (September-October), when the reptiles are preparing for their hibernation.
- From the third year, annual monitoring (once per year) will be conducted in the springtime (April-May), as presented in Figure 2.
- Monitoring surveys will be conducted for a period of at least five (5) years, with consideration for further monitoring made based on the outcome of results achieved, as presented in Figure 2.
- Monitoring surveys will focus on the Project Area of Influence (AoI), with emphasis on the areas of habitat restoration and relocation sites.
- Assess the continued presence of each of the affected reptile species, and areas being utilised by these species, but with emphasis on the critical habitat species (*Alsophylax laevis*).
- Compile a measure of population abundance of the affected reptile species that can be used for comparison against baseline conditions and future surveys.
- Assess the extent to which habitat restoration activities have benefitted the affected species, including use of microhabitat features, and the extent that these habitat conditions have benefitted the species (if at all).
- Communicate with local people to assess if they have observed any change in the species presence, and if this has any effect on use of local resources.

Content for Reporting

32. An evaluation report will be compiled on the completion for each monitoring survey, which will address (but not be restricted to) the following:

- Details of the monitoring survey (specialists involved, dates, weather conditions, daily schedule and logistical arrangements).
- Field methods, equipment and data analysis procedures used for assessment of the affected reptile species, including a quantification of the survey effort (such as hours of monitoring/searching).

- Detailed findings and photographs from the field survey including reptile observations and outcomes of community engagement.
- Comparison of findings against baseline conditions and previous monitoring surveys in a manner that highlights trends once these become apparent.
- Limitations encountered during the monitoring survey.
- Highlight any new research findings that may be relevant to the affected species, including new technologies and methods of assessment.
- Discussion on the effectiveness of measures taken, existing and evolving threats and their likely ongoing impacts the affected reptiles, their local conservation status,
- Discussion regarding achievement of the BAP aims ("*to avoid measurable adverse impacts, avoid a net reduction, and achieve No Net Loss for the critical habitat Smooth even-fingered gecko Alsophylax laevis"*).
- Recommendations for future monitoring surveys.

Monitoring Report Submission

- A monitoring plan with personnel, a daily schedule, estimated costs and payment procedures will be submitted to the PMU and approved prior to initiating monitoring surveys.
- Monitoring reports shall be compiled within one month of the completion of field surveys.
- Reports are to be submitted to the PMU and may require submission to the Uzbekistan Department of Environment (DoE)[5], as determined during authorisation purposes covered in the BAP.
- Reports will be compiled in English and shall include a summary in Uzbek and Russian if required for the various parties to which it is submitted by the PMU and DoE.

Additional Contributions to Science

33. Results of activities conducted under the BAP and monitoring activities described here will be used to further scientific knowledge and conservation of reptiles. Opportunities for scientific contribution will be explored at the discretion of the specialist team, although the following are suggested avenues of analysis to be considered:

- Clarifying the taxonomy of local populations of the affected species.
- Better understanding the threatened status of local reptile species, for improved future IUCN Red List and the Uzbekistan Red List threatened status assessments.
- Improved advice on proposed conservation actions for the above assessments.
- Capacity building of local herpetologists.

[5] Uzbekistan Department of Environment, Tashkent. Website: http://bionazorat.uznature.uz/eng/newsmain/310.html.

SUMMARY OF MONITORING AND EVALUATION PROCEDURES.

Table 3 Summary of Key Monitoring and Evaluation Procedures

Parameter	Description
(a) Monitoring Frequency for Monitoring and Evaluation (Figure 2)	Years 1 and 2: Twice per year (four field surveys)
	Years 3, 4 and 5: Once per year (three field surveys)
	Thereafter: Need for monitoring to extend beyond a 5-year period is to be evaluated by Year 4
(b) Duration	Five years
(c) Seasonal restrictions	Years 1 and 2: Spring period (April-May) and Autumn period (September-October)
	Years 3, 4 and 5: Spring period (April-May)
(d) Personnel / Skills required	➢ 1 x Lead Herpetologist (see BAP) ➢ 1 x Support Herpetologist (see BAP) ➢ 1 x Logistics Support Person (e.g. driver)
(e) Timeframes	➢ Fieldwork: Three days onsite plus travel ➢ Data analysis: 1 week ➢ Report writing and submission: 1 week
(f) Logistical requirements	To be determined by the field team
(g) Equipment requirements	To be determined by the field team, and improved with subsequent monitoring assessments
(h) Expected deliverables	Annual monitoring reports compiled in English Contributions to scientific literature
(i) Submission	➢ PMU

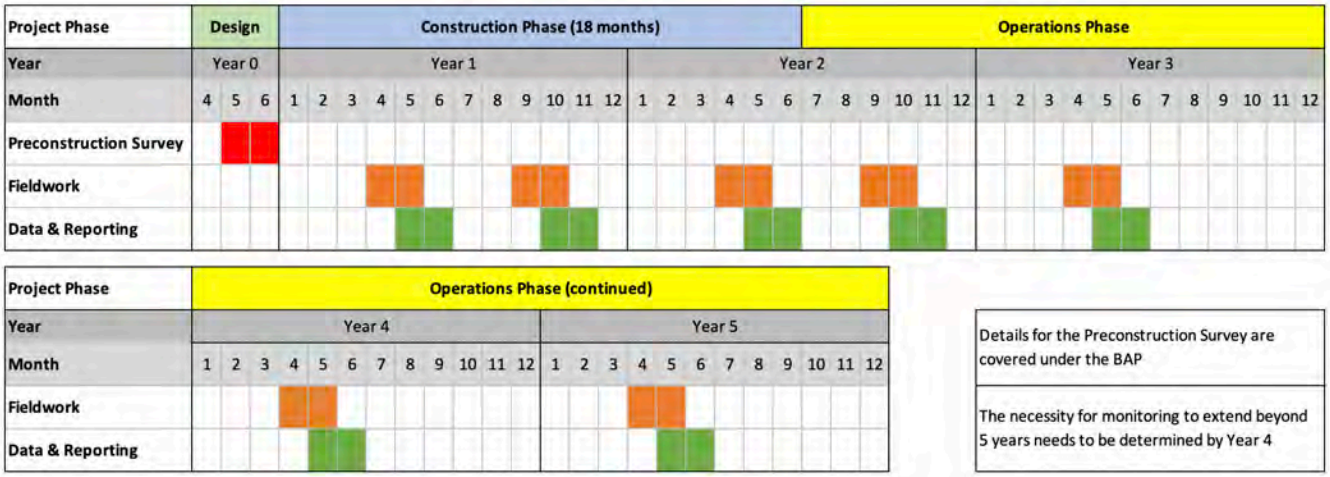

Figure 2 Monitoring and Evaluation Schedule as anticipated across the Project Phases

ANNEX A: INDICATIVE ANNUAL MONITORING BUDGET

The following indicative hourly budget estimate and proposed rates are estimated per monitoring survey; however, this will need to be negotiated and agreed with the PMU prior to initiating monitoring surveys.

Budget Item	Duration (days)		
	Lead Herpetologist	Support Herpetologist	Logistical Support (Driver)
Preparation	1	1	1
Field survey	7	7	7
Data Analysis	2	2	
Reporting	3	3	
Logistic requirements	Accommodation, Subsistence, Transport to site, Vehicle hire and onsite transport, Equipment hire, Consumable equipment, medical and other requirements.		

Position	Proposed Daily Rates
Lead Herpetologist	$200.00 to $500.00
Support Herpetologist	$100.00 to $300.00

Biodiversity Action Plan

for the Smooth Even-fingered Gecko and other key Reptiles

for the

Utility-Scale Solar Photovoltaic PPP Project in Sherabad District, Surkhandarya Region of the Republic of Uzbekistan

Project no.: 54056-001

September, 2020

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THE REPUBLIC OF UZBEKISTAN

MINISTRY OF ENERGY

SHERABAD SOLAR INDEPENDENT POWER PRODUCER PROJECT UZBEKISTAN



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1. This document presents the Biodiversity Action Plan (BAP) to guide mitigation actions to address impacts to the Smooth even-fingered gecko (*Alsophylax laevis*) and other key reptiles through actions to avoid, minimise and restore impacts. This BAP is accompanied by a Biodiversity Monitoring and Evaluation Plan (BMEP) to guide the subsequent monitoring actions. This BAP and BMEP are prepared based on findings of the Critical Habitat and Impact Assessment (CHA report), and there is no framework action plan associated with either document

BACKGROUND TO THE PROJECT.

2. A Utility-Scale Solar Photovoltaic PPP Project is planned in the Sherabad District, Surkhandarya Region of the Republic of Uzbekistan. This Project is developed to align with the environmental assessment requirements under the Asia Development Bank (ADB) Safeguard Policy Statement (SPS) 2009[1], which requires consideration for biodiversity, critical habitats, and legally protected areas. The analysis of Critical Habitat takes guidance from the IFC Performance Standards[2], particularly the Performance Standard 6 (PS6) on Biodiversity Conservation and Sustainable Management of Living Natural Resources and the updated guidance note (GN6, June 2009).

3. Field visits to the project site and along the proposed transmission alignment were conducted by Anna Ten (team leader), Timur Abduraupov, Natalya Beshko and Valentin Soldatov between 6 and 13 March 2020. Three sub-reports were compiled following the field visits and were attached as annexes to the CHA report.

4. A critical habitat assessment (CHA report) was compiled in July 2020, with an assessment of impacts and an overview of mitigation requirements. Critical habitat was assessed based on threatened status classifications of both the IUCN Red List and the Uzbekistan Red Data Book (URDB). This BAP is developed to guide the implementation of mitigation outlined in the CHA report.

BRIEF PROJECT DESCRIPTION.

