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Capacity building for Mongolian Ministry of Environment and Green Development (MEGDT) in relation to biodiversity and conservation in the southern Gobi Desert

FINAL REPORT

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FINAL SUMMARY REPORT
June 30, 2016

I. Background and purpose of project

The Mongolian Gobi region is part of the largest steppe ecosystem in the world that supports its historic wildlife assemblage, including long distance wildlife migrations (Batsaikhan et al. 2014), as well as traditional nomadic pastoralism. Globally, temperate grasslands and savannas such as the Central Asia steppes, the North American Great Plains and the South American Pampas are the most converted and least protected biome (Hoekstra et al. 2015). The Mongolian Gobi region currently supports 33 animals listed as nationally threatened or endangered (Clark et al. 2006, Terbish et al. 2006, Gombobataar et al. 2012), including the world's largest remaining populations of Khulan (Equus hemionus), Mongolian gazelle (Procapra gutturosa), Goitered gazelle (Gazella subgutturosa), wild Bactrian camel (Camelus ferus) and Siberian ibex (Capra sibirica) (Kaczensky et al. 2015, Mallon 2008a, Mallon 2008b).

However, the wildlife and pastoral livelihoods of this area are threatened by rapid growth in mining and related infrastructure. Mining development in the Gobi region is occurring faster than the national trend. In 2012, 24% of the area had been leased for exploration and another 32% available for lease (MMRE 2012). The largest active projects include the Nariin Sukhait / Ovoot Tolgoi coal mine, the Tavan Tolgoi (TT) coal mines and the Oyu Tolgoi (OT) copper mine. Though the direct impacts of mining on land and water are significant and can reach far beyond the mine site, an urgent threat to wide-ranging wildlife is created by transportation infrastructure and traffic to support mining operations that create barriers to movement (Ito et al. 2005, Ito et al. 2013, Kaczensky et al. 2011, Kaczensky et al. 2006, Olson 2012, Lkhagvasuren et al. 2011, Lkhagvasuren 2000).

Mitigating the impacts of these rapid developments on South Gobi biodiversity is an urgent priority for the government of Mongolia, but addressing these issues has been constrained by a lack of biological data on regional and local scales and the need for cooperative data sharing and landscape scale assessments. The purpose of the project was to help facilitate and coordinate these efforts and to assist the Mongolian Ministry of Environment, Green Development and Tourism (MEGDT) in building their internal capacity to manage these issues.

The overall objective of the project was to build capacity in the region for addressing conservation on a landscape level by assisting MEGDT and other stakeholders in the identification, review, assessment, implementation and monitoring of mitigation and other conservation measures in the Southern Gobi. The specific objectives were as follows:

- Help promote ongoing and planned future development in the southern Gobi through capacity building, using sound measures for the conservation of biodiversity.

- To facilitate cooperation between interested parties (including MEGDT, private companies working in the area and other interested stakeholders) to ensure sharing of data and information to allow landscape level design (i.e. regional planning approach) for conservation measures in the south Gobi.
- To provide capacity building assistance to the MEGDT on the approach for landscape level design and other issues related to environmental protection.
- To assist in the application/promotion of the mitigation hierarchy to the current situation in the south Gobi, and to further apply this to anticipated future development of the region. In this instance the efforts will build on the mitigation measures implemented on existing individual projects, and the existing and anticipated cumulative impacts from existing projects to apply the mitigation hierarchy. The intention will be to ensure that all reasonable measures to avoid, minimize and mitigate impacts are implemented before offsets are considered. In the event that offsets are required to address residual impacts, the first step will be to ensure that the impacts are "offsetable," as current literature clearly indicates that not all impacts can be offset (ten Kate and Crowe 2014).

Within Mongolia, any proposed projects that impact the land and/or alter the natural state of the environment are required by law to follow Environmental Impact Assessment (EIA) process. This process initiated by a project proponent starts with a submittal of a detailed project description to either provincial (i.e. *aimag* environmental agencies) or national (Ministry of Environment, Green Development, and Tourism—MEGDT) regulators. It is the responsibility of these regulators to then assess whether or not the project can go forward and if so, what conditions must be met by the company to mitigate its impacts on the environment. For more complex and /or large projects, regulators have the option of requiring a detailed EIA (DEIA) be completed before any decision can be made. Although now requiring extensive baseline data, comprehensive impact analysis and public involvement, the overall goal of the DEIA is to identify all potential impacts and mitigate these impacts as best as possible.

Mongolian Environmental Impacts Assessment Law now requires the use of biodiversity offsets to compensate for impacts, and MEGDT has approved guidance for the implementation of offsets, supporting provisions for offsets in the new law and regulations. MEGDT and other stakeholders have expressed interest in advancing a mitigation design tool to facilitate offset implementation, building on MEGDT/TNC work in the Gobi region. (TNC, 2013). To facilitate the offset planning process, it was necessary to develop a standard set of procedures and data development techniques that will feed into an accompanying web-based GIS tool allowing for companies and licensing authorities to measure impacts and estimate potential offset costs.

Protected areas alone cannot effectively conserve the current populations of this region's iconic wide-ranging plains ungulates, including khulan or Asiatic wild ass (*Equus hemionus*), Mongolian gazelle (*Procapra gutturosa*) and saiga antelope (*Saiga tatarica*). In the deserts and grasslands of Central Asia, vegetation productivity is highly variable and irregular in time and space (von Wehrden et al. 2012, von Wehrden et al. 2010, Zhang et al. 2010, Yu et al. 2004, Fernandez-Gimenez and Allen-Diaz 1999). Steppe productivity and surface water availability varies spatially, seasonally and between years in response to precipitation. Nomadic migrants such as khulan and Mongolian gazelle have evolved to track these dynamic resources, covering large distances to follow vegetation growth that follows precipitation (Mallon and Zhigang 2009, Mueller et al 2008, Mueller and Fagan 2008). The most significant threat to khulan and Mongolian gazelle in Mongolia is the loss of access to habitat due to barriers created by transportation infrastructure (Ito et al. 2013, Lkhagvasuren et al. 2011, Kaczensky et al. 2006) – either fences along borders and railways (Olson 2012, Kaczensky et al. 2011a, Ito et al. 2005, Lkhagvasuren 2000), or high traffic, as in the case of the Tavan Tolgoi coal road.

The viability of populations and movements of grassland ungulates have important implications for herders, other wildlife and the ecological integrity of rangelands in general. Wide-ranging plains ungulates perform important ecological functions, including redistributing nutrients that may influence diversity patterns of plant communities (Mazancourt et al. 1998) and provide a prey base for predators and scavengers. Wild ungulates also represent an important food source for subsistence hunters (Olson 2008).

