



**Oyu Tolgoi LLC**

Health, Safety and Environment

Biodiversity Monitoring and Evaluation Plan (BMEP)

<b>Biodiversity Monitoring and Evaluation Plan</b>		
Effective Date: 2015.12.01	Document Number: OT-10-E14-PLN-0006-E	Version: 1.0

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## 1. INTRODUCTION

The purpose of this Biodiversity Monitoring and Evaluation Programme (BMEP) is to define the scope, methods, and response for monitoring of priority species and habitats, based on those identified in the ESIA. It is a living document that will be periodically reviewed and updated based on the following key drivers:

- monitoring results and increased knowledge;
- revision of the actions and desired outcomes in the Offsets Management Plan (OMP); and
- accumulation of data on the scale of natural variation in biodiversity features (leading to changes of existing or new adaptive management thresholds).

Detailed monitoring methods are included as appendices and will form the basis of Standardized Work Procedures that are designed to capture institutional memory and to enable newcomers to reproduce the methods required for comparable and consistent long-term monitoring results.

## 2. OBJECTIVES

The objectives of the BMEP are to:

- assess impacts (positive and negative) of operational activities and the effectiveness of mitigation (including rehabilitation and offset) actions in order to allow for adaptive management;
- demonstrate that the project is on track for and, in the longer-term, results in a Net Positive Impact (NPI) on priority biodiversity features;; and
- evaluate experimental management options within a scientific framework.

Monitoring includes measurement of:

- biodiversity losses from Oyu Tolgoi (OT) activities;
- effectiveness of mitigation; and
- gains from offset activities over a long period of time.

Measurement of actual gains will be compared against actual losses to demonstrate progress towards achieving the aspired outcomes for priority biodiversity, i.e. to track progress toward the NPI target and update the NPI forecast. The NPI target for each priority biodiversity feature is a feature-specific equation demonstrating precautionarily that gains > losses (as detailed in the NPI forecast). Measures of gains and losses are all captured in this BMEP.

This document brings together all strands of biodiversity monitoring so that they form an integrated programme. This is based on a “state-pressure-response” framework.

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### 3. ROLES AND RESPONSIBILITIES

The OT Biodiversity Team (including flora, fauna, and rehabilitation expertise) is responsible for implementation of the BMEP, including developing and managing contracts and work plans with biodiversity science and conservation organizations with appropriate technical expertise to fulfil the BMEP requirements and timelines. Annual work plans will include:

- detailed time scheduling of monitoring fieldwork;
- project staffing;
- staff roles and responsibilities;
- equipment procurement and maintenance;
- analysis and technical planning;
- reporting schedules; and
- training and capacity-building plans.

The BMEP will be used to guide both the OT Biodiversity Team's higher-level planning (to ensure that all relevant biodiversity values are monitored adequately) and their day-to-day planning. The BMEP will collect a number of indicators to be used for Ecosystem Services monitoring. Additional indicators will be collected by the Social Performance Team, who will manage Ecosystem Services monitoring (including analysis, evaluation, and reporting) as detailed in the Ecosystem Services Monitoring Plan.

The OT Specialist Fauna is responsible for overall implementation of the BMEP and for coordinating management responses if/when thresholds are exceeded or opposite trends are observed. Although some management responses will require coordination amongst various OT departments, the Specialist Fauna will be responsible for coordination of response implementation.

#### 3.1. Key Interfaces

Key internal interfaces in the implementation of this plan (i.e., roles with responsibility for delivering elements of this BMEP) include:

- water team (water monitoring results);
- environment team (air and dust monitoring results);
- social performance team (community-related monitoring results);
- security team (illegal plant and wildlife inspection results);
- transportation team (off-site transport/vehicle monitoring results);
- training team (conducting biodiversity and environment training with employees and contractors); and
- ecosystem services working group.

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Key external interfaces in the implementation of this plan (i.e., roles with responsibility for directing elements of this BMEP) include:

- Ministry of Environment, Green Development and Tourism;
- Ministry of Transportation;
- Wildlife Science and Conservation Center;
- Wildlife Conservation Society; and
- Tri Partite Council (TPC).

#### **4. BACKGROUND ON BIODIVERSITY REGULATIONS AND NPI GOALS**

Oyu Tolgoi aims to ensure that the biodiversity of the southern Gobi region ultimately benefits from the project's presence. In keeping with the Rio Tinto corporate Biodiversity Strategy, OT follows the 'mitigation hierarchy' for minimizing negative impacts to biodiversity and its goal is to have a net positive impact on the biodiversity of the southern Gobi region. Oyu Tolgoi aims, consistent with Rio Tinto strategy, to reach this goal by the time of mine closure, however OT will seek opportunities to achieve NPI as early as practicable in the project life. OT aims to achieve a steady progress towards NPI over the duration of the mine. OT's annual progress reports will tabulate or plot the quantitative progress over time of relevant indicators, enabling a transparent assessment of their trajectory towards NPI.

In addition, OT must comply with a set of environmental regulations and requirements from (see Figure 1):

- 1) the Government of Mongolia;
- 2) a group of international lenders who are financing development of the underground phase of the mine, including the International Finance Corporation (IFC) and the European Bank for Reconstruction and Development (EBRD), who require compliance with specific performance standards; and
- 3) other stakeholders, including Rio Tinto.