5. The project site is geographically situated between 37°35'37"N and 37°31'6"N Latitudes and 66°50'42"E and 67°24'10"E Longitudes in the Surkhandarya region of Uzbekistan. Figure 1 illustrates the location of the proposed project. The project consists of the following components:

- Solar PV plant (200 MW) covering in excess of 400 ha and a transformer (pooling) substation covering 20 ha, located in Karakyr Uplands.
- 220 kV proposed transmission line for approx. length 52 km. The line alignment will follow an existing 110 kV line for a length of 49.2 km and overlap with an extensive area of irrigated agricultural land in the Sherabad valley; it crosses the Shuratakum Gorge, the Karasu River (a branch of the Sherabad River), and the Khaudag Ridge (with a maximum

[1] ADB Safeguard Policy Statement (June 2009): Online Link.
[2] IFC Performance Standards: Online Link.

altitude of 553 m above sea level) before reaching the Surkhan substation, an existing facility north of the city of Jarkurgan. The Transmission line route comprises the following habitat lengths:

- Agrolandscape (Solar PV site to 9 km);
- Shuratakum Gorge (9 to 13.3 km);
- Agrolandscape (13.3 to 23.5 km at Karusu River);
- Agrolandscape (23.5 to 36.2 km); and
- Khaudag Ridge (36.2 to 52 km at Surkhan substation)

6. An initial screening of biodiversity features associated with the project was conducted with supporting data from the Integrated Biodiversity Assessment Tool (IBAT)[3] and the Global Biodiversity Information Facility. IBAT delineates a 50 km radius around the Project site and transmission line route. This zone, covering 12 600 km² (Figure 1) has been used as the Project Ecological Area of Analysis (EAA) to compile: (i) a list of species with distributions overlapping the EAA; and (ii) an overview of nearby protected areas and Key Biodiversity Areas (KBAs).

7. The impact of the project is assessed over the Project Area of Influence (AoI), which was generated from a 200 m buffer around the transmission line ROW centre line, and a 50 m buffer around the Solar PV site including common facilities, new substation and solar PV plant. The combined area of the Project AoI covers 2,688 ha.

INSTITUTIONAL ARRANGEMENTS.

8. The Government Ministry of Energy will be the executing agency responsible for overall supervision and monitoring of project implementation and a Private Partner (private-developer-investor) through a Special Purpose Vehicle (SPV) will be the implementing agency.

[3] IBAT Online Link.

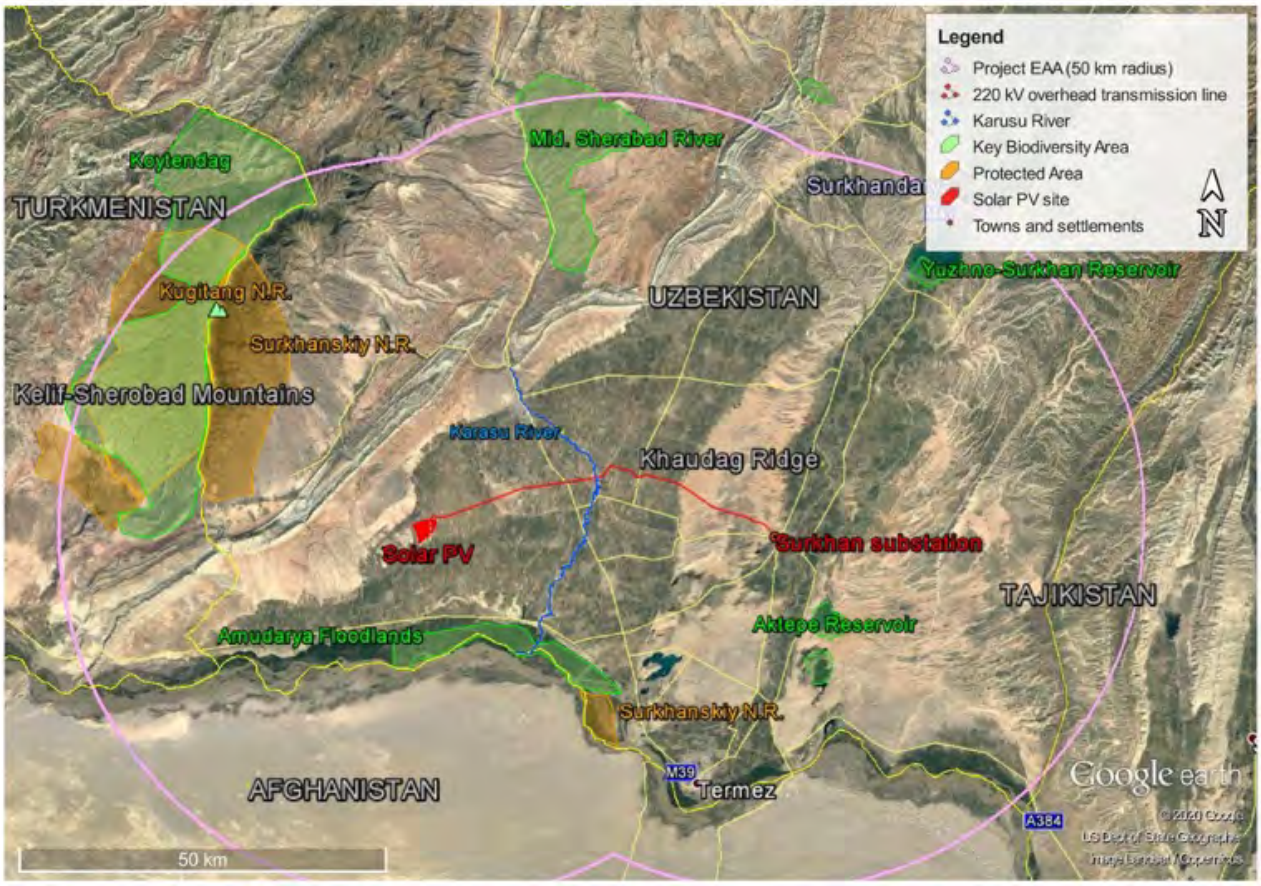

Figure 1: Location of the proposed Solar PV Site and Transmission Line relative to Protected Areas and the Ecological Area of Analysis (EAA), defined by a 50 km radius (pink line) around the Project Developments

9. The NENU will utilize the Project Management Unit (PMU) set up for current ADB funded energy projects in the region.[4] Responsibilities of the PMU (relevant to this document) will include supervision and overseeing compliance with (i) environmental safeguards requirements, engaging the Project Implementation Consultancy (PIC) services, (v) supervising the procurement process, and (vi) reporting to the ADB. The PMU will assign one staff person as an safeguards manager and one staff person as a safeguards officer (PMU-SS), on full time basis.

10. The SPV will set up a Project Implementation Unit (PIU) at the Sherabad district with the responsibility for day to day activities and compliance with safeguards during project implementation.

11. The PIC services will be engaged to assist the PMU and SPV PIU with the implementation of the project, EMP, BAP and BMEP and oversight of the contractors. At the end of PIC services contract, PMU and SPV PIU will be directly responsible for ensuring compliance with safeguards.

12. Updating this BAP, BMEP, and overseeing their implementation (after obtaining ADB's approval) shall be the responsibility of the SPV (PIU), assisted by PIC.

13. All contractors will be responsible for implementing the mitigation measures during construction and operation under the direct supervision of the PIC and SPV PIU and overall supervision of the PMU. The PMU will ensure that safeguards requirements are included in all bids, contracts and tender documents including the provision to apply penalties in case non-compliances to safeguards are encountered repeatedly.

14. The PMU will be responsible for safeguards reporting. The SPV PIU, assisted by the PIC, will conduct monitoring for the project and provide the environment input based on site visits, compliance checks and prepare the subproject Quarterly Progress Reports (QPRs) for submission to the PMU. The PIC will support the PMU to use the information from the project QPRs and prepare a safeguards monitoring report for submission to ADB quarterly and semi-annually during construction stage and annually during operation stage. The safeguards monitoring reports will be publicly disclosed on the ADB website. Reporting to ADB will continue until project completion report is issued.

15. The SPV PIU will be responsible for safeguards monitoring. The SPV PIU, assisted by the PIC, will coordinate and interact with the PMU on compliance to ADB safeguards requirements and with relevant government agencies and local authorities on permits and clearances and national environmental requirements, update and finalize the IEE and EMP, BAP and BMEP as needed.

[4] The NENU functions through the NENs office Main Power Network (MPN) in Surkhandarya Region.

PURPOSE, AIMS AND OBJECTIVES

Purpose

16. The Purpose of this BAP is to align with requirements of the ADB SPS (2009). Critical habitat has been identified, and the SPS Safeguard Requirements 1: Environment (Appendix 1) presents the requirements for critical habitat in paragraphs 27 and 28 (Box 1).

Box 1 Extracts from the ADB Safeguard Policy Statement (June 2009) relevant to critical habitat (paragraphs 27 & 28)

27. Mitigation measures will be designed to achieve at least no net loss of biodiversity. They may include a combination of actions, such as post-project restoration of habitats, offset of losses through the creation or effective conservation of ecologically comparable areas that are managed for biodiversity while respecting the ongoing use of such biodiversity by Indigenous Peoples or traditional communities, and compensation to direct users of biodiversity.

28. No project activity will be implemented in areas of critical habitat unless the following requirements are met:

(i) There are no measurable adverse impacts, or likelihood of such, on the critical habitat which could impair its high biodiversity value or the ability to function.

(ii) The project is not anticipated to lead to a reduction in the population of any recognized endangered or critically endangered species or a loss in area of the habitat concerned such that the persistence of a viable and representative host ecosystem be compromised.

(iii) Any lesser impacts are mitigated in accordance with para. 27.

Aim

17. The Aim of this BAP is to provide guidance to avoid measurable adverse impacts, to avoid a net reduction, and to achieve No Net Loss (NNL) for the one designated critical habitat feature, namely the Smooth even-fingered gecko (*Alsophylax laevis*).

Objectives

18. The above aim guides the objective of this BAP, which is to present the actions and procedures necessary to demonstrate how NNL can be achieved for the Smooth even-fingered gecko, based on mitigation measures provided in the CHA report.

19. Mitigation measures are expanded to include other reptiles of conservation concern, as no additional effort is required and expanding the diversity of species increases the likelihood of achieving NNL for the designated critical habitat feature.

BASELINE AND CRITICAL HABITAT STATUS

SEPARATION OF MODIFIED AND NATURAL HABITAT.

20. The Solar PV site is located within the Karakyr Uplands habitat, which reveals clear patterns of past agricultural practices. The proposed overhead transmission line route passes through habitats described as agrolandscapes, the Shuratakum Gorge, Karasu River (the width of Karasu River at the intersection of the line is approx. 20 km), Khaudag Ridge and the Kattakum Sands. The Khaudag Ridge and the Kattakum sands are botanically similar and are considered a single entity within the CHA report.

21. The Ecology Survey Report (April 2020) observed that the Surkhan-Sherabad valley is an ancient agricultural oasis that has been used by human beings for many centuries, with many human settlements (mainly villages) located in the area. All areas suitable for farming are used to cultivate crops or as gardens, causing most of the study area consists of anthropogenic landscapes. Patches of virgin lands were noted within the Karakyr Uplands; however, the area was considered to be disturbed and small patches of natural habitat are not recognised as the ecological functions there are heavily disturbed. All habitats were therefore classified within the CHA report as modified habitats.