Mining development and transportation infrastructure in southern Mongolia are expanding rapidly. In the Southeast Gobi region, this includes two parallel mining roads connecting the Energy Resources Tavan Tolgoi coal mines and the Oyu Tolgoi copper mine to the Gashuun Sukhait border crossing and lying between Small Gobi Strictly Protected Areas A and B, a planned railway that runs roughly parallel with these roads, and another railway under construction between Dalanzadgad and Sainshand (see Figure 1). Effective mitigation of these barriers is critical to the viability of the Southeastern Gobi khulan population and is the focus of several studies and conservation efforts including Lkhagvasuren et al. (2011), Olson (2012), Huijser et al. (2013), Wingard et al. (2014), CMS (2015a, 2015b) and the traffic study conducted by the project (see section II.C below and Appendix D).

The increased mining and transportation activity related to mining growth in the Gobi Desert has the potential to fragment habitat for khulan, goitered gazelle and other endangered species. If future mining growth continues, the related freight traffic could fragment the habitat to the point that these species of concern could face extinction. Transportation infrastructure and traffic create barriers to wildlife movement by the vehicle traffic itself (some of which is off-road, parallel to the paved road, creating a wider impact zone), fencing adjacent to linear transportation infrastructure, and tall cut and fill slopes along the Mongolian Railroad. In addition to its direct habitat fragmentation effects, transportation causes direct wildlife mortality from vehicle strikes, habitat degradation adjacent to roads due to sight and noise of traffic and dust (for unpaved roads), and increased human access that can result in an increase in poaching.

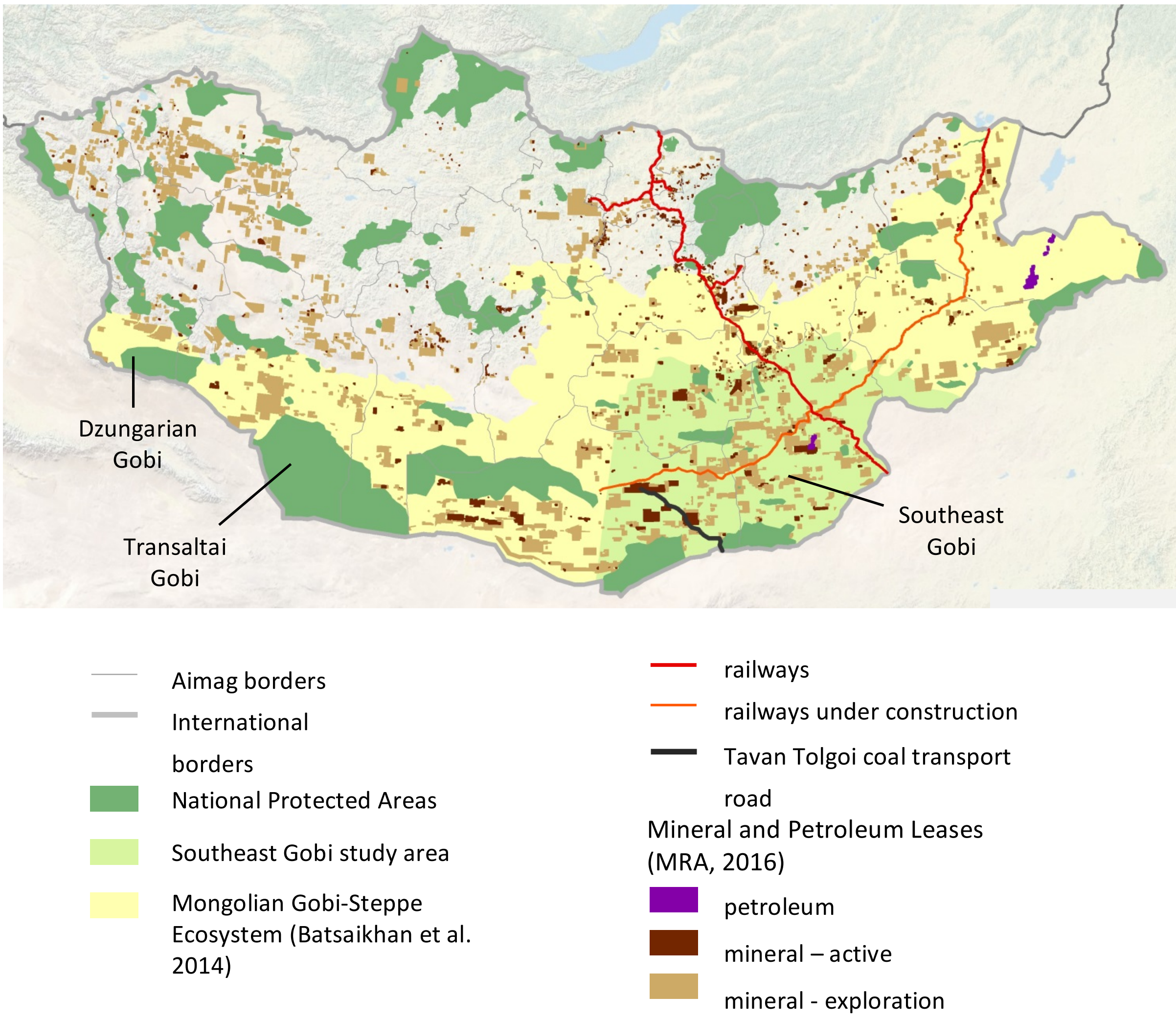

Figure 1. Map of region showing major southeast Gobi transportation corridors

II. Summary of outcomes by task

All activities proposed in the project document have been successfully completed. We believe the scientific analysis of habitat connectivity, Mitigation Design Tool development and implementation in multiple formats, traffic engineering assessment and extensive stakeholder engagement; coupled with training and capacity building along every phase of the project has provided a substantial enhancement of MEGDT's ability to implement mitigation of development impacts on biodiversity in the region. Following is an executive summary of the outputs for each major task of the project. Detailed reports have been submitted to MEGDT and EBRD on schedule over the course of the project and are annexed to this summary report.

A. Development of Mitigation Design Tool

Although offsets have great potential as a conservation tool, their establishment requires overcoming a number of conceptual and methodological challenges: How to ensure that offsets are ecologically equivalent to impact sites and will persist at least as long as on-site impacts, and that they will be complimentary to broader landscape level conservation priorities.