##### **4.1. Overlaps with other Management Plans**

This Management Plan is one of a suite of documents that collectively outline Oyu Tolgoi's approach to managing biodiversity risk (see Figure 1). The ESIA Appendix 1: Oyu Tolgoi LLC Biodiversity Strategy continues to accurately outline OT's overall approach to biodiversity management. Underneath this, the following documents will be periodically updated, to reflect changes in knowledge and adaptive management:

- Oyu Tolgoi LLC Biodiversity Management Plan (BMP) - details how OT has followed Rio Tinto's approach to biodiversity action planning. It identifies priority biodiversity for the project, and assesses project risks to this

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biodiversity. It then outlines mitigation of critical and high risk project impacts to this biodiversity through avoidance and minimisation;

- Oyu Tolgoi LLC Land Disturbance Control and Rehabilitation Management Plan (LDCRMP) – addresses, in more detail, mitigation of project land disturbance impacts on priority biodiversity, with a focus on rehabilitation;
- Oyu Tolgoi LLC Offsets Management Plan (OMP) - outlines the programme of biodiversity offset projects designed to address significant residual impacts after mitigation outlined in the BMP & LDCRMP;
- Oyu Tolgoi LLC Net Positive Impact forecast (NPI forecast) - calculates predicted residual biodiversity losses from critical and high risk impacts (after avoidance and minimisation), calculates projected gains from rehabilitation and offsets, and compares losses against gains to predict if and when OT expects to reach no net loss/net positive impact goals for priority biodiversity; and
- Oyu Tolgoi LLC Biodiversity Monitoring and Evaluation Plan (BMEP; this plan) - details monitoring to assess the state of priority biodiversity in the southern Gobi, project-related impacts/pressures, and project response at all steps of the mitigation hierarchy. As such, monitoring informs the NPI forecast, clarifies whether the project remains on track to achieve NPI within its stated timeframe, and provides feedback for adaptive management of the BMP, LDCRMP and OMP.

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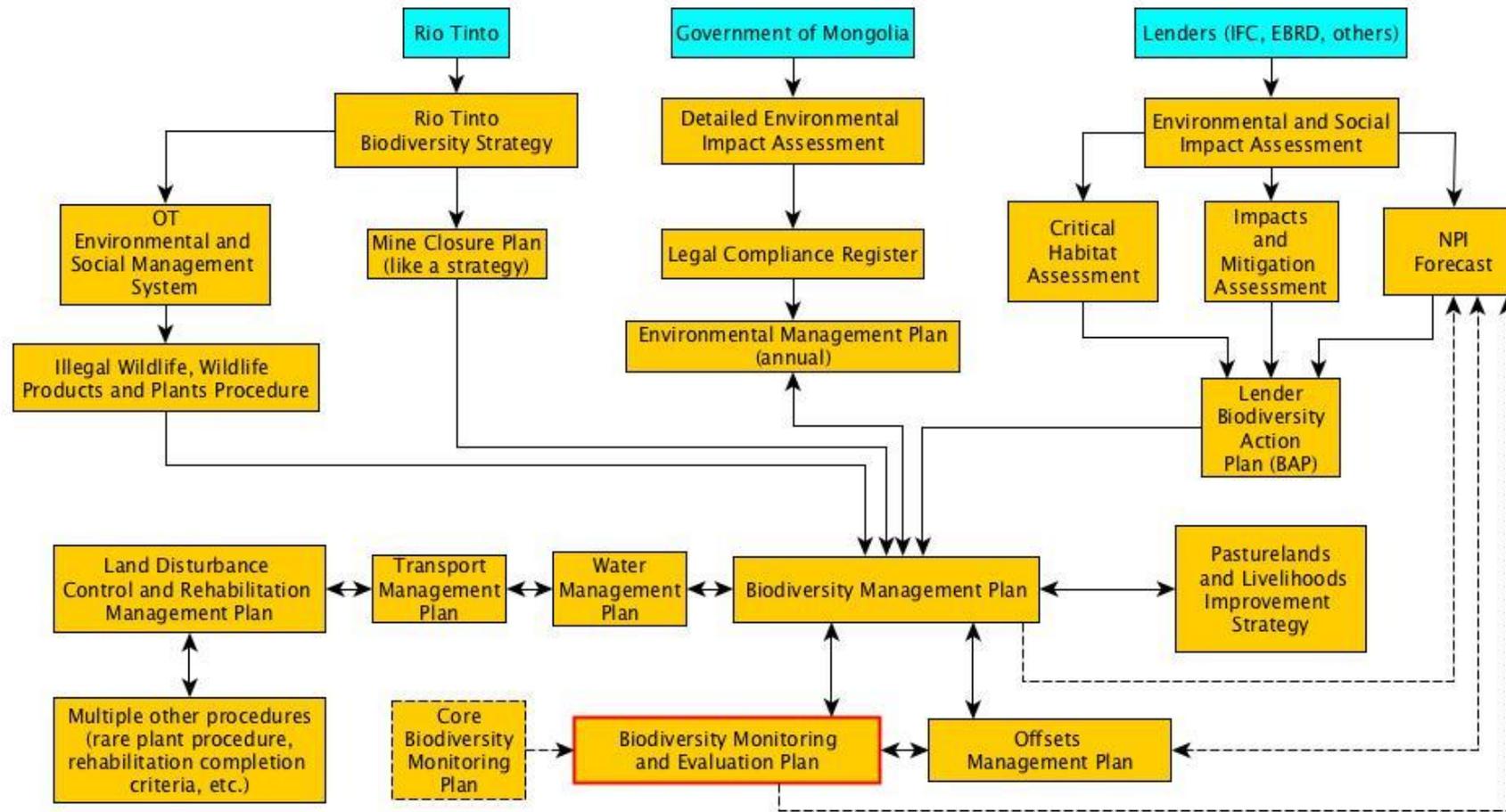


Figure 1. Relationships between the OT documents that relate to biodiversity monitoring.