IMPORTANT REPTILE SPECIES.

22. The CHA report assessed potential species presence from IBAT along with summaries of species recorded during the field survey.[5]

23. Four reptile species of conservation concern (including the Smooth even-fingered gecko) are listed within the CHA report and represent significant biodiversity features for the Project, however at least nine reptile species are of conservation importance (Table 1). This BAP is developed to guide the implementation of mitigation to protect these nine species.

[5] A list of 460 potential plant and animal species expected within the Project EAA was generated from IBAT.

Table 1: Reptile Species of Conservation Concern and Key Recommendations

FAMILY and Species names	English Name	Global Threat Status (IUCN)	National Threat Status (URDB)
GEKKONIDAE *Alsophylax laevis*	Smooth even-fingered gecko	CR	2 (VU:D)
TESTUDINIDAE *Testudo horsfieldii*	Central Asian Tortoise	VU	2 (VU)
AGAMIDAE *Phrynocephalus raddei boettgeri*	Boettger Caspian Toad-head Agama	LC	2 (VU:D)
LACERTIDAE *Eremias nigrocellata*	Black-ocellated Racerunner	LC	2 (VU:D)
VARANIDAE *Varanus griseus caspius*	Transcaspian Desert Monitor	Not listed	2 (VU:D)
COLUBRIDAE *Boiga trigonata melanocephala*	Indian Gamma (Common Tree) Snake	LC	2 (VU:R)
COLUBRIDAE *Lytorhynchus ridgewayi*	Afghan Awl-headed Snake	LC	2 (VU:R)
COLUBRIDAE *Lycodon striatus bicolor*	Northern (Barred) Wolf Snake	Not listed	2 (VU:R)
BOIDAE *Eryx tataricus speciosus*	Tartar Sand Boa	Not listed	3 (NT)

24. Limited ecological data is available online for some of the species listed in Table 1, yet an understanding of the identifying features and ecology of the above reptile species is necessary for the development and implementation of this BAP. Annex B of this BAP therefore presents important background data on these species.

OCCURRENCE OF CRITICAL HABITAT.

25. Critical habitat was assessed based on the IFC PS6 guidance notes (2019) using the IUCN Red List, the URDB data, and engagement with species specialists. One Criterion 1(a) critical habitat trigger is recognised for the Project, namely the Smooth even-fingered gecko (Alsophylax *laevis*). Population data for assessment of this species against the Criterion 1(a) thresholds were not available. However, a critical habitat designation was considered appropriate following a precautionary principle in favour of protecting this gecko species, as presented in the CHA Report.

26. The ADB SPS (2009) state that NNL requirements are to be demonstrated for critical habitat species, in this case the Smooth even-fingered gecko (*Alsophylax laevis*). Table 2 presents an overview of the conservation recommendations provided within the IUCN Red List and the URDB for the Smooth even-fingered gecko and the Black-ocellated Racerunner. These recommendations can be achieved and appropriate mitigation measures to achieve are presented later in this BAP.

Table 2: Conservation recommendations for affected reptile species provided in the IUCN Red List and the URDB

Species and Recommended Conservation Actions	Mitigation Approach to address the Recommended Conservation Actions
Smooth even-fingered gecko (*Alsophylax laevis*) • Create of a special gecko reserve in the southeast of Türkmenistan (IUCN Red List). • Methods are required to estimate the abundance for this secretive and nocturnal species (URDB). • The taxonomic status of isolated populations needs to be clarified (URDB).	• Involvement of recognised and competent specialist herpetologists and providing sufficient resources and opportunity in the field for assessment and subsequent monitoring. • Specialist herpetologists are encouraged to use these opportunities to further the understanding of taxonomic status and publish their findings. • Avoid and minimise predicted impacts. • Some habitat protection can be provided by the presence of the solar development in the Karakyr habitat and the transmission line within the Kattakum Sands that will guard against further development within the ROW. • These sites will not achieve the status of a special reserve, but onsite restoration of suitable microhabitat conditions can secure habitat to safeguard local populations to a level that is commensurate with expected impacts.
Black-ocellated Racerunner (*Eremias nigrocellata*) • The IUCN Red List recommends that surveys are needed to clarify the population status of this species, and it is not clear whether Iranian and Uzbek populations are truly conspecific (IUCN Red List).	

OVERVIEW OF IMPACTS RELEVANT TO REPTILES

27. Loss of habitat and disturbance of individual reptiles in areas where sensitive species can occur is the most important impact, particularly in the Karakyr Uplands and Khaudag Ridge habitats. These areas have been selected for development of the proposed Solar PV site or traversed by the proposed overhead transmission line with the following impacts expected:

- Construction activities for the Solar PV site are expected to disrupt the entire site, with extensive earthworks conducted to establish foundations and laying of cables. Fauna that is unable to escape from the area, such as reptiles, are therefore likely to be destroyed. Some vegetation will be established post construction, but the Solar PV arrays will provide shade over much of the area, and suitability of the habitat for reptile species currently established there is likely to be compromised.
- Construction of the overhead transmission line will be less intensive than construction of the Solar PV site, will be focused along a narrow strip, and faunal species may be able to escape the area more easily. There will be loss of habitat along the Right of Way (ROW) within a width of 68 m. Some recovery of the terrestrial habitat will be possible post construction although tall vegetation, if present, will need to be cropped within the ROW and access tracks will be maintained. Vegetation is currently sparse, and vegetation clearing is not expected to have an important impact.
- Many construction activities for both the Solar PV site and along the transmission line present risks to fauna, such as a temporary disturbance effect, animals becoming trapped in pits and trenches, road kills by moving vehicles and the unnecessary killing of animals or taking pets by construction workers.

FRAMEWORK TO ACHIEVE NO NET LOSS

28. This BAP is required to achieve No Net Loss (NNL) for the designated critical habitat feature, namely the Smooth even-fingered gecko (*Alsophylax laevis*). The following definition of No Net Loss (NNL) is provided by the IFC PS6:

> No net loss is defined as the point at which project-related impacts on biodiversity are balanced by measures taken to avoid and minimize the project's impacts, to undertake on-site restoration and finally to offset significant residual impacts, if any, on an appropriate geographic scale (e.g., local, landscape-level, national, regional).

Approach to achieve No Net Loss

29. Impacts can be mitigated, and various conservation actions recommended by the IUCN Red List and URDB (Table 2) can be implemented, with the transmission line right of way serving as an *in situ* offset. This combination of actions can feasibly result in no significant residual impact and achieve NNL for the Smooth even-fingered gecko and associated reptile species affected by the Project.

30. Achieving NNL requires (i) Involvement of appropriate specialists; (ii) Confirmation of the occurrence of the Smooth Even-fingered Gecko and safe translocation of individuals away from construction footprints; (iii) Compiling a quantitative preconstruction benchmark state (using translocation data) against which the future post construction/operational state can be compared; (iv) Providing appropriate guidance for contractors to avoid and minimise impacts; and (v) Developing measures for future monitoring and assessment of populations.

31. The Smooth even-fingered gecko is elusive and quantifying the actual population may not be practical. Confirmation of NNL can therefore be achieved through creation of increased microhabitat to compensate for the habitat lost, and subsequent confirmation that this habitat is used by the affected reptile species. These steps are described below and within a supporting BMEP, developed to guide these procedures for the Project.

Step 1. Establish a Specialist Team.

32. Preconstruction surveys will need to be conducted by a team comprising competent herpetologists and botanical specialists. Dr R. Nazarov [6] is a competent Uzbekistan-based herpetologist, has been involved in the recent update of the URDB, is an invited member of the IUCN SSC Snake and Lizard Group (SLG), and is recommended by the Chairman of the SLG.

33. This BAP recommends that Dr R. Nazarov gathers and leads the required specialist team to conduct preconstruction surveys to relocate affected reptile populations out of the construction footprint, compile guidance for the appointed subcontractor to avoid and minimise impacts (permeability and translocation), compile guidance and minimum targets for appropriate habitat restoration measures, and establish and implement future monitoring procedures.

[6] Contact: Dr Roman A. Nazarov (Zoological Museum, Moscow State University, B. Nikitskaya 2, Moscow 125009, Russia; Email: r_nazarov@mail.ru).

34. Outcomes of the specialist team activities will be used to improve the scientific understanding of the taxonomy and future conservation of the affected reptile species through publication and incorporation of findings into scientific media.

35. The specialist team will comprise at least the following specialist competencies:

- Lead Herpetologist
- Support Herpetologist
- Botanist
- Students of specialized Uzbek universities to support preconstruction fieldwork
- Logistic Support Staff (such as drivers)

36. The specialist team shall be contracted by the PMU. An indicative hourly budget and proposed rates for the specialist team to conduct the tasks below are presented as Annex A of this BAP, but shall be revised and negotiated with the PMU prior to implementation.

37. The specialist team shall be available to respond to questions and comments from the PMU, PIC services and/or contractors regarding proposed activities and any of the mitigation requirements presented within the BAP.

Step 2. Preconstruction Survey and Translocation from Construction Footprint.

38. A preconstruction survey shall be conducted by the specialist team, which shall involve a thorough search and trapping exercise within the footprint where construction activities will impact habitats. All reptiles within these construction footprints will be captured (to the extent possible), identified, photographed and relevant details recorded (Table 3). Specimens will be relocated to safe places nearby, with some tissue samples retained for DNA analysis and research purposes (as required for actions in Table 2) as deemed relevant by the lead herpetologist. Important plant specimens will also be relocated where possible.

Table 3 Example of required data to be recorded for translocated specimens to be used for quantitative baseline development

Event Data	Specimen Data
• Date and time of capture • Prevailing weather conditions • Method of capture • Personnel involved • Date and time of release • Release location	• Species identification and Photograph • Specimen size (such as body length, carapace dimensions, as relevant) • Body mass • Gender • State of health • Reproductive state

39. Additional data shall be recorded during the preconstruction survey, which shall include, but not be limited to the following:

- Evidence of the presence, or former presence of any reptile species not trapped or captured shall also be recorded. Evidence of the presence may include observations such as burrows, bones, carapace, eggs, likely vocalisations or others.