Whether a project requires a DEIA or not, each project is required by law to follow the mitigation hierarchy by first avoiding areas identified as environmentally sensitive or culturally important and then designing plans or using practices which minimize impacts on the environment. Regardless of the measures taken to avoid and minimize impacts, the residual impacts must according to Mongolian law have an offset plan be in place to allow for the project to move forward. These offset plans created by the project proponents must be approved by regulators and are many times negotiated between parties before accepted. Typically these plans identify actions to protect or enhance habitat and/or biodiversity outside of the impacted area and are performed at the expense of the company developing the area. To give companies guidance on the requirements of an offset plan, the Mongolia government released offset procedural guidelines associated with EIA law, hereafter referred to as the Mongolian Offset Guidelines (MOG). This regulation also provides a methodology for companies to estimate a compensation value that can then be matched by actionable items to meet their offset requirements.

Following the MOG, companies calculate required offset compensation value in three main steps: 1) Identify the area that is likely to be affected by the proposed project (i.e. map the development footprint and its direct supporting infrastructures, delineate an impact area, and determine the magnitude of these impacts); 2) Use this impact area to calculate the total offset units necessary to meet the offset regulation; and 3) Calculate total yearly offset compensation value. For each step, the MOG defines methods for calculating and fulfilling these requirements. In order to follow these steps, it is however necessary to be well versed in using GIS and fully understand all data used in the analysis. Without this knowledge, the regulation can be difficult to implement leading to inconsistencies in those trying to follow the regulation.

Within this grant, Task 1b required a web-based MDT application be built which supported offset decision-making within the southern Gobi region of Mongolia. This tool had four main objectives; 1) help companies avoid areas restricted to development by Mongolia law, 2) minimize development occurring in environmentally sensitive areas as identified by the Gobi Ecoregional Assessment, 3) produce an offset compensation report which follows the MOG procedures, and 4) locate potential offset locations. This tool was then to be used as a prototype to be implemented across Mongolia.

Due to an apparent demand by companies, consultants, and regulators working across Mongolia for such a tool and the need to support those with limited Internet connectivity, TNC and MEGDT leveraged economies of scale with other on-going projects and were able to create two versions of the MDT (i.e. MDT-Desktop and MDT-Web) to support mitigation decision-making throughout Mongolia. Both applications allow users to meet the original objectives of the MDT with very limited GIS skills and/or knowledge and produce consistent results regardless of which one is used. To provide detailed background information on the MOG requirements and explanation on the procedures used by these applications, the *GIS Protocols and Procedures for Compliance with the Mongolian Offset Regulation using the Mitigation Design Tool* (GIS_PPC) document has been created and available for download in either English or Mongolian at the Mongolia Mitigation Design Tool Web Portal (MMDT Web Portal). This web portal was built to support distribution of all documents and tools created in relation to the MDT efforts. This was not originally included in the initial EBRD proposal but became necessary due to logistics associated with distributing tools and data to users across all Mongolia. Specific documentation for each application both in English and Mongolian is also included or accessible with each version of the MDT.

MDT - Desktop

The MDT-Desktop (Figure 2) has four main toolsets; Land Disturbance and Impact Tools, Offset Tools, Supplementary Avoidance Tools, and Update Tools. The *Land Disturbance and Impact Tools* assist users in following standards set such as projection and attribution for digitally creating within GIS land disturbances (LDs) data and then use these spatial data to create a project impact dataset. The *Offset Tools* use the project impact dataset to derive an offset cost report and identify potential offset locations. The *Supplementary Avoidance Tools* allow users to relatively compare potential offset costs and development restrictions for either leases and or planned LDs. These avoidance tools give users a way to potentially minimize their offset costs by avoiding important landscapes and habitat within Mongolia and guide development away from those areas restricted by law to development. Finally the *Update Tools* help users stay current with the application database without having to reinstall the MDT application. Each tool is described in detail within the MDT - Desktop Help document. The tool and documentation can be downloaded at the MMDT Web Portal. Users will download a zip file containing the toolbox, scripts and data necessary run all the tools. For most tools to run, the MDT-Desktop not only requires ArcGIS 10.1 or higher versions but also the ESRI Spatial Analyst extension.

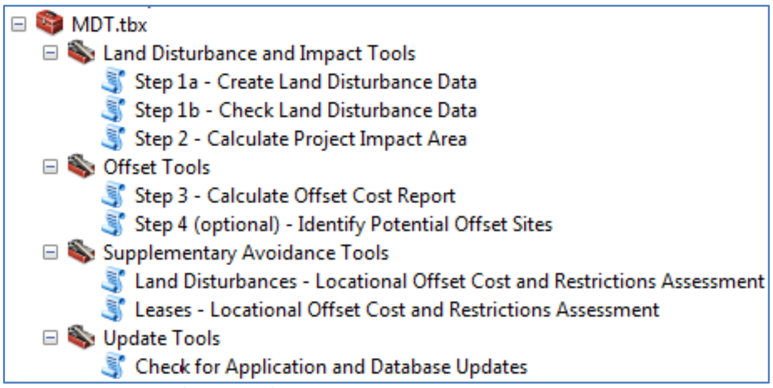

Figure 2 MDT-Desktop application

MDT - Web

The web-based mitigation tool (Figure 3) allows users via the Internet to produce data and reports necessary to comply fully with the MOG while at the same time applying mitigation principles. Users are required to create input data (i.e. land disturbances) in a shapefile format and upload these data to the application. Any available desktop mapping or design software can be used which allows for spatial data to be exported in a shapefile format. Once uploaded to the application, users have access to data necessary to first examine if their proposed development overlaps any restricted development areas. The user then is required to run a quality check on these uploaded data to insure the necessary attribute standards have been followed for all disturbances uploaded. If errors occur with attributing the application gives users the ability to fix these errors and re-assess the data, all within the web application. Once the uploaded LD data are certified as correct, then the user can compare land disturbances for potential ways to minimize offset costs and further avoid environmentally sensitive areas. Finally the user can submit the uploaded LD data to be processed by a remote TNC server with regards to the MOG. The web application in return emails users a zipped file containing a raster dataset representing the project impact area, an html file containing the MDT offset report, and all supporting shapefiles (i.e. offset site selections and input land disturbances). None of the data uploaded by the users is saved to the server except temporarily during the processing of data. A full description of the MDT-Web and how to use it is available within the MDT-Web Help documentation. The application and documentation can be found at http://s3.amazonaws.com/DevByDesign-

Web/MappingAppsVer2/MDT_Mongolia/index.html or also by going to the MMDT Web Portal.

Figure 3. MDT-Web application

MDT Stakeholder Engagement

Several presentations and demonstrations were done over the course of this project in order to solicit feedback from potential users and provide users with guidance on applying the applications (see Table 1). Feedback from these presentations provided TNC with guidance throughout the development of the project and influenced the decision to further expand the MDT to support all of Mongolia. Presentations were given to all parties having a use for these applications, i.e. companies, consultants and regulators.