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**5. BIODIVERSITY MONITORING COMPLETED UP TO 2015**

To support OT’s commitments to managing biodiversity and to fill gaps in baseline data, OT has continuously monitored biodiversity since 2012. This included a two-year Core Biodiversity Monitoring Plan (CBMP) in 2013 and 2014 which aimed to test methods and consolidate baselines, including understanding the natural variation in high-priority biodiversity features. The CBMP included 37 different monitoring methods which between them measured 27 pressure indicators, 18 state indicators and 16 response indicators. Some methods, such as the aerial and ground-based ungulate surveys, were extremely complex operations. This monitoring is summarized in the 2012, 2013, and 2014 annual reports by OT, and the CBMP contractors.

In line with adaptive management principles, two assessment exercises have also been completed:

- 1) Gap Analysis (2013) - OT, Wildlife Conservation Society (WCS), Sustainability East Asia, and Global Biodiversity Consultancy (GBC) completed a gap analysis to assess the completeness of the CBMP. The exercise checked whether indicators were selected for each significant positive and negative impact predicted by OT (based on the OT ESIA Appendix 3) on each Critical Habitat-qualifying biodiversity feature, plus Natural Habitats and houbara bustard.
- 2) Method and indicator evaluation (2015) - Prior to the close of the two-year pilot CBMP, OT, WCS, GBC and other partners evaluated the monitoring methods that had been tested in the CBMP. Methods were evaluated on a range of criteria including cost, risk of failure, soundness of assumptions, statistical power, practical management value, and usefulness for adaptive management. Many of these criteria involved real-world trade-offs. Individual indicators were evaluated on accuracy, precision, sensitivity and sample size. The result of the evaluation was a list of the monitoring methods that would be used in the next 5-year phase of monitoring and are included in this programme.

**6. MONITORING SCOPE**

This Biodiversity Monitoring and Evaluation Plan is designed to support OT reach its NPI goals by monitoring OT activities and natural responses on both the positive and negative sides of the NPI balance sheet.

**6.1. Monitoring timeline**

OT’s biodiversity monitoring program will continue until mine closure (currently estimated to occur in 2055). The scope of biodiversity monitoring is likely to remain fairly stable for most habitats and species, while it is expected that some methods will

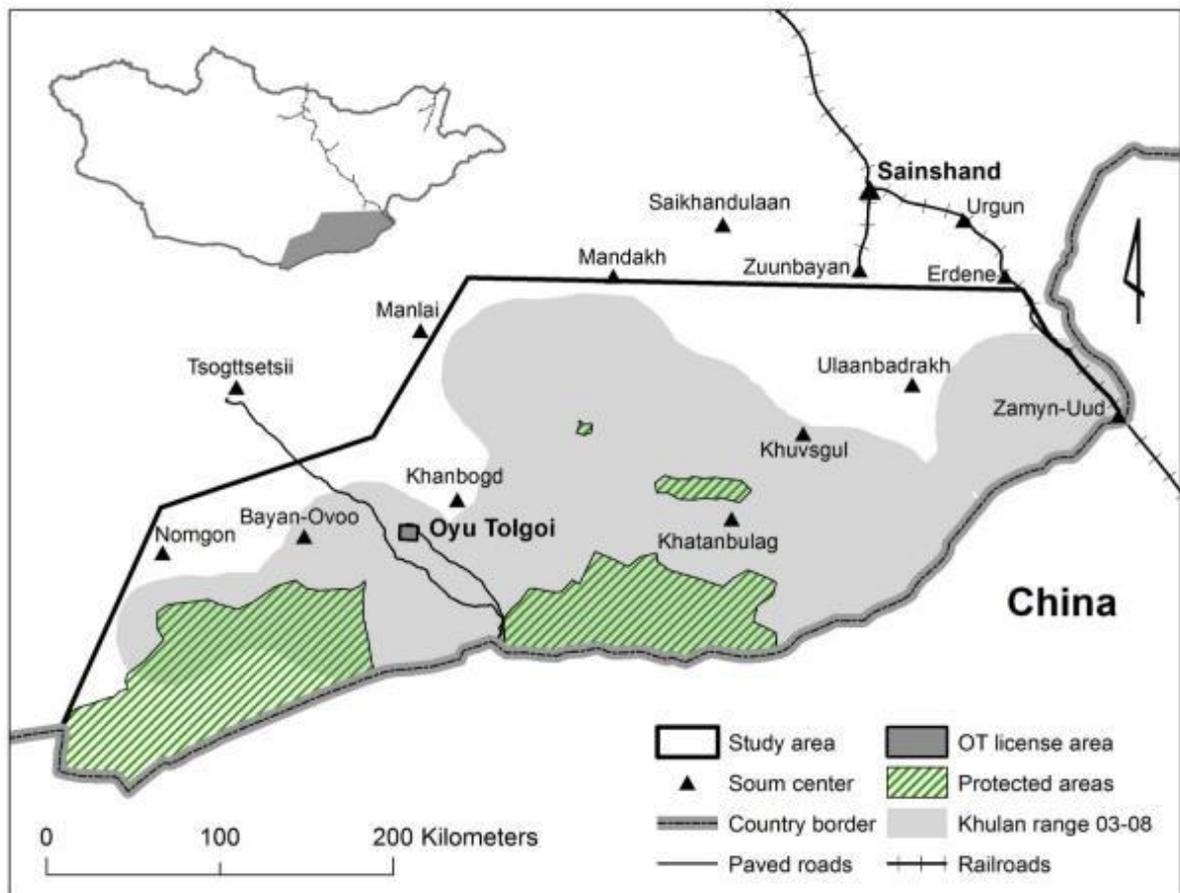
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be added, changed, or dropped over time to accommodate adaptive management priorities.