- Presence of suitable habitat conditions and features relevant to any of the sensitive reptile species, such as potential burrows, micro habitats (sandy patches, clay soils, slopes, large stones and boulders, fallen logs and suitable vegetation).
- Survey dates and prevailing weather conditions, with emphasis on conditions that influence the activity of the focus reptile species.

40. The Uzbekistan Department of Environment (DoE)[7] will be informed of all activities planned to be conducted during the preconstruction survey, the relevant authorisation required in Uzbekistan will be obtained and activities will be coordinated with these departments with reporting thereafter as required.

- Any actions concerning protected species need to be coordinated with the DoE, they may appoint an inspector to oversee the fieldwork and will likely require a report once fieldwork and data is compiled.
- The DoE issue permits for research purposes if samples need to be collected, and will likely require such sampling to be coordinated with the Uzbekistan Academy of Science.

41. The duration of the Preconstruction Survey is estimated to require 14 days (Annex A) and shall be conducted during the spring or early summer season (April to June).

Step 3. Establish a Benchmark State of Affected Reptile Species.

42. A benchmark state of the habitat is required for the future evaluation of NNL requirements. Therefore, following the preconstruction survey, incorporating and extrapolating results from the translocation exercise, the specialist team shall compile a baseline description that provides a quantifiable state of all the affected habitats. The specialist team will use their discretion in the development of the baseline description, but it is likely to include minimum expected occurrence of easily observed reptiles, important vegetation and physical habitat characteristics and minimum occurrence of microhabitat conditions (such as boulders, small slopes, burrows and/or other features).

Step 4. Compile Guidance for Minimising Expected Impacts.

43. The specialist team will develop guidance to determine if any reptile and plant species will require to be translocated by construction teams. For example, construction of the transmission line may occur at a different time, or the precise footprint may not be known. Appropriate release sites shall be described and identified on site maps, and guidance developed on the procedures to be followed for capture, transport, and release / transplanting.

44. Guidance to minimise impacts will include measures, as mentioned in the following section, to avoid the loss of reptiles and other fauna in pits, trenches and other construction related hazards, through provision of escape routes and regular site inspections. Guidance will include

[7] Uzbekistan Department of Environment, Tashkent. Website: http://bionazorat.uznature.uz/eng/newsmain/310.html

advice and locations indicated on site maps for providing gaps within fences to allow permeability and avoid fragmentation for small fauna as listed in the CHA report.

45. The specialist team will engage with the PIC and contractor to establish the contractor's capacity to implement the required mitigation, with specific emphasis on the necessary skills and personnel requirements.

46. All guidance, developed under the leadership of Dr R. Nazarov will be compiled in a non-technical format appropriate for contractors construction teams to follow.

Step 5. Compile Guidance and Minimum Targets for Habitat Restoration.

47. The specialist team will engage with the PIC to establish the contractor's capacity to create appropriate microhabitat conditions through onsite restoration. The specialist team will compile appropriate targets for creation of microhabitat features during construction activities, which exceeds current conditions and aims to increase the suitability of habitat for the affected reptiles over the long term and accommodates construction activities necessary for the project to proceed.

48. A guidance document will be compiled, which will be concise and presented in a non-technical format appropriate for the construction teams to follow.

Step 6. Develop Evaluation Procedures.

49. Procedures for future monitoring and evaluation are presented in the Project BMEP.

PROPOSED MITIGATION MEASURES

50. The following mitigation measures are provided in the CHA report and are developed to minimise impacts and contribute towards the recommended conservation outcomes for the affected reptiles (Table 2):

Design and Avoidance Measures (Pre-construction and Design Phase)

51. Solar PV arrays are to be installed with a maximum possible distance from each other. The larger the distance, the less negative impact on reptile, mammals and birds and plants.

(a) Construction footprints are to be planned and minimized in extent. To avoid footprint creep, these areas are to be clearly demarcated on the ground including the construction site, equipment dropdown areas, site office, vehicle parking, worker's rest areas, ablution facilities and any other requirements.

(b) Fencing around the Solar PV site needs to be permeable to small mammals up to the size of a fox, which are able to squeeze through a 12 cm hole.

(c) Construction works for the transmission line are to be well planned in advance so that the construction period is kept to the shortest possible period of time to minimise the duration of disturbance to species in the field.

(d) Preconstruction surveys shall be conducted by the specialist team as described above.

Minimisation Measures (Construction Phase)

(e) Hedges and field margins around the Solar PV site perimeter shall be maintained.

(f) Faunal hazards are to be mitigated, for example: (i) pits and trenches must not be left exposed for long periods; (ii) escape routes for fauna are to be incorporated at regular intervals within trenches and pits that are exposed overnight or longer periods; (iii) appropriate capacity will be available to safely remove and release after translocation any fauna trapped onsite.

(g) The PIC services will ensure that construction workers are aware of faunal sensitivities through training and capacity building, induction programmes and appropriate media.

(h) The SPV PIU and contractor(s) shall compile and implement a faunal protection policy to avoid unnecessary killing of fauna, ensures vehicle speed limits are controlled, hunting and possession of hunting equipment is prohibited, and taking pets and/or purchase/sale of wild animals or animal products is prohibited.

Habitat Restoration and Rehabilitation Measures (Construction Phase)

(i) Efforts shall be taken to translocate fauna that is unable to escape from construction activities, and transplant important plant specimens based on guidance provided by the specialist team as described above.

(j) Habitat restoration will be applied along the transmission line route and where possible within the Solar PV site based on guidance provided by the specialist team as described above.

(k) Remaining construction sites (other than sites for habitat restoration above) shall be rehabilitated to the extent possible, involving the following: (i) Rehabilitation is to be implemented as soon as practically possible after construction activities end; (ii) All waste and broken equipment is to be removed from construction sites; (iii) Restoring temporary land use (such as material storage) to pre-construction conditions; (iv) Soils are to be returned to excavations in a manner that restores the natural profile of soil horizons; (v) Landscaping of the fenced perimeter of the Solar PV site; (vi) Rehabilitated sites shall be planted with indigenous plants; and (vii) An invasive alien species control programme will be incorporated into the site rehabilitation plan.

Minimisation Measures (Operations Phase)

(l) Hedges and field margins around the Solar PV site perimeter shall be maintained.

(m) The PMU and SPV PIU will ensure that construction operational staff are aware of faunal sensitivities through induction programmes and appropriate media.

REQUIREMENTS FOR IMPLEMENTATION.

Mitigation Action	Responsibility and Personnel / Skills required	Timeframe and seasonal restrictions	Equipment, Logistical Requirements, and Deliverables	Indicators of success
Design and Avoidance Measures (Preconstruction and Design Phase)				
(a) Solar PV array layout	Design Engineers	Designs to be developed preconstruction	Engineering design Construction spatial layout plan	Spatial layout plan includes areas where some restoration for reptiles can be applied.
(b) Construction footprints minimised and demarcated	SPV PIU / PMU	Preparations developed preconstruction. Implemented during construction	Engineering design Construction spatial layout plan	
(c) Permeable fencing of the Solar facilities	SPV PIU / PMU Some guidance from specialist team	Preparations to be place preconstruction. Implemented during construction	Construction spatial layout plan, showing locations for faunal permeability features to be installed.	Small fauna are able to move in and out of the Solar PV site.
(d) Minimised construction period for transmission lines	SPV PIU / PMU	Construction plan to be developed preconstruction	Feasible and approved construction plan of action with appropriate mechanisation	Construction time period is feasible and short duration.
(e) Preconstruction surveys	Specialist Team, PIC services	Preparation, 14 days of fieldwork, and reporting. Field survey to be conducted in Spring/Early Summer	Appropriate guidance provided on translocation, permeability and targets for microhabitat development for reptiles of conservation concern. A provision budget is presented in Annex A. Logistics shall be negotiated with the appointed contractor.	Acceptance of the guidance by the appointed SPV contractor(s) Achievement of NNL through ongoing monitoring
Minimisation Measures (Construction Phase)				
(f) Maintain hedges and field margins around the Solar PV site perimeter.	SPV PIU / PMUAppointed SPVContractor(s)	During construction and operations	Equipment appropriate for vegetation management (clippers, chain saws, mowers and such)	Vegetation around the Solar PV site is retained after completion of construction.

Mitigation Action	Responsibility and Personnel / Skills required	Timeframe and seasonal restrictions	Equipment, Logistical Requirements, and Deliverables	Indicators of success
(g) Onsite faunal hazards to be mitigated	SPV PIU / PMU, Appointed SPV Contractor(s)	During construction	Small ramps and poles for fauna to climb Trenches to include escape features Boards to cover holes with small openings	No reported unnecessary loss of fauna as a result of construction activities.
(h) Awareness of construction workers to faunal sensitivities	SPV PIU / PMU, SPV Appointed Contractor(s)	During construction and operations	Induction programme Posters and other media to generate awareness	No reported unnecessary loss of fauna as a result of construction activities.
(i) Policy implemented to avoid unnecessary loss of fauna	SPV PIU / PMU, Appointed SPV Contractor(s)	During construction and operations	Faunal protection policy developed and included within induction	No reported unnecessary loss of fauna as a result of construction activities.
Rehabilitation and Habitat Restoration Measures (Construction Phase)				
(j) Translocation of fauna encountered onsite and transplanting of important plant specimens	Specialist Team, SPV PIU / PMU and Appointed SPV Contractor(s) based on guidance by the specialist team.	Based on guidance by the specialist team.	Based on advice from Specialist Team	Acceptance of the guidance by the appointed SPV contractor(s) Achievement of NNL through ongoing monitoring
(k) Habitat restoration to create appropriate reptile microhabitat	SPV PIU / PMU, Appointed SPV Contractor(s), based on guidance from the Specialist Team	During and post construction	Based on advice from Specialist Team, who will prepare detailed guidance on the types of restoration, locations for restoration to be implemented and expected end result.	Approval of restoration actions by the Specialist Team during a subsequent monitoring event. A schedule of monitoring events is presented in the BMEP.
(l) Rehabilitation of remaining construction site	PMU, Appointed Contractor	During and post construction	Site rehabilitation plan, which incorporates an invasive alien species control programme.	Construction sites rehabilitated after

Mitigation Action	Responsibility and Personnel / Skills required	Timeframe and seasonal restrictions	Equipment, Logistical Requirements, and Deliverables	Indicators of success
				completion of construction activities
Minimisation Measures (Operations Phase)				
(m) Maintain hedges and field margins around the Solar PV site perimeter.	SPV PIU / PMU	During operations	Equipment appropriate for vegetation management (clippers, chain saws, mowers and such)	Vegetation around the Solar PV site is retained after completion of construction.
(n) Awareness of operational staff to faunal sensitivities	SPV PIU / PMU	During operations	Induction programme Posters and other media to generate awareness	No reported unnecessary loss of fauna as a result of construction activities.