Table 1. Presentations given associated with MDT

Presentation	Date	Audience
EBRD Project Planning	Dec. 2014	TNC, EBRD, MEGDT
MDT Update	Sept. 2015	MEGDT Managers
MDT Update	Dec. 2015	EIA consultants
MDT Update	Jan, 2016	Provincial regulators
MDT Update	Mar, 2016	MEGDT staff, provincial regulators, EIA consultants, Mining companies
EBRD Project Planning	Dec. 2014	TNC, EBRD, MEGDT
MDT Update	Sept. 2015	MEGDT Managers
MDT Update	Jan. 2016	MEGDT Managers and Provincial regulators

Web Portal

Finally the MMDT Web Portal was developed to aid TNC in distributing all information, data and applications produced by this effort (Figure 4). This website requires users to register in order to download the MDT-Desktop application or any associated data with these applications. Additionally all documents and presentation created for the MDT project are found on this site and available for access. It also provides http or email links to all involved in the effort. Future updates and releases of the applications and/or data will be hosted here and provide MDT users with access to the most recent version available.

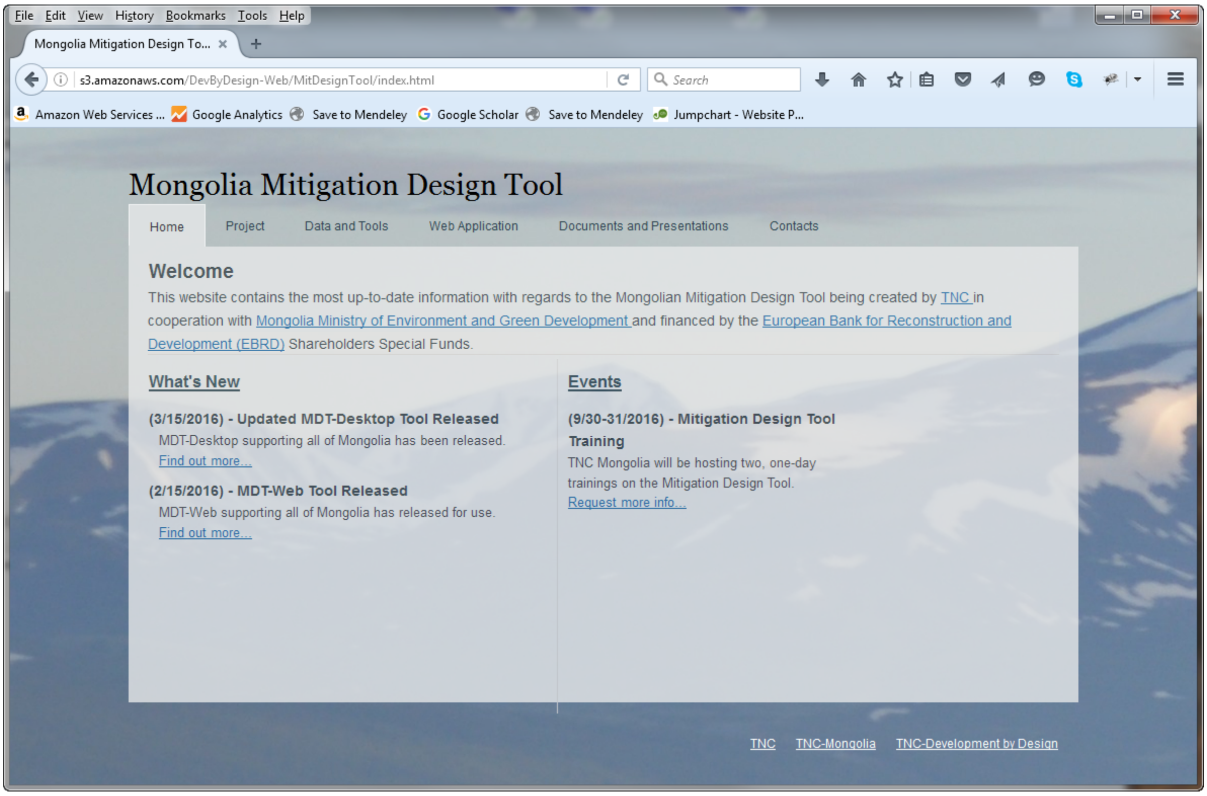

Figure 4 Homepage for Mongolia Mitigation Design Tool web portal

Future Work

The MDT applications and data will continue to need to be maintained and updated for the long-term. Currently TNC is committed to this effort to one year following this project however MEGDT will need to find a methodology to continue this maintenance. Discussions between Mongolia TNC and MEGDT have begun to find a more long-term solution. Additionally, it will be important to continue to promote the use of the MDT throughout Mongolia and train new government regulators and EIA consultants on the use of the MDT. Tutorials provided within the GIS PPC document provide some opportunity for those to learn how to apply the applications however in person training will always provide the best education on use to the tools. Finally, as more people begin to use the applications, users will inevitably request additional functionality and features. Capturing these requests and implementing them into future releases of the MDT has yet to be addressed. All code is freely available for any to use or modify however those who do so must be well versed in multiple computer programming languages and environments while also understanding all data associated with these tools. Again Mongolia TNC and MEGDT will need to incorporate this into their long-range maintenance vision of the MDT.

B. Connectivity Analysis

Connectivity conservation can mitigate the effects of habitat fragmentation by maintaining movement among disjunct patches, e.g., by promoting gene flow, population rescue, and colonization of vacant habitat (Crooks and Sanjayan 2006). Moreover, connectivity will be increasingly critical for maintaining adaptive capacity (e.g., Sexton et al. 2011) and facilitating species range shifts under climate change. For these reasons, conserving connectivity is the most-often recommended climate adaptation strategy (Heller and Zavaleta 2009). In the disaster prone ("dzud" and drought events) Gobi environment, the possibility for temporary evasive movements is of further importance (e.g. Kaczensky et al. 2011b).

Circuitscape models connectivity using electric circuit theory, treating landscapes as conductive surfaces and taking advantage of connections between circuit and random walk theories (McRae et al. 2008). It incorporates all possible pathways connecting movement sources and destinations, modeling flow via low-resistance routes. The results highlight important movement pathways, particularly pinch points where the lack of alternate pathways means the loss of a small amount of habitat could disproportionately reduce connectivity.

The goal of this task was to build capacity of MEGDT and the research community to map and analyze wildlife movement and habitat connectivity, by developing the following:

- Specific training on Circuitscape modeling as described on page 20 below.
- A case study to demonstrate how existing GIS datasets may be used to model movement and habitat connectivity of khulan in the Southeast Gobi region using Circuitscape. The results identify key data gaps, provide a first iteration spatial model others can expand and improve, and may guide data collection, field surveys and monitoring. The current model is based on expert opinion and not on actual animal movement data. Models must be validated and improved with the best available animal movement data from collar studies and/or field observations (See Annex D)
- A national GIS database containing datasets that may be used or modified to represent habitat, human activities and infrastructure. These datasets are organized in a consistent raster environment, geographic projection and file format to support modeling spatial distributions of wildlife habitat and movement. Other datasets can be easily incorporated into this modeling environment.