**6.2. Monitoring Scope - Geographic**

A range of different geographic scales are required and included in this programme given the diverse set of research questions that guide the monitoring. Some biodiversity features can be monitored over a fine-scale in the immediate vicinity of OT, whereas large-scale monitoring across the southern Gobi region is needed for other features. For example, the success of OT’s efforts to improve the quality (or condition) of Natural Habitat must be monitored at the landscape-scale so that the effects of numerous confounding factors (notably rainfall) can be better understood. As another example, OT has been surveying khulan across the whole range of the south-east Gobi khulan population (Figure 2)

**Figure 2:** Example monitoring area: ground-based ungulate survey area.



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### 6.3. Monitoring Scope - Indicator Types

Three monitoring indicator types are used in this programme:

- the state of species, populations, and other natural resources;
- the human pressure (including that from Oyu Tolgoi) on these biodiversity features; and
- OT's management response to those pressures.

### 6.4. Monitoring Scope – Habitats and Species

The BMEP is monitoring a suite of habitats and species as defined in Annex 1 of the BMP and listed below in Table 2. This includes all natural habitat (rangeland), Critical Habitat-qualifying features and other priority biodiversity features identified by Oyu Tolgoi stakeholders.

## 7. ADAPTIVE MANAGEMENT APPROACH TO BIODIVERSITY

OT uses an adaptive management approach towards biodiversity. OT acknowledges that knowledge of biodiversity will always be incomplete, and the system itself is a moving target, because of the impacts of management and external human influences.

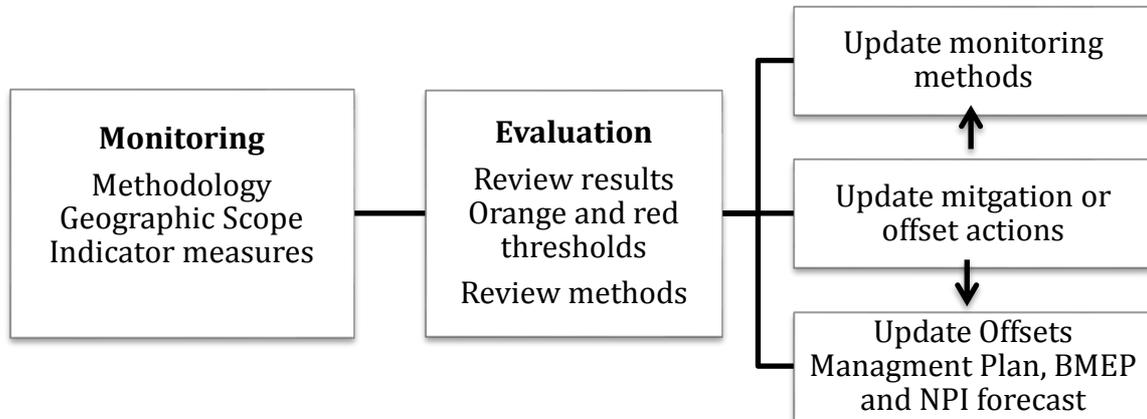
One of the aims of adaptive management, in the context of this plan, is to quickly and flexibly respond to negative changes in the status of a priority feature, and to experiment with solutions in an intelligent framework that makes it possible to learn quickly from successes and mistakes. Key principles include:

- Active adaptive management requires that management actions are designed as experiments, that they occur in a well-designed monitoring framework in which the results can be quantitatively evaluated, and that actions which improve learning are valued over those which do not; and
- Management policies should be chosen in light of the assumptions they test, so that the most important uncertainties are tested rigorously and early.

Based on monitoring activities and analysis, OT will apply an adaptive management approach (Figure 3).

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**Figure 3.** Interrelationship of activities and documents impacted by adaptive management



OT will regularly review the monitoring program and will modify monitoring methods and other components of the biodiversity approach as needed, always with the goals of measuring progress towards NPI and serving the needs of adaptive management (Table 1).

**Table 1.** Types of review that the components of the monitoring plan will undergo, and the frequency undertaken.

Review activity	Frequency
Compare monitoring data with indicator thresholds (see below).	Within one month of collation of new data. This will be annual for most methods.
Evaluate methods and indicators and adjust methods as necessary.	Once per year, before the field season.
Adaptive review of BMEP	Once per year, following review of methods and NPI forecast*
Compare data to NPI forecast and adjust forecast if necessary.	Once per year, following the field season.
Fully revise NPI forecast.	Every five years.
Review adaptive management thresholds and revise as necessary.	Once per year, following the field season.
Review adaptive management actions or experiments and revise management as necessary.	At a minimum, once per year. Additional review may be required if there is evidence that approaches are failing (e.g., indicator thresholds are crossed) or that there is an opportunity for a major improvement.

\*the annual report to the lenders will comprise both reporting on the results and reporting on any updates to indicators, methods, and thresholds as they are developed based on the new data collected (form of reporting still to be agreed by OT and lenders)

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## 8. MONITORING PLAN

This section summarizes the current biodiversity monitoring (Table 2). This plan is documented with the explicit intention that it will be periodically adapted and updated based on monitoring results and other inputs (see Table 1).

Detailed monitoring methods are included as appendices and will form the basis of Standardized Work Procedures (SWP) that describes detailed step-by-step procedures for each method.