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Uzbekistan Department of Environment website

ANNEX A: SPECIALIST TEAM PROVISIONAL BUDGET

A provisional hourly budget and proposed rates are presented below but shall need to be negotiated between the Lead herpetologist and the PMU prior to implementation.

Budget Item	Duration (days)				
	Lead Herpetologist	Support Herpetologist	Botanist	Student Support (*Note (a)*)	Driver etc. (approx. 2)
Preparations (*Note (b)*)	5	7	2		1
Preconstruction Survey	10 to 14	10 to 14	10 to 14	(10 - 14 days) x 5 persons	(10 - 14 days) x 2 persons
Data Processing	7	7	7		
Reporting: Field Survey Report	5	5	5		
Reporting: Minimise impact guidance	7	7	7		
Reporting: Habitat Restoration Guidance	7	7	7		
Logistic requirements	Accommodation, Subsistence, Transport to site, Vehicle hire and onsite transport, Equipment hire, Consumable equipment, medical and other requirements.				

Note (a): Support students are not expected to be paid a professional fee, but will require their accommodation and subsistence costs to be covered. The number of students and costs will need to be clarified with the Specialist Team.

Note (b): Preparation will include (but not limited to) support towards obtaining authorisation, preparing equipment, arranging students, drivers etc.

Position	Proposed Daily Rates
Lead Herpetologist	$250.00 to $550.00
Support Herpetologist	$100.00 to $300.00
Botanist	$150.00 to $400.00

ANNEX B: ECOLOGY OF IMPORTANT REPTILE SPECIES

Development and implementation of this BAP requires an understanding of the distinguishing features and ecology of the affected reptile species, and this Annex presents supporting data for the following nine reptile species present in the Project Area are considered to be of conservation importance .

FAMILY and Species Names	**English Name**
Gecko	
GEKKONIDAE *Alsophylax laevis*	Smooth Even-fingered Gecko
Tortoise	
TESTUDINIDAE *Testudo horsfieldii*	Central Asian Tortoise
Lizards	
AGAMIDAE *Phrynocephalus raddei boettgeri*	Boettger Caspian Toad-head Agama
LACERTIDAE *Eremias nigrocellata*	Black-ocellated Racerunner
VARANIDAE *Varanus griseus caspius*	Transcaspian Desert Monitor
Snakes	
COLUBRIDAE *Boiga trigonata melanocephala*	Indian Gamma (Common Tree) Snake
COLUBRIDAE *Lytorhynchus ridgewayi*	Afghan Awl-headed Snake
COLUBRIDAE *Lycodon striatus bicolor*	Northern (Barred) Wolf Snake
BOIDAE *Eryx tataricus speciosus*	Tartar Sand Boa

Smooth Even-fingered Gecko

Species Name: *Alsophylax laevis* Nikolsky, 1907

English Name	Uzbek Name	Russian Name
Southern Even-fingered Gecko	Силлиқ гекконча	Гладкий гекончик

Size. The body size of an adult gecko does not exceed 4 cm, with its tail approximately equal to the length of the body.

Identifying Features. The Smooth even-fingered gecko is morphologically similar to *Alsophylax pipiens*, from which can be differs by the absence of enlarged tubercles on the dorsal surface. Males have 8–13 cloacal pores.

Colouration. The colour of the dorsal surface of the body is from light grey to sandy-buffy. On both sides of the head, from the tip of the muzzle, through the eye and above the ear opening, a wide dark brown band stretches, which, closing on the back of the head, forms a horseshoe pattern. On the back, from four to seven transverse dark stripes are clearly visible, the intervals between which are usually less than the width of the stripes themselves. Up to 11 transverse stripes occur on the tail; indistinct dark pattern on the upper surface of the limbs. The ventral surface of the body is white.

Distribution and Subspecies. The range of the species consists of two isolated areas, i.e. in Uzbekistan and Turkmenistan. Two isolated populations occur in Uzbekistan, in the Central Kizilqum Desert and in South Uzbekistan. Only a few specimens are known from Surkhandarya, from the Karasu riverbank near Termez.

Preferred Habitat. This species avoids saline areas and occurs on flat areas practically devoid of vegetation (takir). Deep cracks in the ground and insect holes serve as refuge. However, in the Uchquduk region it is found under small flat rocks on the slopes of low clay hills.

Ecology. *Diet* comprises small arthropods. *Activity*. These geckos are nocturnal, and leave their shelters at dusk, with a peak in activity between 22-23 hours. There is a sharp decline in activity after midnight. Like other members of the genus, *A. laevis* have acoustic communication. The territorial signal consists of a series of individual clicks, which can be restarted approximately up to 30 m. *Reproduction*. The females lay eggs from late May to early July,

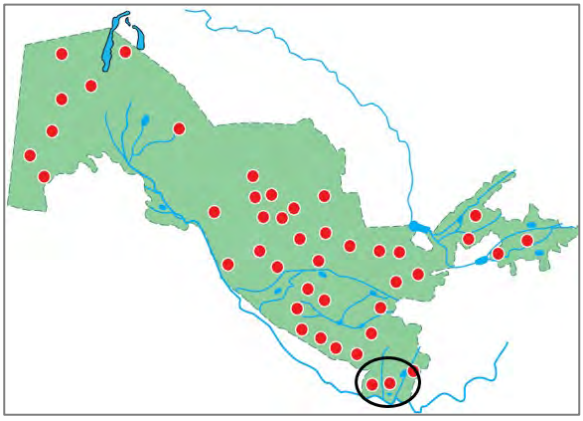
possibly producing two or three clutches during the season, each consisting of one or two eggs. The first record of a juvenile, with body size is 1.5–2 cm, was observed on the beginning of August. Sexual maturity is probably reached at one year old.

Threatened Status. IUCN Red List Status - CR, URDB (2019) classifies the gecko as VU. The URDB indicates an outlier distribution record that is within the Project EAA but was last recorded there over 40 years ago. Philip Bowles, chair of the IUCN Snake and Lizard Group (SLG) explained that *A. laevis* has been listed as CR on the IUCN Red List due to its population decline primarily within Türkmenistan. Insufficient information is available on the distribution, ecology and taxonomic status of this elusive species to reliably determine its vulnerability and need for protection. However, there is a sharp downward trend and an increased focus of attention on this species is urgently needed to prevent its possible disappearance.

Known Threats and Conservation. The main threat to the southern even-fingered gecko is habitat loss, with over half its historical habitat having been lost in the last 20 to 30 years. The species does not occur within any protected areas so the creation of a special reserve would be beneficial (Edge of Existence website). Recommended conservation actions (Table 2) include (i) creating of a special reserve in the southeast of Türkmenistan (IUCN Red List), (ii) developing methods to estimate the abundance for this secretive and nocturnal species and (iii) clarification of the taxonomic status of isolated populations (URDB).

Current Research. The natural history of *A. laevis* has been studied and described in the past (Bogdanov,1968; Szczerbak and Golobev, 1986). Numerous specimens of this species were collected during 1960's to 1980's but were not assessed based on DNA analysis. Despite intensive survey efforts to update its taxonomy in recent years, only a few specimens of have been collected in Central Uzbekistan, which may be a result of decline in the population density, its elusive behaviour or a combination of both effects. An international group of scientists from Uzbekistan, Russia, China and USA, conducted a joint study on the current status of several populations of the *A. laevis* in Central and South Uzbekistan. Dr Roman Nazarov, an Uzbekistan-based herpetologist, is the coordinator of this scientific group and an invited expert of the SLG, and his results on the taxonomical and conservation status of *A. laevis* are due to be published soon. Preliminary data reveal that the population within Central Uzbekistan is a new species and deserves a critically endangered status, but no data is available for the population in southern Uzbekistan (within the Project EAA) and the taxonomy there is not well understood. Studies for the southern population are currently being planned.

Central Asian Tortoise



Species Name: *Testudo (Agrionemys) horsfieldii* Gray 1844

English Names	Uzbek Name	Russian Name
Horsfield's tortoise, Afghan tortoise, Central Asian tortoise, Russian tortoise	Ташбока	Среднеазиатская черепаха

Size: diameter of carapace up to 28.6 cm

Identifying Features: The tortoise's carapace is covered by large symmetrical shields. The medial or vertebral row consists of five shields, and on the sides of it there are lateral or costal rows formed by four plates. A row of 25 smaller marginal scutes along the edge of the carapace. The plastron is formed by six pairs of shields (throat, shoulder, chest, abdominal, femoral and cloacal). The four-toed limbs are covered with large horny scales. Annual rings are expressed on the carapace shields, by which the age of the animal can be determined. However, these rings are erased in individuals over 15 to 20 years old making this not a reliable means to determine the age of old and large tortoises. The intraspecific structure of this species, according to some authors, consists of five subspecies (*bogdanovi*, *kazachstanica*, *kuznetzovi*, *rustamovi*, and the nominative form). Three subspecies are described in Uzbekistan although this is not accepted by majority of tortoise specialists so not considered here.

Colouration: The dorsal surface of the carapace is usually solid yellowish-olive, sometimes with wide dark spots. The underside is usually darker. In young individuals, the colour is more contrasting. The colour varies in different parts of the range.

Distribution and Subspecies: This species is widely distributed throughout the region and inhabits Afghanistan, Pakistan, northeastern Iran, Turkmenistan, Tajikistan, Kazakhstan, Kyrgyzstan and even in northwestern China, a small population of steppe tortoise is known. In Uzbekistan, the species is distributed sporadically, the main foci are the central Kyzyl Kum and foothills of the Nuratu ridge. This tortoise is also found on the Ustyurt plateau and in the south in the Surkhandarya region. Presence of the Central Asian Tortoise was confirmed in the Project area during field surveys, with burrows observed in the Karakyr Upland

habitat. However, engagement with local communities has revealed that this tortoise is locally rare (Abduraupov, 2020).

Preferred Habitat: The Central Asian tortoise is versatile in its habitat requirements, which allows it to occupy a wide range of habitats from sandy deserts to mountain valleys at an altitude of more than 1500 meters above sea level. The highest number of tortoises was noted in the foothills covered with wormwood bushes.