Though the focus of the case study is khulan movement, the modeling methods and the National GIS database may support research and conservation of other wide-ranging species in Mongolia. However, different focal species have different movement abilities and habitat requirements and constraints to movement. Models based on expert opinion, like the case study, must be validated and improved with the best available animal movement data from collar studies and/or field observations.

The case study consisted included the following steps, described in more detail in Annex D

The study area is the Southeast Gobi region, which supports the largest Mongolian subpopulation of khulan (Kaczensky et al. 2011a) and is undergoing rapid development of mines and supporting infrastructure, including railways and roads with high mining traffic, and other related changes in land use and human impacts.

<u>STEP 1</u>: Define type of connectivity to be modeled: movement between water sources, or water points, during summer drought periods.

STEP 2: Define what is being connected: We developed two datasets of locations of water points from two sources: water point surveys and hydric (wet) vegetation from a spatial model of terrestrial ecosystems.

STEP 3: Assign resistance scores and create the resistance layer based on a) Terrain roughness (Vector Ruggedness Measure); b) proximity to population centers; c) herder household density in summer and autumn.

STEP 4: Map connectivity areas: After a sensitivity analysis to test various combinations of habitat features and various methods for calculating the resistance surface, we designed two scenarios and generated maps of modeled electric current or movement flow for each scenario with the resistance surface described in Step 3.

Model results identify several areas of likely high movement and constrained movement that support observations and research by wildlife biologists:

- The wide depression lying southwest to northeast between Gashuun Sukhait border crossing and Sainshand. This is a large area, over 20,000 km^2, that is well-used by khulan, likely because of relatively low human settlement (N. Batsaikhan pers. comm.), and that will be significantly impacted by the railway under construction between Sainshand and Dalanzadgad.
- The area between Small Gobi SPA A and B. The two SPAs were designated specifically to conserve habitat of four migratory large mammals: khulan, black-tailed gazelle, argali and ibex, and other biodiversity representative of the Galba Gobi and Borzon Gobi (Myagmarsuren and Namkhai, 2010). Therefore, the area joining the two SPAs is important for maintaining habitat connectivity and movement, and an area of great conservation concern because it is bisected by the parallel mining roads and high traffic between Energy Resources Tavan Tolgoi coal mine and the Oyu Tolgoi copper mine to the Gashuun Sukhait border crossing. Mining traffic on these roads has significantly reduced khulan movements, and in particular across the Tavan Tolgoi coal road.
- Two large areas of possible movement along the UB-Beijing railway Northwest and Southeast of Sainshand. That could be achieved simply by removal of sections of fence at locations away from population centers following methods described by Olson (2012), would re-connect 17,000 km^2 of suitable khulan habitat east of railway (Kaczensky et al., 2011a). Scenario B also predicts high use of Zagiin Us Nature Reserve and possible E-W movement north of the Nature Reserve, though these areas are at the northern edge of current khulan range.

Future modeling, research and conservation will benefit from:

1. Improved data for water sources used by khulan, from field surveys and collar studies. Those data would include locations, and also information about seasonal and diurnal use.
2. A more accurate and complete delineation of roads and infrastructure in a publicly-available dataset.
3. Estimates and monitoring of traffic volumes.

4. Research regarding how water availability varies with climate, specifically precipitation.
5. Improved data for locations of pastures and herder households by season. The database of seasonal locations compiled by CPR (2010) is a valuable resource, and should be regularly updated.
6. Research regarding khulan responses to herder households, human settlements and human land use, including avoidance distances and avoidance behavior by season.

Recommendations for future modeling

The focus of this modeling study was movements restricted to one habitat feature (water sources) during one season or life stage (summer drought periods). Other important habitat resources, life stages and factors affecting movement include:

- Water sources in other seasons. Water dependence is higher in spring and in winters without snow (Petra Kaczensky pers. comm.).
- Winter forage (Petra Kaczensky pers. comm.)
- Sand massives: unique plants and ephemeral water sources (pers. comm. N. Batsaikhan).
- Deep snow: During the 2015/2016 dzud, due to deep snow in parts of Mongolia, gazelle moved long distances to use disturbed habitat where gazelle had not been observed previously. Many gazelle died trying to cross railway fence (pers. comm. B. Lkhagvasuren).
- The landscape resistance calculation could be modified to consider forage and water availability. For example, very dry true desert and semi-desert could be included in the resistance surface to indicate areas of higher resistance, i.e. higher energetic cost and lower habitat suitability. (pers. comm. N. Batsaikhan).

The spatial extent was the Southeast Gobi region, which supports one of the three Mongolian sub-populations of khulan. Expanding the spatial extent across Southern Mongolia would be useful to identify barriers and pinch points between the three subpopulations described by Kaczensky et al (2011a), and specifically between the Southeast Gobi study area and khulan range in Central and Western Omnogobvi and the Trans-Altai Gobi subpopulation.

Stakeholder engagement on connectivity analysis

The September 2015 training for GIS staff and MEGDT managers provided an initial opportunity to solicit input and feedback on the connectivity analysis. A formal connectivity rollout workshop was held on March 24, 2016 to review results with scientists from the National University, the Academy of Sciences, MEGDT, NGOs, and others. We also conducted a Gobi offset training that included connectivity presentations, discussion and feedback in April 2016.

C. Assessment of alternatives and logistical constraints on regional traffic

The increased transportation activity related to mining growth in the Gobi Desert has the potential to fragment habitat for khulan, goitered gazelle and other species. If future mining growth continues, the related freight traffic could fragment the habitat to the point that the species of concern could face extinction. The following are the major transportation impacts to wildlife:

- Habitat fragmentation caused by
  - increased vehicle traffic,
  - some of this traffic being off-road parallel to paved road, creating a wider impact zone,
  - fencing adjacent to linear transportation infrastructure, and
  - tall cut and fill slopes along the Mongolian Railroad;
- Potential for increased wildlife mortality if traffic increases;
- Habitat degradation adjacent to roads due to sight of traffic and dust (for unpaved roads); and
- Increased human access resulting in an increase in poaching.