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**Table 2.** Summary of indicators for priority biodiversity (further details included in Appendix)

Biodiversity	Pressure State or Response? OMP KPI?	Indicator (refer to appendices for details)	NPI target (over 25-year NPI timeframe)	Orange threshold	Red threshold
<b>1. Critical Habitat qualifying features</b>					
<b>1a. Predicted critical risk from OT impacts</b>					
Asiatic wild ass (khulan) and Goitered gazelle	Pressure (= OMP-KPI-1)	Carcass density within the anti-poaching offset landscape (from line transects)	18% reduction in new carcasses (from 2015 baseline)	Any inter-annual increase, or <30% reduction over ten years	No decrease in carcasses over any 5 years
	Pressure / Response (= OMP-KPI-3)	Avoidance of infrastructure	8.5% reduction where anti-poaching work is implemented	To be set when baseline data are available	To be set when baseline data are available
	Pressure	Number of crossings of OT-GS road (by GPS collared individuals)	Any animal crossing/year (from 20 collared Asiatic wild ass) Any animal crossing/year (from 10 collared goitered gazelle)	<5 animal crossings/year (from 20 collared Asiatic wild ass) <5 animal crossings/year (from 10 collared goitered gazelle)	<1 animal crossing/year (from 20 collared Asiatic wild ass) <1 animal crossing/year (from 10 collared goitered gazelle)
	Pressure	Number of confirmed incidents of illegal hunting, collecting or possession (from enforcement teams)	Detectable reduction per unit effort (from 2015-2016 baseline)	To be set when baseline data are available	To be set when baseline data are available
	Pressure	Number of OT inspections finding illegal wildlife products	n/a	Any inspection finding any listed priority	>1 inspection finding any listed priority

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			mammal or bird species	mammal or bird species
Pressure	Household, community and market surveys (indicators under review)	To be set when indicators are finalised	To be set when baseline data are available	To be set when baseline data are available
Pressure	Number of wildlife collisions with OT and contractor vehicles	n/a	Any collisions	>1 Asiatic Wild Ass collisions/quarter >4 Goitered Gazelle collisions/quarter
Pressure	Number of OT vehicle transgressions (speeding, driving and parking off-road)	n/a	To be set when baseline data are available	To be set when baseline data are available
Pressure	Traffic volume and number of speeding vehicles on OT-GS road	n/a	To be set when baseline data are available	To be set when baseline data are available
State (= OMP-KPI-2)	Population over approx. 100,000 km <sup>2</sup> (from line transects)	Detectable increase (p<0.2; from 2013-2015 baseline)	>10% mean decline over 3 years	>30% mean decline over 3 years
State	Population over approx. 100,000 km <sup>2</sup> (from aerial photography) every 5 years	Detectable increase (from 2013 baseline)	>10% mean decline over 3 surveys (approx. 15 years)	>30% mean decline over 3 surveys (approx. 15 years)
State (= OMP-KPI-5)	Extent of Occurrence of Asiatic wild ass in the southern Gobi	Expanded range includes 5,000 km <sup>2</sup> of suitable habitat east of the UB-Beijing railway	No expansion east of railway within 12 months of pilot fence removal	No expansion east of railway within 2 years of full fence removal
Response (= OMP-KPI-6)	Total number of detected crossings of UB-Beijing railway	>10 crossings of both species per month	<5 crossings of both species per year within 12 months of pilot fence removal	No crossings within 2 years of full fence removal

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	Response	% staff/contractors trained (in driver awareness)	100%	80%	60%
	Response	Number of person-days MATs and MAPUs on patrol	n/a	To be set when baseline data are available	To be set when baseline data are available
	Response	Progress with implementation of regional plan	n/a	To be set when baseline data are available	To be set when baseline data are available
<b>b. Predicted high risk from OT impacts</b>					
<i>Amygdalus mongolica, Cistanche lanzhouensis, Spongicarpella grubovii, Zygophyllum potaninii</i>	Pressure	Number of individuals lost under OT associated infrastructure	To be set when LDC&RMP is finalised	To be set when LDC&RMP is finalised	To be set when LDC&RMP is finalised
	State	Number of individuals (across established rangeland monitoring sites)	No decline attributable to OT (from baseline or compared to controls)	To be set when baseline data are available	To be set when baseline data are available
	Response	Number of individuals in rehabilitated rangeland (indicators under review)	To be set when indicators are finalised	To be set when baseline data are available	To be set when baseline data are available
<b>1b. Predicted low / moderate risk from OT impacts</b>					
Granite outcrop floral communities		(Pressure and state indicators under review)	To be set when indicators are finalised	To be set when baseline data are available	To be set when baseline data are available
Short-toed snake-eagle	Pressure	Number of electrocution carcasses found under power infrastructure	Zero electrocution carcasses	Any electrocution carcasses	>1 electrocution carcasses / year
	Pressure	Number of collision carcasses found under power lines	Zero collision carcasses	Any collision carcasses	>1 collision carcasses / year
	State	Number of active nests in Khanbogd survey area	No decline (from 2013-2015 baseline)	To be set when baseline data are available	To be set when baseline data are available
	Response	% bird flight diverters along OT powerline infrastructure	n/a	n/a	n/a

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		malfunctioning / missing			
	Response	% targeted power line poles, dead-ends, sub-stations and pylons with installed and maintained insulation	100%	90%	70%
	Response (= OMP-KPI-8)	Kilometers of non-OT power line with insulation installed	To be set as part of the feasibility study	To be set as part of the feasibility study	To be set as part of the feasibility study
<b>2. Other stakeholder priority features</b>					
<b>2a. Predicted high risk from OT impacts</b>					
Houbara bustard	Pressure	Number of collision carcasses (before applying correction factors) found under power lines	≤4 collision carcasses / year	>4 collision carcasses / year	>6 collision carcasses / year
	Pressure	Number of construction and maintenance activities in the Galba Gobi IBA during the bustard lekking season	n/a	Any activity	>1 activity in same area in same year
	Pressure	Number of wildlife collisions with OT and contractor vehicles	n/a	Any bustard collisions	>1 bustard collisions/year
	Pressure	Number of ravens at the Waste Management Center	n/a	To be set when baseline data are available	To be set when baseline data are available
	Pressure	Number of active raven nests in Khanbogd survey area	n/a	To be set when baseline data are available	To be set when baseline data are available
	State	<i>Based on results of monitoring pressure, annually review the periodicity and methods for monitoring population density</i>			
	Response	% bird flight diverters along all OT related powerline infrastructure malfunctioning / missing	n/a	n/a	n/a
	Response (= OMP-KPI-7)	Kilometers of non-OT powerline built in Mongolia following a new national standard	To be set when the powerline standard is agreed	To be set when the powerline standard is agreed	To be set when the powerline standard is agreed
Other priority plants		Potential impacts from loss and degradation of rangeland habitat: same methods as Critical Habitat-qualifying priority plants			