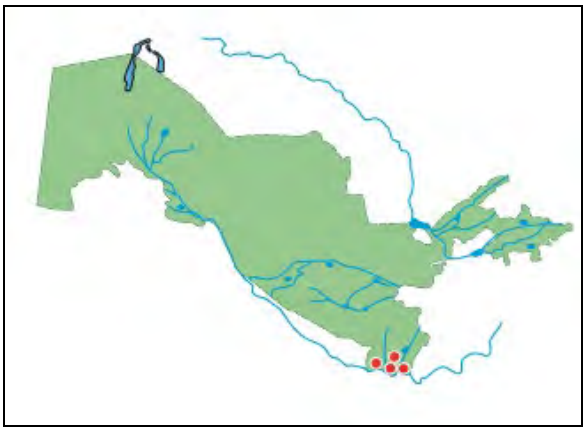
Activity: Daily activity, usually tortoises leave their burrows in the morning and actively feed before the heat (35 to 40 °C). In the evening, when the temperature drops, the tortoises re-emerge from their shelters. The seasonal activity of tortoises is very short and is equal to about three months, from late March / early April to mid or late June, but is determined the weather conditions and the availability of food each year.

Ecology: *Diet* is mainly a variety of plants, however, although they occasionally eat small dead vertebrates. *Reproduction*. In late May – early June, tortoises lay 2 to 6 eggs. Laying takes place in a burrow and hatch after about two and a half months, but spend the winter in a burrow and only appear on the surface next spring. *Behaviour*. These tortoises, oddly enough, are quite social and individual in their behaviour. When kept in captivity, individuals have different food preferences and can develop the simplest conditioned reflexes. In the nature, behaviour of tortoises is quite diverse. During the mating season, males fight for a female - they knock each other with their shells and bite. During mating, males make loud noises. At sufficient population density (in some areas greater than 50 individuals / ha), their activity can lead to landscape-alteration and lead to formation of biotopes. They selectively eat a large volume of vegetation, they dig a large number of burrows that serve as a refuge for many other species and, probably have a significant impact on the hydrochemistry of the soil as they change its drainage properties. This aspect has yet to be fully investigated. Individuals have been estimated to live for 100 years, although sexual maturity is believed to be attained in 7 to 10 years. This species hibernates in deep burrows and is well known for its digging abilities. Tunnels are up to 2m long with widened end chambers that are frequently excavated in steep hillsides or under overhanging stones. Rodent or hedgehog burrows may be adapted and colonised by this tortoise.

Threats. This tortoise occurs throughout much of Uzbekistan, but its population is declining and is classified locally as Vulnerable (URDB). In most parts of Uzbekistan, populations do not exceed 1.5 specimens/ha, although in some areas, population densities of 45.9 – 67.3 specimens/ha have been recorded. During the Great Patriotic War, the Central Asian Tortoise meat was harvested in large quantities to produce canned meat, however recently the species is impacted by agricultural development of virgin lands, the pet trade and gathering their eggs for commercial exports (URDB). The main threat currently to *Testudo horsfieldii* in the wild is the pet trade for which specimens are collected and exported from their range for commercial purposes. Uzbekistan is the main exporter of both wild caught and farmed tortoises for the pet trade. The species is listed under CITES Appendix II and may therefore be legally traded under a quota system established by the CITES member state. CITES have investigated the trade and requested information on population size of wild *Testudo horsfieldii* in Uzbekistan.

Conservation Actions. No conservation actions are presented for this tortoise by the IUCN Red List or the URDB, other than controlling the pet trade.

Boettger Caspian Toad-head Agama



Species Name: *Phrynocephalus raddei* Boettger, 1888

English Names	Uzbek Name	Russian Name
Caspian Toad-head Agama	Каспий тўгаракбоши	Закаспийская круглоголовка

Size. The body size is usually no more than 6 cm, body weight up to 7 g.

Identifying Features. An important distinguishing feature of the violet form is a pair of suprascapular red-brown (from dirty-brownish-red-brown) spots surrounded on the outside (sometimes above and below) lead-grey (to pale blue) stripes or spots, the outer thin stripe has a crescent moon. The suprascapular spots in preserved specimens remain clearly visible.

Colouration. The body is grey or yellowish-grey dorsally with numerous light spots in a pale grey edging and 3-5 pairs of brownish or hazel-coloured spots (stripes). The underside of the body is white, the chest is often with dark specks, and the marbled pattern of grey streaks is sometimes noticeable below the head. Undertail of young individuals is sulphur-yellow or honey-yellow. Bottom of the tail - 4–5 dark transverse stripes, that are white or bluish between in sexually mature individuals. The distal part of the tail is blackish ventrally.

Distribution and subspecies. The species know from Turkmenistan, Southern Uzbekistan (Surkhandarya region) and South-Western Tajikistan. The Uzbek and Tajik populations are referred as a separate subspecies - *Ph. raddei boettgeri* Bedriaga in Nikolsky, 1905, but not all researchers recognize this subspecies.

Preferred habitat. The Caspian Toad-head Agama lives on rubble-red-clayey soils with sparse vegetation; in Turkmenistan and Tajikistan it settles on loess-sandy areas with gravel and plump salt marshes.

Activity. The Caspian Toad-head Agama appears already in mid-February (during warm winters). In spring and autumn, it is active during the day, and in hot summer, the activity shifts to morning and evening (up to 20 PM). Spends warm nights on the surface of the ground or under bushes. Appears almost immediately after sunrise. It experiences heat in burrows, which are used both for spending

the night and for wintering. The active season ends in mid-November.

Ecology. *Diet*. Caspian Toad-head Agama feeds mainly on insects, and ants form the basis of their diet. In addition to them, they consume other Hymenoptera, small beetles and fillies, termites and Homoptera, occasionally caterpillars, spiders and woodlice. Sometimes it feasts on juicy buds and flowers. *Reproduction*. Oviposition begins in the first half of April. Clutch consists of 2–6 eggs up to 1.5 cm long, and the volume of the second clutch (in early May) is usually larger than the first. Juveniles appear in late May - early June, with repeated clutches in July. New-born individuals reach a length of about 2.5 cm. After wintering (at the age of 9 months) they become sexually mature. *Behaviour*. Some researchers estimate life expectancy at one year. Hides from enemies under the wormwood bushes; hides using cryptic colouring or takes refuge in its own burrows up to 40 cm long and up to 25 cm deep, sometimes using rodent burrows for this. Able to twist the tail in a spiral and swing the distal part of the vertically raised tail in different directions.

Conservation. The distribution of the Caspian Toad-head Agama in Uzbekistan is local due to the transformation of biotopes. Its number has been noticeably decreasing recently. A possible reason is the intensive expatriation of livestock and the breaking of habitats characteristic of the species into the sand, resulting in a powerful expansion of the psammobiotic fauna (*fauna living in sandy habitats*).

Black-ocellated Racerunner

Species Name: *Eremias nigrocellata* Nikolsky, 1896

English Name	Russian Name
Black-Ocellated Racerunner	Черноглазчатая ящурка

Size. Medium-sized lizard, body length about 9 cm, tail slightly longer than body up to 10 cm.

Identifying Features. This species can be distinguished from other *Eremias* species in

Uzbekistan by the following features: the infraorbital plate not reach the mouth edge; the supraorbital plates are partially separated from the frontal and fronto-parietales by row of granules; one wide frontal-nasal shield; row of femoral pores not reach the knee bend by one or two scales; the entire inner surface of the lower leg is covered by widened shields. The closest related species is *E. intermedia* and distinguishing between these species can be problematic. *E. intermedia* have only one row of sub-digital plates on the fourth toe of the hind foot, and *Eremias nigrocellata* have two. All other characters are quite similar. Therefore, in modern literature, this combination is increasingly common – *nigrocellata* – *intermedia* complex.

Colouration. The main background of the back is light grey, sometimes with a brownish tint. The pattern of the back is ocellated, consists of rounded light spots with an uneven black edging. Accumulations of these spots form regular longitudinal stripes on the back.

Distribution and Subspecies. The Black-Ocellated Racerunner is common in Iran, Uzbekistan, Tajikistan, Turkmenistan and Afghanistan. In Uzbekistan, the species recorded only in the south part of the country in the Surkhandarya region. The Black-ocellated Racerunner was described as fairly abundant in the Project area following field surveys, with at least 22 individuals observed in the Karakyr Upland, Khaudag Ridge and Kattakum Sands habitats (Abduraupov, 2020).

Preferred Habitat: This lizard occurs on plains with dense loamy soils and rare ephemeral vegetation, it can also inhabit gravelly semi-deserts. In Uzbekistan, the species inhabits gentle areas of loess hills.

Activity. The lizards leave wintering in mid-February. They hibernate in September – October. On warm winter days, they can bask in the sun.

Ecology. *Diet*. The diet of the black-eyed lizard consists mainly of ants, beetles, caterpillars, dipterans, bugs and orthopterans. *Reproduction*. They reach puberty at the age of one year. Mating begins in late March, and oviposition in mid-April. The number of eggs in a clutch varies from 3 to 9; the female makes 2-3 clutches per season. Oviposition takes place in the burrow. *Behaviour*. This lizard is quite clumsy and not very fast when moving.

Conservation. The development of virgin lands and cattle grazing have a negative impact on the state of populations. Since this species belongs to a taxonomically complicated group, the status of some populations remains undetermined. The IUCN Red List recommends that surveys are needed to clarify the population status of this species and explains that it is not clear whether Iranian and Uzbek populations are truly conspecific.

Transcaspian Desert Monitor

Species Name: *Varanus griseus* (Daudin, 1803)

English Names	Uzbek Name	Russian Name
Transcaspian Desert Monitor	Бўз эчкемар	Серый варан

Size. The largest lizard in Uzbekistan and throughout Central Asia. Body length reaches 60 cm, tail - 90 cm, weight - up to 3.5 kg (according to some sources - up to 4 kg).

Identifying Features. The massiveness of the body distinguishes the monitor lizard from all other lizards in Uzbekistan. In addition, the top of the monitor lizard's head covered by small scales, rather than large symmetrical plates. The obliquely slit nostril is located closer to the eye than to the tip of the rostrum. The femoral pores are absent. The tail is laterally compressed in the distal part and rounded in the proximal part.