The project team analyzed current and anticipated traffic levels and drafted a suite of alternatives and mitigation measures for consideration by Mongolian policy makers (see Annex E).
One of the geographic locations of most concern is the area where freight transport occurs to bring mining products to the Gashuun Sukhait border crossing with China. There are two roads and a partially constructed railroad. There is some good news in this area:

- Unlike the Trans-Mongolian Railroad, the Mongolian Railroad Company is building rail lines in the South Gobi without fences. The partially constructed rail line adjacent to the UK-GS Road has no fences.
- The Mongolian Railroad also includes several partially constructed wildlife underpasses.
- The slow down for coal demand in China has led to a reduction in freight traffic.
- Off-road travel adjacent to the UK-GS Road appears to be nearly eliminated.
- A permanent traffic count station has been installed on the OT-GS Road primarily to provide data for understanding traffic impacts to wildlife. Efforts also continue to collect and study wildlife movement data.

Despite this good news, efforts need to continue to protect wildlife from transportation impacts. If off-road traffic becomes an issue, efforts should be made to curtail it. Other transportation infrastructure in the South Gobi should also have limited or no fencing. The following types of data collection and research are very important:

- Traffic flow data,
- Wildlife mortality data,
- Wildlife movement data and research to answer these questions:
  - How much traffic on a roadway or railroad creates a significant barrier for various species?
  - What is the width of habitat degradation adjacent to the road for various species?
  - Do cut and fill slopes on railroads create a barrier to wildlife?
  - Where are priority wildlife corridor movements for various species?
- Mitigation monitoring.

Wildlife crossing structures are the most promising approach to mitigating against habitat fragmentation. Constructing even a limited number of crossing structures before traffic increases to become a total barrier is crucially important, so as to better understand the usefulness of particular designs to the target species. Considering the three parallel linear infrastructures (OT-GS Road, UK-GS-Road and Railroad), structures should be placed at a similar latitude for better connectivity across all roads/railroads.

Additional mitigations that could be considered include:

- Managing freight demand
- Driver awareness and public education campaign
- Time of day restrictions
- Truck platooning

Annex E provides more details on these issues relating to traffic, freight logistics and mitigating impacts on wildlife. The detailed investigation of traffic impacts in the Gobi Desert provided in the Annex could be used to educate new MEGDT staff and others involved in these issues. The annex also includes a chapter summarizing potential mitigations that could be used as a Mongolian guidebook for mitigating transportation impacts to wildlife. The mitigations chapter could be updated regularly as mitigations in the Gobi desert are implemented and studied so as to provide a guidebook with the latest information about mitigations. The annex also includes a general guide on managing road dust.

Traffic analysis stakeholder engagement

The regional traffic assessment was discussed and presented in slide format when meeting with individual stakeholders and large groups to solicit feedback on the report and comments of feasibility of the potential solutions proposed by the project.

In Ulaanbaatar on 24 August 2015 Dr. McGowan met with Dr. Gerelnyam at the Ministry of Transportation. They discussed mitigation methods and the feasibility of implementing them. They also discussed the Ministry's traffic data collection efforts and planned improvements.

In Ulaanbaatar on 25 August 2015 McGowen presented at the Conservation of Migratory Species (CMS) workshop. Although there was little feedback during the group question/answer period following the presentation, informal discussions during workshop breaks proved very fruitful. Informal discussions included:

- Davaanyam Tsedendamba, environmental officer for Mongolian Railways, to gain permission to inspect the partially constructed rail lines in the Gobi, and to discuss obtaining data on construction details (particularly the cut and fill slopes);
- Enkhtuvshin with Wildlife Conservation Society to discuss some of their continuing public outreach efforts; and
- Many international wildlife experts in attendance (Petra Kaczensky, Kirk Olson, Buuveibaatar) to discuss their research work and how that can inform mitigation methods.

In Ulaanbaatar on 26 August 2015 Dr. McGowen met with Tsenguun Tsogt, the CEO of Gashuun Sukhait Road LLC. This company owns the Ukhaa khudag-Gashuun Sukhait road. They discussed the company sharing toll data for use in this study and efforts but the company to limit off-road travel. In Tsotsetsgi on 31 August 2015 Dr. McGowen met with Altankhuyag one of the local managers for the Gashuun Sukhait Road Company. They discussed current and historic efforts by the company to minimize impact on wildlife.

III. Other Stakeholder Engagement

We engaged nearly 700 stakeholders from government, scientific institutions, NGOs, and the private sector through our workshops and trainings. Figure 5 shows the total number of participants from each sector involved in the formal events organized through the project. In addition, we met with many individuals and leaders from local communities during our field visits in the South Gobi.

Below is a summary of some of our significant formal outreach activities.

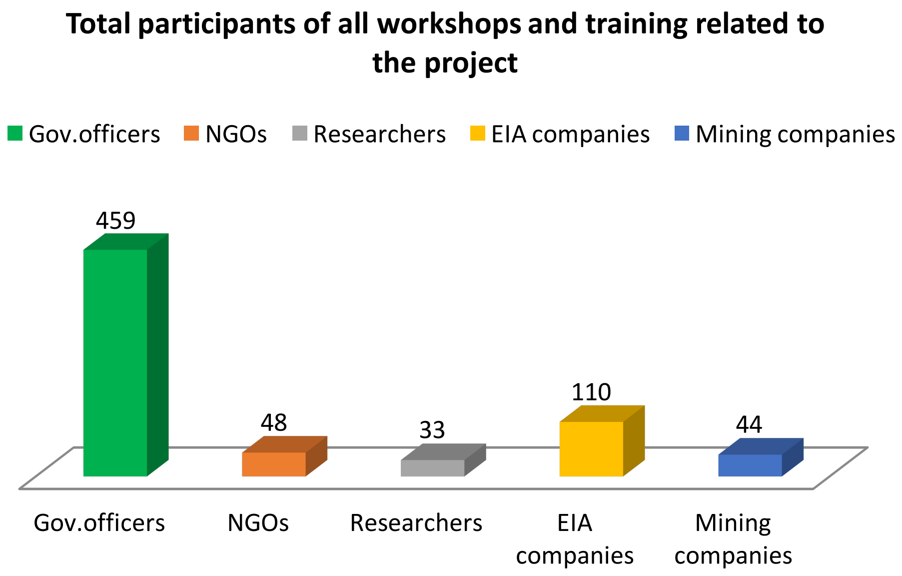

Figure 5: Stakeholders in workshops and trainings

A. Inception Workshop

The project inception meeting was held in the Ministry of Environment and Green Development (MEGDT) offices in Ulaanbaatar for a full day on December 4, 2014. The goals of the inception meeting were to review the Scope of Work and revise it as necessary, to identify any other stakeholders beyond MEGDT (such as the Ministry of Transportation) in the Mongolian government, and to review the ideal qualifications for trainees for the GIS/connectivity, Mitigation Design Tool and Soil Assessment training courses.