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		(above); and potential impacts from over-harvesting: same methods as tall saxaul forest (below)			
<b>2b. Predicted low / moderate risk from OT impacts</b>					
Riverine elm and poplar	Pressure	Hydrological flows near springs and trees	No significant change in areas potentially impacted by OT compared to controls	A sustained groundwater level change (either rising or falling) over >2 measurement periods	A sustained groundwater level change (either rising or falling) over >4 measurement periods
	Pressure	Number of trees lost under infrastructure	Zero additional loss	Any tree lost	Any two trees lost
	State	% elm canopies dead	No significant change in areas potentially impacted by OT compared to controls	>5% mean increase in % canopy dead in areas potentially impacted by OT compared to controls in any year	>20% mean increase in % canopy dead in areas potentially impacted by OT compared to controls in any year
	Response	Number and survival of elm trees planted	n/a	n/a	n/a
Tall saxaul forest	Pressure	Density and area lost under infrastructure	Zero additional loss	Any tall saxaul forest lost	>1 ha tall saxaul forest lost
	Pressure	Number of reported incidents of illegal hunting, collecting or possession (from enforcement teams)	Detectable reduction (from 2015-2016 baseline)	To be set when baseline data are available	To be set when baseline data are available
	Pressure	Household, community, and market surveys (indicators under review)	To be set when indicators are finalised	To be set when baseline data are available	To be set when baseline data are available
	State	Area and quality (indicators under review)	To be set when indicators are finalised	To be set when baseline data are available	To be set when baseline data are available
	Response	Area and quality of saxaul planted	To be set when LDC&RMP is finalised	To be set when LDC&RMP is finalised	To be set when LDC&RMP is finalised
Natural	Pressure	Area lost under OT associated infrastructure	No more than the	>500 QH in addition to	n/a

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habitat/rangeland			predicted impact of 8500 QH	map used for NPI forecast	
	Pressure	Number of OT vehicle transgressions (speeding, driving and parking off-road)	n/a	To be set when baseline data are available	To be set when baseline data are available
	Pressure	Overall mean grazing effect, measured as change between plots inside and outside exclosures	n/a	n/a	n/a
	Pressure	Density and patterns of vehicle tracks (indicators under review)	Insignificant increase in area (from 2013 baseline)	To be set when baseline data are available	To be set when baseline data are available
	State / Response (= OMP-KPI-4)	Rangeland quality (across established rangeland monitoring sites)	3.75% gain across 350,000 ha (compared to controls)	To be set when baseline data are available	To be set when baseline data are available
	Response	Area and quality of rehabilitated rangeland (indicators under review)	50% of the predicted impact of 8500 QH	To be set when baseline data are available	To be set when baseline data are available
	Response	Density of goats (and other livestock) in cashmere project area	% reduction in goat numbers to be set in 2017	To be set in 2017	To be set in 2017
	Response	Bags of waste collected by communities along roads	n/a	n/a	n/a
Argali	Pressure	Number of reported incidents of illegal hunting, collecting or possession (from enforcement teams)	Detectable reduction (from 2015-2016 baseline)	To be set when baseline data are available	To be set when baseline data are available
	Pressure	Household, community, and market surveys (indicators under review)	To be set when indicators are finalised	To be set when baseline data are available	To be set when baseline data are available
	Pressure	Number of OT inspections finding illegal wildlife products	n/a	To be set when baseline data are	To be set when baseline data are

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			available	available	
	State	Population over approx. 100,000 km <sup>2</sup> (from aerial photography)	Detectable increase (from 2013 baseline)	>10% mean decline over 3 surveys (approx. 15 years)	>30% mean decline over 3 surveys (approx. 15 years)
	Response	Amount of wildlife products confiscated (from OT inspections at mine site)	n/a	To be set when baseline data are available	To be set when baseline data are available
Mongolian gazelle		Potential impacts as goitered gazelle but occurs in small numbers in impact area: same methods, targets and thresholds as goitered gazelle (above)			
Long-eared jerboa Marbled polecat Mongolian accentor		No monitoring proposed as no records within the impact area			
Swan goose Ferruginous duck Saker falcon Lammergeier Great bustard Relict gull Dalmatian pelican		Potential impacts from power lines: same methods, targets and thresholds as short-toed snake-eagle and houbara bustard (above)			
Pallas' sandgrouse Mongolian ground-jay		Potential impacts from power lines: same methods, targets and thresholds as short-toed snake-eagle and houbara bustard (above); and potential impacts from loss and degradation of rangeland habitat: same methods as rangeland (above)			
<b>2c. Predicted negligible risk from OT impacts</b>					
Ephemeral lakes & pools		No monitoring proposed until ephemeral lakes and pools appear within the impact area			
Yellow-breasted Bunting		No monitoring proposed as no records within the impact area			

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## 9. MONITORING TARGETS AND THRESHOLDS

### 9.1. NPI targets

A quantitative NPI target has been set for most indicators. This is the target to meet the outcomes predicted in the NPI forecast. Additional interim targets (e.g. over 5 or 10 years) can be developed when adequate data are available. A few indicators do not feed directly into the NPI forecast because they have an insignificant quantitative impact relative to the uncertainties around indicators of other much larger impacts. As an example, the ‘Number of OT vehicle transgressions (speeding, driving and parking off-road)’ is quantitatively insignificant compared to the habitat loss under the project footprint and the vehicle-avoidance behaviour caused by illegal hunting, but it remains important to OT and its stakeholders that this impact is addressed and monitored. Other indicators are ‘input indicators’ (e.g. Number of person-days MATs and MAPUs on patrol) – although most input indicators are documented as part of the BMP or OMP and not this BMEP, some (such as this example) are considered important to feed into adaptive management as well as external communication.