Colouration. The main background colour of the upper body is from apricot-yellowish to ochre-terracotta with obvious yellowish tints. It has olive-grey (to chocolate-umber) small specks and large transverse bands. On the back can be 5-8 such bands, on the tail - up to 19. Coloration of young individuals is more contrasting, transverse bands are black. Through the eye and the ear opening, it passes along a longitudinal strip, similar in colour to the transverse ones. Thin and less pronounced transverse stripes run along the sides of the body and the head side. The belly is white.

Distribution and Subspecies. The Desert Monitor is known from North Africa and Turkey to the Aral Sea and from the Caspian to the foothills of the Pamir-Alai and Tien Shan. The Central Asian grey monitor *Varanus griseus caspius* (Eichwald, 1831) distributed in Uzbekistan.

Preferred Habitat. The grey monitor prefers different types of arid habitats: from sand dunes and fixed sands to gravelly foothills, loess soils, clayey semi-deserts and wormwood steppes. Can be found along the riverbank in “tugai” and cliffs, sometimes it appears in gardens and arable lands.

Activity. From the wintering holes, closed with an earthen plug, it appears at the end of March, showing activity only in the afternoon. In May, it appears from night shelters in the morning. By the

middle of summer, it switches to two activity peaks (morning and evening).

Ecology. *Diet*. The food of monitor lizards is diverse: young tortoises, eggs and chicks of birds, rodents (jerboas, gerbils, ground squirrels, voles, mice), hares and hedgehogs, snakes (including poisonous ones), lizards (agamas, lizards), amphibians, freshwater crabs, scorpions, phalanxes and large insects (darkling beetles, for example). *Reproduction*. Mating takes place in May. During the breeding season, the male and female live in pairs in the same burrow. Egg laying begins in June. The clutch contains up to 23 eggs (in young females - 6–15), the development of which lasts about three months. Newborns appear in September - October. It is assumed that they remain to winter in the nesting chamber and leave only in April of the next year. Sexual maturity occurs in the third year of life. *Behaviour*. Monitor lizards have an individual site and a feeding area, which is patrolling, sometimes passing up to 0.5 km. The enemies are large birds of prey and animals. From them, the monitor lizard hides in its own burrows (up to 4 m long, with an extension at the end) or uses the burrows of rodents, birds and tortoises. Runs very fast, reaching speeds of up to 7.2 km / h. When running, it raises the body, slightly spreads its legs and does not touch the ground with its tail. Able to climb trees. In case of danger, inflates the body, hisses, whips its tail, makes throws with an open mouth. The bites are painful, and the saliva is mildly toxic. Mating tournaments of males take place in spring.

Conservation. In the early 1990s the population in Uzbekistan was estimated at 45,000 individuals, while the isolated Fergana population numbered about 200. The number of the species continues to decline due to the destruction of its habitat, death on roads, vandalism of local residents (fried and boiled monitor lizards used in tradition medicine as aphrodisiac). For a long time, the leather of the monitor lizard was used in haberdashery (for the manufacture of belts, handbags and wallets) and the manufacture of shoes. The monitor lizard is included in the Red Book of IUCN, Uzbekistan and other states, in the appendix to the CITES list. Protected in the Nurata, Kyzylkum and Surkhan protected area.

Indian Gamma Snake

Species Name: *Boiga trigonata* (Schneider in Bechstein, 1802)

English Names	Uzbek Name	Russian Name
Indian Gamma Snake, Common Tree (Cat) Snake	Бойга	Индийская черноголовая бойга

Size. This snake reaches a length of almost 1 m, the tail is 12-25% of the body length. Weight - up to 88 g. The head is obtuse in front.

Identifying Features. Boiga is different from other snakes living in Uzbekistan, a specific triangular head shape, which is strongly delimited from the neck, laterally compressed by the body and the presence of a number of expanded scales along the ridge. The vertically elliptical pupil, one-piece of the cloaca plate and smooth dorsal scales with one apical fossa, which distinguishes it from most other serpentine snakes. Moreover 21 (19 - 23) scales around the middle of the body. Three upper labials shield touch the eye.

Colouration. Boiga is painted in yellowish-brown or greyish-olive shades with the light, almost white transverse, oblique patterns along the back. For the Uzbek population black coloration of the entire head including the supralabials plates is the common. The belly is light, with no spots on it.

Distribution and Subspecies. Indian Boiga have a wide distribution in Asia from Sri Lanka, Nepal and India to Pakistan, Afghanistan, East. Iran, Bangladesh, South Turkmenistan, South Uzbekistan and South-East Tajikistan. In the Central Asia countries (Afghanistan and Iran and adjusted countries) recognised a subspecies - *B. t. melanocephala* (Annandale, 1904). This form differs from the nominative by the black head. In Southern Uzbekistan, this species has been observed in the Project area following previous field work which were conducted by international scientific group of herpetologists. During last eight years in Khaudag Ridge were monitored on stabile population of this species. The Khaudag Ridge is the least affected by anthropogenic activity area that is way we should very carefully manage all construction process and do not damage the unique population of rare species.

Preferred habitat. The Indian Boiga lives in clay and sandy deserts with varying degrees of vegetation. This snake can be found in anthropogenic landscape in the villages and on irrigated agriculture territories. In the Central Asian deserts, the Indian Boiga leads mainly terrestrial lifestyle, in India this species (like other representatives of the genus) typically arboreal form.

Activity. After wintering, Boiga normally appear in early March, but some individuals can bask during the day in early February. In summer snakes come out to the surface only at night. Large eyes indicate their fitness to orientation in space with a lack of light. In addition, Boiga is also demanding humidity, and therefore in the warmest time of the day it avoids leaving shelters (rodent burrows, voids between stones, etc.), where the temperature is significantly lower, and humidity is noticeably higher than in air above ground. Sometimes Boiga even during a few hot days or cold nights does not get out of the shelters.

Ecology. *Diet*. Boiga feeds mainly on lizards, less on rodents, small birds and snakes, sometimes feasts on bird eggs in the nests. *Behaviour*. Boiga readily climbs trees and spreading bushes of *Halaxilon Tamarix* and *Kandym*. Its high manoeuvrability of movement is facilitated by flattened from the sides, called belt-like, body shape. Boiga defends itself from enemies with a characteristic pose by curling up in a spiral, hisses,

sways and shakes the head. From this position, the Boiga makes long attacks in the direction of the enemy. Boiga is a venomous snake belonging to the posterior-furrowed type poisonous apparatus: poisonous teeth are located on the upper jaw in the back of the mouth. Poison possesses a neurotoxic effect, but only poses a serious danger to small mammals. *Reproduction*. Boiga's mate in May and lay eggs in July. The clutch contains from 3 to 11 eggs with an average size of 1.7 × 4.0 cm. Newborns snakes reach 24.0–26.5 cm in length and 6 g in weight.

Conservation. Indian Boiga in many places of the range is characterized by low population density, in connection with that this species included in the Red Data Books of Uzbekistan and Turkmenistan.

Afghan Awl-headed Snake

Species Name: *Lytorhynchus ridgewayi* Boulenger, 1887

English Names	Uzbek Name	Russian Name
Afghan Awl-headed Snake, Derafshi Snake	Afғgon litorinhi	Афганский литоринх

Size. *Lytorhynchus* is small sized snakes reaches 40 cm, while the tail is 6-8 times shorter of the body. The head is weakly delimited from the body. The tip of the rostrum is pointed, protrudes beyond the level of mouth.

Identifying Features. The most characteristic feature of the Afghan *Lytorhynchus* is a head pattern and a prominent pointed part above the mouth due to a thickened intermaxillary shield turned upward, which indicates burrowing lifestyle of this species. The body is covered by smooth scales with a single apical pore. This snake has 19 scales around the middle of the body, the cloacal plate is divided into two parts. The nostrils look like slanting slits. The pupil is vertically elliptical or rounded.

Colouration. The dorsal patterns of this species is sandy of brown shades. On the back stretches 35–45 (along the tail - 10–14) transverse brownish oval spots bordered with white, a light narrow strip runs along the ridge, and along sides - one row of

rounded whitish spots, staggered in relation to the dorsal.

Distribution and Subspecies. The *Lytorhynchus* lives not only in the West. Afghanistan, but also in East Iran and Southwest Pakistan. As well this species known from Turkmenistan and Uzbekistan. Occurs in the foothills of the Kopetdag (from the Messerian plateau to the tract Karrybent, 22 km southeast of Tejen), penetrating into the Karakum Desert (up to the village of Serny Zavod), and to the southeast to the village. Kushka, lake Chaskak and the interfluve of the Syr Darya - Amu Darya (low Bukantau and Aytymtau). Subspecies are not distinguished.

Preferred habitat. Inhabits the Awl-headed Snake in dry foothills, sandy and compacted (takyr-like and loamy) deserts and semi-deserts with rare hodgepodge and wormwood, but even in fine sands, he chooses areas like cemented soil with an admixture of loess. In the mountains rises to a height of 2000 m a. s. l. *Lytorhynchus* was often found in termite mounds of the Trans-Caspian termites, along the paths of which it can penetrate deep into the soil.

Activity. Leads a twilight-nocturnal lifestyle, hiding in the cracks of the soil during the day, burrows of lizards and rodents, and only in the spring crawls out into the sun after rains. This species leaves wintering shelters already at the end of February and goes to winter in early November.

Ecology. *Diet*. The Awl-headed Snake feeds almost on lizards (saurophage). Its diet includes both daytime (roundheads, steppe agamas), and nocturnal (geckos) species of lizards, sometimes insects. *Reproduction*. In the second half of June, females lay 3 – 4 eggs 1.0 × 3.5 cm in size. The growing individuals reach sexual maturity at a length of 30 cm. *Behaviour*. *Lytorhynchus* digging his own burrows using head movements. In case of danger, it hides in termite mounds or hides and becomes invisible due to the colour.

Conservation. In general, the biology of this species is poorly studied, and the population density of this species difficult for estimating. Therefore, the Awl-headed Snake was included in the Red Data Books of Uzbekistan and Turkmenistan.

Historical note. The Afghan *Lytorhynchus* was described from specimens from Afghanistan and named after British Army Lieutenant Colonel Joseph West Ridgway (1844-1930), who visited Kabul in 1886 with a commission of the Ministry of Foreign Affairs to participate in negotiations on the establishment of the Russian-Afghan border, named by historians The "Ridgway line". Ridgway was later governor of Ceylon. The collector of standard (reference) samples of the Afghan *Lytorhynchus* were a Scottish botanist and doctor of this Commission James Edward Tierney Aitchison (1836–1898).