Opening remarks from MEGDT and EBRD stressed the importance of the project's resulting in tangible outputs related to the government's capacity to implement its mitigation policy in the mining sector, and that this capacity be developed in a way to be self-sustaining within the ministry. Participants held detailed discussions on each of the project components and revised the scope of work and timing of deliverables in a subsequent exchange of correspondence. (See Appendix 1: Report on Inception Workshop).

B. Offset Roundtables

On September 23, 2015 we organized the first roundtable meeting entitled "Mongolian Offsets: Roundtable" in Ulaanbaatar to discuss offset planning and implementation, advance stakeholder engagement, intensify implementation, and share challenges and achievements. Participants included officers from MEGDT; Jeff Jeter from EBRD; Michael Looker, TNC Director of Regional Strategies and Infrastructure; representatives from mining and EIA companies, scientists and conservation NGOs (30 participants in all). Mr. Jeter reviewed biodiversity conservation and mitigation hierarchy principles and Mr. Looker discussed best international practices for mitigation. A second roundtable was conducted in January 2016 with more than 20 people participating, representing MEGDT, scientists, NGOs, mining companies, and EIA companies. The following are summaries of major issues and concerns raised by the roundtable discussions:

1. Stakeholders organize an NPI roundtable meeting quarterly to promote biodiversity offset implementation and to share information and practices.
2. Future roundtables divide participants into working groups (scientists and experts; mining companies etc.) to discuss certain topics.
3. An offset consulting organization be established to provide professional consulting service.
4. Stakeholders cooperate to explore best international practices. As a start, we should translate the Cross Sector Biodiversity Initiative's white papers on "Cross-Sectoral Guidelines for Implementing Mitigation Hierarchy" and "Good Practices for the Collection of Biodiversity Baseline Data".
5. Stakeholders should create a webpage or social media account to update and share information with interested groups regularly.
6. Stakeholders should develop an annual work plan.
7. Outreach should be conducted to wider range of stakeholders.

C. Facebook Group

Following the roundtable discussions, we created a Facebook group to enable participants to communicate and exchange ideas. We opened the Facebook page **NPI Mongolia /https://www.facebook.com/NPI-Mongolia-1552978878346002/?fref=nf/** and a blog **NPI (Net Positive Impact) Mongolia /http://npi-mongolia.blogspot.com/** to share information about biodiversity offsetting with each other.

D. Gobi Offsets Stakeholder Conference

In April 2016 a South Gobi Biodiversity Offset conference was organized by MEGDT, Omnogobi Province and The Nature Conservancy. The main goal and objectives of the conference was to bring all primary and secondary stakeholders together to come to a common understanding about biodiversity offset issues and challenges. The conference was attended by wide range of people from different fields that include national and local government representatives, local communities, herder group members, private sectors, NGOs, scientist and experts. Stakeholders highlighted multiple times that it was an important meeting to bring together every related stakeholders at one table to gain a common understanding, share opinions and challenges in implementing biodiversity offsets.

MEGDT presented on the Mongolian offset legal framework and implementation, and Omnogobi province Environment and Tourism department presented about their policies and principles. TNC presented the Offset Guidelines and Mitigation Design Tool. Five mining companies— Southgobi Sands, Osoh zoos, Monkh Noyon Suvraga, Oyu Tolgoi and Mongolyn Alt—that operate in Omnogobi province presented on their offset plans and activities. Dr. Batsaikhan from the National University presented on the importance of conservation and what offsets can offer to protected areas in a manner that was accessible to the community stakeholders present. The conference reviewed current gaps and challenges in implementing the offset guidelines in South Gobi and made recommendations for improving compliance.

E. Learning Exchange to United States

In January 2016 TNC hosted a 6-member government delegation headed by Mr. Dejid Rinzaan, Director of Environment and Natural Resources Management Department, MEGDT on a learning exchange in Arlington, VA and field visits to mitigation sites near New Orleans, Louisiana. The purposes of the Mitigation Learning Exchange were to learn about the recent changes to US government mitigation policy, better understand The Nature Conservancy Mitigation Principles and to discuss major issues that need to be addressed in the new biodiversity offset regulation of Mongolia. In addition to the participation of TNC staff, US government officials from the Bureau of Land Management and the Environmental Protection Agency presented to the Mongolian delegation.

F. Final Workshop

A final wrap-up workshop for the project was held May 18, 2016 in Ulaanbaatar with 75 participants from the government, international agencies, corporations and NGOs (see Annex L for agenda and list of participants). It was chaired by Mr. Tsogtsaikhan, Director General, Department of Monitoring-analysis, assessment, internal audition, MEGDT. The workshop included presentations on the major outputs of the project as well as panel discussions on the future of offset implementation in South Gobi and Mongolia as whole, connectivity conservation, and a discussion of next steps to build on the accomplishments of the project. Many participants commended the work of all stakeholders in the project and expressed their satisfaction at the project's achievements, but noted that follow-up funding and activities would be important to cement these gains and continue efforts on offset implementation for sustainable development in Mongolia.

IV. Training and Capacity Building Outputs

A. Use of Mitigation Design Tool

Training and capacity building in support of the MDT was accomplished in four ways: 1) documentation/tutorials, 2) presentations/demonstrations, 3) training, and 4) creation of the MMDT Web Portal.

Documents and Tutorials

The GIS_PPC document, available for download in either English or Mongolian at the MMDT Web Portal, provides all the background information and descriptions associated with following the MOG and how the outlined process steps were incorporated into the MDT applications. Additionally it has two step-by-step tutorials for users to follow and understand how to apply either the MDT-Desktop or MDT-Web applications. These tutorials have associated spatial data that are used while the user learns how to use all of the tools available in each application. The MDT-Web tutorial guides users on applying QGIS, a free and open-source GIS, to create land disturbance data and then shows the user how to apply these data within the application. Since the MDT-Desktop is built upon ESRI's ArcGIS platform, this tutorial illustrates how to apply all tools within this environment. Other documents were created throughout this project (see Table 1) and provided either detailed help documentation on each tool or provided MEGDT with the development plan prior to the application being built.

Table 2. Capacity building documents produced for MDT with brief descriptions.

Document	Document Description
GIS Protocols and Procedures for Compliance with the Mongolian Offset Regulation using the Mitigation Design Tool (GIS_PPC).	Provides all standards, data requirements, data descriptions and GIS methods used by both MDT applications. Also provides tutorials for using either application (English & Mongolian version available).
MDT – Desktop Help Documentation	Full documentation for using MDT – Desktop application within ArcGIS (English & Mongolian version available)
MDT – Web Help Documentation	Full documentation for using MDT – Web application (English & Mongolian version available)
Application Development Plan for MDT- Desktop	Initial plan for development when creating Gobi only version of application (English only).
Application Development Plan for MDT-Web	Initial plan for development when creating Gobi only version of application (English only).
MDT – Locational Offset Database Development	All procedures used in creating the Locational Offset Database. Also placed as an Appendix within the GIS_PPC document (English only).