Targets and thresholds assume a static baseline (i.e. no change in non-OT impacts), which will be tested by analysis of monitoring and other research data.

### 9.2. Thresholds for adaptive management

In general, ‘state’ indicators should follow an upward trend to demonstrate NPI. In some cases (e.g. Houbara bustard and priority plants unaffected by collecting), it might not be technically possible to improve their state, so the state target is no change, with additional response indicators to monitor gains from offsets and/or rehabilitation. In general, ‘pressure’ indicators should follow a downward trend. In some cases (e.g. the direct project footprint), the target is set at no additional impacts over those already predicted in the NPI forecast. In general, ‘response’ indicators should follow an upward trend. In many cases, it is not applicable to set a response target because the responses are ‘inputs’ which are better monitored through their impact on pressure or state indicators (and additional ‘input’ indicators are listed in the Offsets Management Plan).

Thresholds are used as part of the monitoring analysis and serve as warning signals. The thresholds, if exceeded, will trigger a review to determine whether the negative change in the indicator was caused by OT or by an external driver. If it is determined that OT activities were responsible, further review will determine whether it is necessary to adapt current management. The monitoring partners will annually review whether thresholds have been exceeded. However, in some circumstances (e.g., vehicle collision with Asiatic wild ass), crossing thresholds can be quickly

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identified. When thresholds are crossed the process outlined below will be followed.

To support adaptive management, thresholds:

- are written in terms of absolute values and time periods; and
- warn of large movements in an indicator over a short period, or sustained incremental variations that add up to significant changes over longer timeframes.

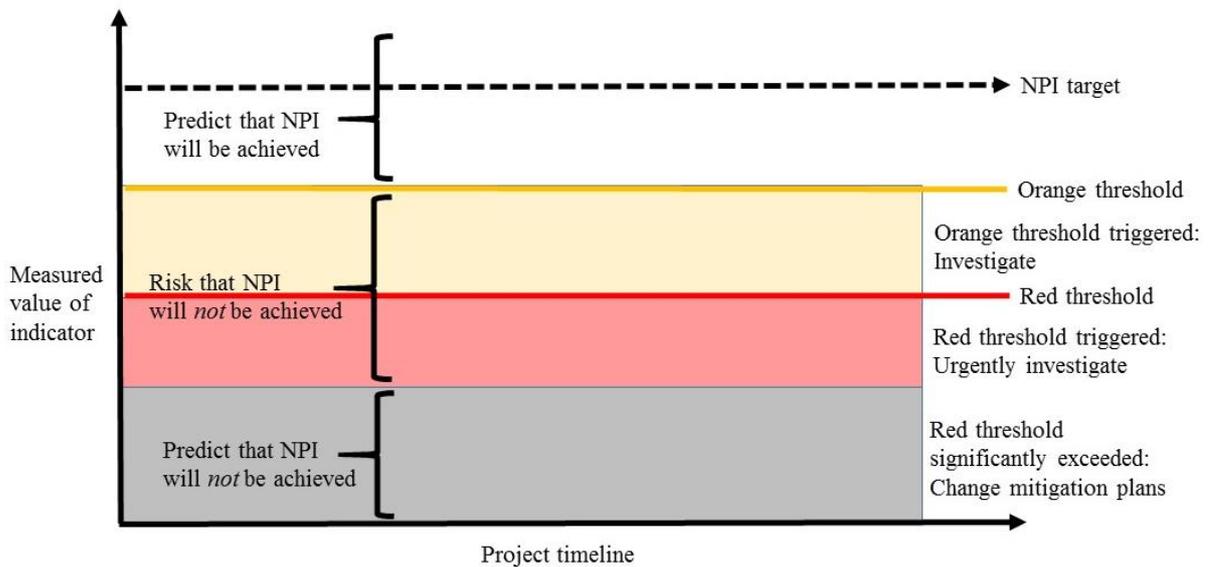
Two levels of thresholds are used and are defined in **Error! Reference source not found.**4, with different consequences:

- exceeding *orange* thresholds will trigger further investigation to determine the cause; OT might need to modify current mitigations in order to remain on track to deliver on its NPI goals; and
- exceeding *red* thresholds will trigger urgent additional study to understand the cause and determine what actions are needed, to be reviewed by two OT-appointed external reviewers; NPI predictions may not be met without modifications to mitigation efforts e.g. additional offsets may be required.

These thresholds are listed in the Appendix, showing that measured values of an indicator are likely to fluctuate, trigger investigation if exceeding an orange threshold, and trigger urgent investigation if exceeding a red threshold. Based on the investigation, mitigation may need to be adapted. It is predicted that NPI will be achieved (i.e. the project is on track) if the indicator remains above the orange threshold, but there is an increasing level of risk that NPI will not be achieved if indicators head below orange and red thresholds. It is noted that the NPI forecast is intentionally precautionary, so crossing the orange threshold does represent a risk of not reaching NPI, but probably not a sizeable risk.