Northern Wolf Snake

Species Name: *Lycodon striatus* (Shaw, 1802)

English Names	Uzbek Name	Russian Name
Northern (Barred) Wolf Snake	Kundalang yully british	Поперечнополосатый волкозуб

Size. A rather slender small snake, rarely reaching a length of 45 cm, tail 9–15 cm. The head is almost not separated from the body by the cervical interception and slightly flattened. The tip of the head is bluntly rounded.

Identifying Features. The *Lycodon striatus* differs well from all other snakes of Uzbekistan by 17 rows of scales around the body and a character of dorsal pattern. Besides, this species is characterized by a rounded-vertical pupil and small size. Scales on the backs are smooth. The frontal scutellum is wide (twice the width supraorbital plates along the line between the centres of the eyes). The intermaxillar shield from above is almost no noticeable. The anal plate is bifurcated. The maxilla is strongly curved in the middle, and the bend divides the dentition with a toothless gap (diastema) into two, in each of which the last two teeth are noticeably larger than the previous ones.

Colouration. The head of *Lycodon striatus* from above (like the rest of the body) is black or brown. A series of white or yellow runs along the middle of the back (usually males) and dark transverse spots (stripes), and on the sides of the body - a longitudinal row of light spots formed by light edges of the scales. Gaps between light transverse bands decrease in towards the tail. Light scales have a dark strip along the midline or a dark speck at the top. Belly and supralabials light (white or yellow).

Distribution and Subspecies. This wide distributed species known from Central and East Asia. It is found in E and N-E Iran, Afghanistan, Pakistan, N-W India, Sri Lanka, South Turkmenistan, Uzbekistan and West Tajikistan. In Uzbekistan know form Tashkent and Surkhandarya Provinces. *Lycodon striatus bicolor* (Nikolsky, 1903) is extremely rare subspecies in this region. From the nominative subspecies it differs by a larger number of abdominal and subcaudal scales. Another subspecies is endemic of Sri Lanka.

Preferred Habitat. *Lycodon striatus* usually occurs in foothills (clay, loess and gravelly) deserts, but is

also found in mountains, in areas with semi-desert vegetation, in steppe places in intermountain and interhill depressions, on stony slopes and among riparian thickets in floodplains rivers. In the mountains rises to a height of 1800 m. a.s.l. Sometimes can be find among the complex juniper forests with steppe vegetation, interspersed with mountain gardens.

Activity. This species is a rather thermophilic, from wintering appears late (later than many other snakes). The earliest find belongs to the first dates of April. He spends the day in cracks in the soil, holes of rodents, under stones. Biology is very poorly studied. Twilight or nocturnal activity but mid-summer may come across in the early morning.

Ecology. *Diet*. The diet is dominated by lizards. Among others the components of the food spectrum are probably arthropods. *Reproduction*. Mating in this species is expected in April - May, and oviposition in June - July. Clutch consists of 2–5 white eggs, 9–10 × 26–39 mm. The incubation probably lasts about a month.

Conservation. This rare snake leads a secretive lifestyle, and over 100 years of study herpetofauna Central Asia is known for a little more than 40 exemplars. Some of these finds – road killed specimens crushed by cars on dusty country roads. As a rare species with a low abundance, *Lycodon striatus* was included in Red books of Turkmenistan and Uzbekistan. The limiting factors are land development (ploughing, hayfields, partly grazing).

Tatar Sand Boa

Species Name: *Eryx tataricus* (Lichtenstein, 1823)

English Names	Uzbek Name	Russian Name
Tatar Sand Boa	Sharq bŭғma iloni	восточный удавчик

Size. The females of the eastern boa reach a length of just over 1 m (a blunt and rounded tail makes up 6% of the entire body). Males are somewhat smaller; with a maximum body length of 95 cm (tail occupies 7.4–8.5% of the body).

Identifying Features. The boa constrictors differ from all other snakes in the width of the abdominal plates (they do not cover the entire width of the belly). In addition, the top and bottom of the head of the boa constrictor are covered with small scales. The anal plate is divided into three sections. The eastern one differs from the sandy boa in the location of the eyes on the side of the head. The interorbital distance is approximately equal to or greater than the distance from the edge of the eye to the corner of the mouth, and behind the internasal scutes there are usually 1 to 2 (in *E. t. vittatus*) or 3 to 4 (in *E. t. tataricus*) rows differing in size from subsequent ones (interorbital) scales.

Colouration. The colour of the boa on top has brown tones of different shades (from yellowish and reddish to grey). Along the back there is a row of blackish irregular spots, sometimes merging into a zigzag line, and on the sides, there are dark specks and specks. The lower part of the body is light, often with merging dark spots. Melanists are extremely rare.

Distribution and Subspecies. Eastern boa lives in Kazakhstan, Sred. and Center. Asia (Kyrgyzstan, Tajikistan, Uzbekistan, East. Turkmenistan, Afghanistan, North. Iran, West. Pakistan, West. China and South. Mongolia), as well as in North-West. India. The main part of the area in Uzbekistan is occupied by the nominative subspecies, but *E. t. vittatus* lives in the Gissar valley (within the limits of South-East Uzbekistan and South-West Tajikistan), although some experts consider it an independent species.

Preferred Habitat. It inhabits different types of arid territories: from clay and loess deserts to dune sands (if there is no sandy boa), stony-gravelly foothills and even steppes and tugai. Comes across gardens and orchards. Along the edges of pistachio forests, it occurs in the mountains up to an altitude of 1800 m above sea level.

Activity. The active season lasts almost nine months, in Kazakhstan and Mongolia - about five months. In spring in Uzbekistan, it appears in March - April, and leaves for wintering in September - October. At the beginning of the season, the activity is common on the surface in the daytime, closer to summer (sometimes even from the beginning of May) it passes to a two-peaked peak of activity: early morning and night. In mid-August, *E. t. vittatus* returns to daytime activity. It may not leave the burrow for several days.

Ecology. *Diet*. The eastern boa constrictor feeds on lizards (from daytime foot-mouths and roundheads to night skink geckos) and rodents (house mice, voles, gerbils, jerboas, mole voles, grey hamsters, ground squirrels), even finding them in burrows, or small birds (house sparrows) and insects (darkling beetles). Young individuals feed mainly on small lizards and insects - Orthoptera and beetles. *Reproduction*. The birth of offspring occurs in the middle of summer or closer to autumn. One female can have from 6 to 34 cubs. New-born boa constrictors reach a length of 20 cm. *Behaviour*. Living in sands or loose loess, it readily digs into the ground, moving in it quickly. It is capable of burrowing into loose loess to a depth of 2.5 m, but does not dig its holes, but more often hides in the holes of tortoises, rodents and lizards, where it hibernates, choosing deeper shelters. *Comments*. The Latin specific epithet indicates a historical area, which in the old sense corresponded to the regions of the Middle and Central Asia, but not the Russian republic.

Conservation. In nature, boa constrictors fall prey to monitor lizards and other predators. Many boa constrictors are caught by reptile collectors. In a number of places, the natural habitats of boa constrictors are being reduced in connection with human economic activities. As a result, this species is included in the CITES list of protected species.

TERMS OF REFERENCE

Objective: To Address Data Gaps and Data Analysis of Bird Impacts by the Sherabad IPP Solar PV Project

Background.

1. The Sherabad IPP Project has been proposed in southern Uzbekistan, comprising a Solar PV site, covering approx. 600 ha in the Karakyr Uplands, and a 220 kV transmission line of 52 km that will follow an existing 110 kV line across agrolandscapes, the Karasu River, and Khaudag Ridge in the east. The Project aims to align with the Asian Development Bank (ADB) Safeguard Policy Statement (SPS) 2009 and the IFC Performance Standards (PS6).

2. A Project Ecological Area of Analysis (EAA) was established for compiling the environmental baseline and critical habitat assessment, based on a 50 km radius around the proposed solar project site and proposed transmission line.

3. A field visit to the project site and transmission line alignment was conducted by Anna Ten (team leader), Timur Abduraupov, Natalya Beshko and Valentin Soldatov between 6 and 13 March 2020, and timed to coincide with the northward bird migration. An Ecological Survey Report was compiled following the field visit and serves as a baseline.

4. Observations of bird flight movements were made during the field survey. Data collected include date, location, bird species, flock size, flight altitude, direction and type of flight (migratory movements, foraging, daily movements or unspecified). Number of observations was 64 recorded from 11 different locations over a total period of six days, representing 1,751 individual birds and 27 bird species.

5. A Critical Habitat Assessment (CHA) was conducted, which found that endangered bird species do occur, but none of the species met the threshold requirements for critical habitat. The CHA report presents a basic analysis of the flight data, highlighting an important data gap where the transmission line crosses the Karusu River, but there were insufficient observations along the transmission line route to provide confidence on the levels of mitigation required.

6. Mitigation options were presented in the CHA report, which has been reviewed by the design engineers. However, the CHA report (paragraph 84) recommends that further surveys of bird flight patterns are conducted to address data gaps, to provide a higher standard of data analysis and get inputs from an ornithologist experienced in this kind of assessment.

Actions Required.

7. Further fieldwork is required to conduct vantage point surveys along the transmission line route. Key points to be assessed include the Karusu River crossing, the Solar PV site within the Karakyr Uplands and along the Khaudag Ridge. Field surveys are recommended to include bird carcass searches along the existing 110 kV line.

Procedures Required.

8. Planning of the field survey needs to incorporate inputs from the data analyst, who will guide the field team on the type of data to be collected and highlight key locations for vantage point surveys to be representative of the full transmission line route.

9. The field survey is recommended to cover 32 person days of data collection, which can be most efficiently achieved with a four-person team for 8 days. One week is recommended for data analysis and review of mitigation. These recommendations are presented in Table 1 with proposed rates provided in Table 2.

10. Field surveys are most productive during the migration period, when observations can be made for both migratory and resident bird populations. The northward bird migration takes place during March/April and the southward migration takes place during August/September.

Table 1 Recommended days for the field survey, data analysis and reporting

Study Component	Field Team (4 persons)	Data Analyst (1 person)
Preparation	1	0.5
Field survey	8	
Field report	4	
Data Analysis		3
Reporting		2

Table 2 Recommended rates for the various staff levels required for to conduct the survey

Position	Number of persons	Proposed Daily Rates
Field team lead	1	$200.00 to $500.00
Field assistants	3	$80.00 to $250.00
Data Analyst	1	$350.00 to $700.00