Originally training identified for this effort was only scheduled to occur only at the end of the project. Due however to expanding both the supporting computing environment (i.e. desktop and web) and geography (i.e. Mongolia-wide), it was necessary to hold training during and at the end of the project. Overall four one-day trainings were held with one session being in Sept 2015 and the other in March 2016 (Table 3). The first training session done in Sept 2015 focused on providing background regarding the GIS methods and procedures being employed by the MDT applications. The second training done March 2016 focused more on the use of both applications and gave users an opportunity to work with TNC staff to specifically apply the tool for specific development plans they are working on. All trainings occurred at the Mongolia National University GIS lab and were interactive by providing students with lectures and exercises. All training materials were provided to students digitally via individual USB drives given to students at the training. This allowed for those being trained to share their information with others and further expand the knowledge of the applications. Detailed descriptions of these trainings and a listing of participants can be found in the two training reports produced for each training sessions.

Table 3. MDT Training provided by TNC

Training Date	Trainees
September 8, 2015	Federal and Provincial Government Regulators and NGOs
September 9, 2015	EIA Consultants and Mining Companies
December 4, 2016	EIA Consultants
March 30, 2016	EIA Consultants and Mining Companies
March 31, 2016	Federal and Provincial Government Regulators

September 8, 2015	Federal and Provincial Government Regulators and NGOs
September 9, 2015	EIA Consultants and Mining Companies
March 30, 2016	Federal and Provincial Government Regulators
March 31, 2016	EIA Consultants and Mining Companies

B. Landscape modeling and connectivity analysis

Training was provided in landscape modeling using Circuitscape software (McRae et al. 2013), including a self-paced tutorial (translated in Mongolian). This training was delivered by Brad McRae, the developer of Circuitscape, in September 2015 to GIS and wildlife staff from MEGDT, Administration for Land Affairs, Geodesy and Cartography (ALAGAC), the Mongolian Academy of Science, the National University of Mongolia, National Meteorology Agency (NMA), Dornogovi Department of Environment and Tourism (ETD) and Department of Land Affairs and Urban Development (DLAUD), Khovd ETD and DLAUD, Khentii DLAUD and Altai Tavan Bogd National Protected Area (NPA). See Annex H for the tutorial document, a link to tutorial datasets and a list of participants in the September 2015 training.

C. Assessment of regional soil conditions in the mineralized zones of the Gobi Desert

The development of mining projects in the Gobi and elsewhere in Mongolia will have unavoidable impacts on soil conditions and thus on the entire ecosystem they support: from plants to animals and humans and including impacts on water and air resources. Reclamation of mined areas will be highly dependent on identification and preservation of suitable soils during the mining process and utilization of these materials appropriately.

During September of 2015, Stephen Williams (PhD) and Ariunaa Jalsrai (PhD) provided training in reclamation of disturbed sites to 23 student-trainees that were all employees of MEGDT. Williams provided the training structure including classroom events and field trips. Jalsrai provided interpretation, class room assistance and assistance in the field. The focus of this training was the soil resource and how it should be preserved during mining and how it is used during reclamation. Training was conducted at the conference facility at Hustai National Park, at locations inside and nearby the National Park as well as at locations in the Tavan Tolgoi mining district of South Central Mongolia.

The goals of this training were to provide training to staff members from MEGDT on the methods for evaluating possible soil contamination resulting from development of mining projects in this area. The training included identification of soils that are suitable for reclamation of the mined areas after mining has been completed. The training also covered strategies for developing soil sampling plans as well as analytical methods that can be used (including in field tests and laboratory support) to determine soil quality. Quality assurance/quality control methods, especially of soil analysis, were also a part of the training as well as data interpretation and analysis.

This training included classroom training sessions and field sampling programs. The sampling exercise allowed collection of samples that were tested as much as possible in the field but also submitted to an analytical lab to establish baseline soil conditions. For this exercise, the class was divided into multiple groups to sample different soils. However all of the groups were exposed to all sites sampled in a given area. All of the trainees were involved in sampling and field analysis. Further, there was coordination with several mining companies, to arrange for their participation. The samples collected by the student-trainees were also sent to two analytical laboratories for testing: one in Mongolia and one in the United States. This was done to confirm the finding of the student-trainees in the field as well assurance of the data quality from the Mongolian and USA laboratories.

The consultant organized a workshop where the student-trainees presented group plans for post-mining reclamation. This was done as group exercises where each group submitted a preliminary plan for reclamation of a particular mine site. The ultimate objective of this task was to provide these student-trainees, all being MEGDT employees, with the background and capabilities to recommend and monitor reclamation efforts related to the mining sector.

Part of this training was to provide an overview of environments typical of Mongolian environments that are likely to be disturbed during mineral extraction and energy development. Attention was given to the role that soils have as components of ecosystems and how they can be stockpiled during disturbance and then used later. Restoration of lightly disturbed sites was addressed as well as reclamation of heavily disturbed site.

Disturbance of soils can lead to situations that resist reclamation and may lead to toxic materials being released into the soil nutrient pools that supports ecosystems (e.g. plants and grazing organisms). These toxic materials may include heavy metals (e.g. Mercury, lead, copper, and others) as well as non-metals (e.g. Selenium, Sulfate). Evaluation of soil contamination during disturbance was addressed in this training.

The work done by the Consultant and submitted in the final report also includes a section on proposed reclamation standards for Mongolia. This is a brief report and presents general standards. More specific standards need to be developed in the future. An appendix to the report also contains all of the soil analysis done by the student-trainees, by the Mongolian soils lab and by the USA soils lab. Statistical analyses comparing these findings are a part of the full report.

D. Equipment Purchased and Transferred to MEGDT

Though equipment transfer was not provided for in the original contract or project budget, TNC purchased and transferred one Phantom-2 Vision drone and two Trimble field computers to MEGDT in the course of the project. The value of this equipment was approximately US $7000.

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VI. List of Annexes

A. Inception workshop report

B. Mitigation Design Tool Report

C. GIS Protocols and Procedures for Compliance with the Mongolian Offset Guidelines using the Mitigation Design Tool

D. Connectivity Report and GIS Database contents

E. Traffic Considerations

F. Stakeholder Engagement Report

G. MDT Training Report 1

H. MDT Training Report 2

I. GIS/Connectivity Training Report

J. Soil training report

K. List of equipment provided

L. Final workshop agenda and participants