**Figure 4:** Schematic representation of thresholds, actions and consequences for NPI.

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The range of natural variation in most of OT’s biological indicators (particularly *state* indicators), as well as sampling error, is not yet well enough understood to develop robust evidence-based thresholds based on population trends. For many ‘state’ indicators, at least three years of standardised robust monitoring is necessary to estimate a baseline, and longer to understand natural population variability and to interpret erratic or gradual trends in population size. Some other indicators lack three years of standardised robust monitoring because monitoring methods have been under incrementally revised.

Until more data are available, thresholds are set precautionarily and are based on expert opinion. These thresholds should be considered as preliminary, with explicit review at nominated time intervals in the future, with such review informed by the targeted and adaptive monitoring program (such as three years of standardised robust data). These preliminary thresholds are based on comparing standardised data between years or over longer time periods (maximum change through ‘moving windows’ with no set start or end point).

Indicator thresholds currently used to trigger adaptive management actions are based primarily on ‘pressure’ indicators, and their purpose is to determine whether OT remains on track to deliver NPI or whether any NPI predictions or underlying assumptions are challenged by the monitoring data. Pressure indicators are particularly valuable since they are less costly to monitor than ‘state’ indicators, may show changes more quickly, and are easiest to attribute to OT. Pressure indicators can measure not just OT’s negative impacts but also OT’s positive impacts in reducing the baseline (pre-project / counterfactual) pressures, e.g. the rate of illegal hunting. Given that the relationship between ‘pressure’ and ‘state’ is not always well-

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known (e.g. additional unidentified pressures may be impacting the state), state indicators are monitored for all priority biodiversity features, and thresholds will be identified as soon as practicable. These thresholds will be refined, and new thresholds added, as additional data becomes available, but will not be adjusted solely because they are triggered.

Orange and red thresholds are set at a level indicating when the project is at risk of not meeting its NPI targets, because indicators suggest that reality is moving too far from assumptions or pressure or state values predicted in the NPI forecast. No thresholds are given for response indicators as 'input indicators' are set in contracts and workplans, and monitored by implementation reports. 'Outcome indicators' for responses are generally the same as pressure indicators (e.g. the anti-poaching offset work will monitor its effectiveness by monitoring the pressure indicators already established for hunted species) or state indicators (e.g. the rangeland offset work will monitor its effectiveness by monitoring the state indicators already established for rangeland and constituent rare plant species).

#### Adaptive management action/response when thresholds are exceeded

When any orange threshold has been crossed by the relevant indicator, biodiversity risks are indicated and adaptive management actions are triggered. The process to respond is:

1. Check the original data to corroborate findings;
2. Compare the data with other datasets to clarify what has happened and why (e.g., is OT the root cause of the threshold being crossed, were external factors the driver, or some combination of the two?);
3. Assess whether mitigation measures were being implemented effectively:
  - a. if not, would thresholds have been exceeded had mitigation been implemented correctly? Remedial action should be taken; OR
  - b. if mitigation was being implemented correctly but thresholds were crossed, the mitigation is not as effective as it was designed to be or the impact was caused by some external driver outside of OT control. If the threshold breach is attributable to OT's primary or secondary impacts, additional/different mitigation actions should be implemented if appropriate; and
4. Consider whether the threshold should be re-calibrated.

Actions for red thresholds are as above, PLUS:

- Undertake these assessments within one month of OT being aware of passing the threshold;
- These assessments to be reviewed by two OT-appointed external reviewers; and

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- Implement remedial or additional/different mitigation actions required, if the exceedance are attributable to OT's primary or secondary impacts, within one month of OT being aware.

### **9.3. Offset plan and mitigation actions**

Mitigation and offset actions require specific monitoring to determine how successful the actions are in meeting NPI goals. Monitoring needs may change when a new management approach is tried, or an existing approach is modified. Therefore, a feedback loop between monitoring and mitigation or offset actions is designed into this plan. All contracts and workplans for mitigation and offset actions include the monitoring and reporting of 'input indicators'. 'Outcome indicators' for responses are generally the same as pressure indicators (e.g. the anti-poaching offset work will monitor its effectiveness by monitoring the pressure indicators already established for hunted species) or state indicators (e.g. the rangeland offset work will monitor its effectiveness by monitoring the state indicators already established for rangeland and constituent rare plant species). In combination, these monitoring data will be used to evaluate management actions once per year, unless a threshold is crossed or there is another reason (logistics, cost, stakeholder concerns, seasonality, etc.) to evaluate the management strategy more often. These evaluations will be fed back into the mitigation and offset actions as well as the BMEP and NPI forecast.

### **9.4. Feedback to NPI planning and forecast**

A forecast of the likelihood that OT will succeed in having a Net Positive Impact was included in the 2012 ESIA and updated in 2015. The NPI forecast is an important component of OT's overall plan, and it will be revised regularly as the environment changes and/or new information becomes available. The forecast is a set of predictions about losses and gains to priority biodiversity features. These losses and gains were first estimated based on baseline data, analogous studies elsewhere and expert opinion. These estimations or predictions were precautionary and included various assumptions are transparently. In later version of the NPI forecast, these losses and gains are based on empirical data gathered formation from OT's biodiversity monitoring and OT's other biodiversity research (e.g. testing and refining the NPI assumptions).

Biodiversity monitoring data will be evaluated, annually, for its significance (e.g., changes in means and confidence intervals) with regard to NPI calculations. The NPI forecast will be updated annually in response to any clear, relevant and significant changes in data (e.g., significant reductions in a priority species' population size that are likely to be outside of the bounds of natural variation and likely to be caused by project impacts, such as increased hunting pressure). Every five years, the NPI forecast will be updated, based on the previous data and experience.

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**10. DOCUMENT CONTROL**

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