Project Report for
Task 1b: Create a Web-based Mitigation Design Tool
&
Task 4i: Training and Capacity Building for use of the Mitigation Design Tool

Introduction

Within Mongolia, any proposed projects which 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 and Green Development – MEGD) 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 their 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.

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 the Mongolian Offset Guidelines (MOG). This regulation also provides a methodology for companies to estimate a compensation value which 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. To meet this implementation gap, The Nature Conservancy (TNC) in partnership with MEGD created the Mongolian Mitigation Design Tool (MDT).   This endeavour was part of a larger effort of building capacity within MEGD to support landscape-level conservation in the southern Gobi and was directly financed by the European Bank for Reconstruction and Development (EBRD) Shareholders Special Funds.   The remainder of this document focuses on the results associated with the MDT, more specifically the two tasks initially presented within the EBRD proposal; Task 1b: Creating a Web-based Mitigation Design Tool, and Task 4i: Training and Capacity Building for use of the Mitigation Design Tool.

Project Task Results

Task 1b: Creating a Web-based Mitigation Design Tool

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 MEGD 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 of 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 (Fig. 1) 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

Fig. 1 MDT-Desktop application

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 develoment. 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 zipfile 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.
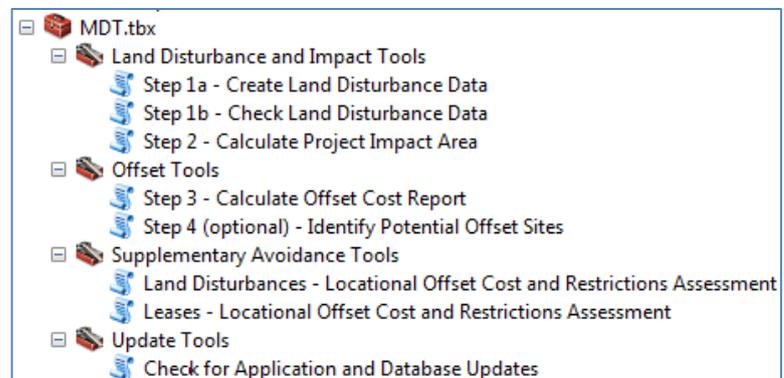
MDT - Web

The web-based mitigation tool (Fig. 2) allows users via the Internet to produce data and reports necessary to comply fully with the MOG while at the same time apply mitigation principals. 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.
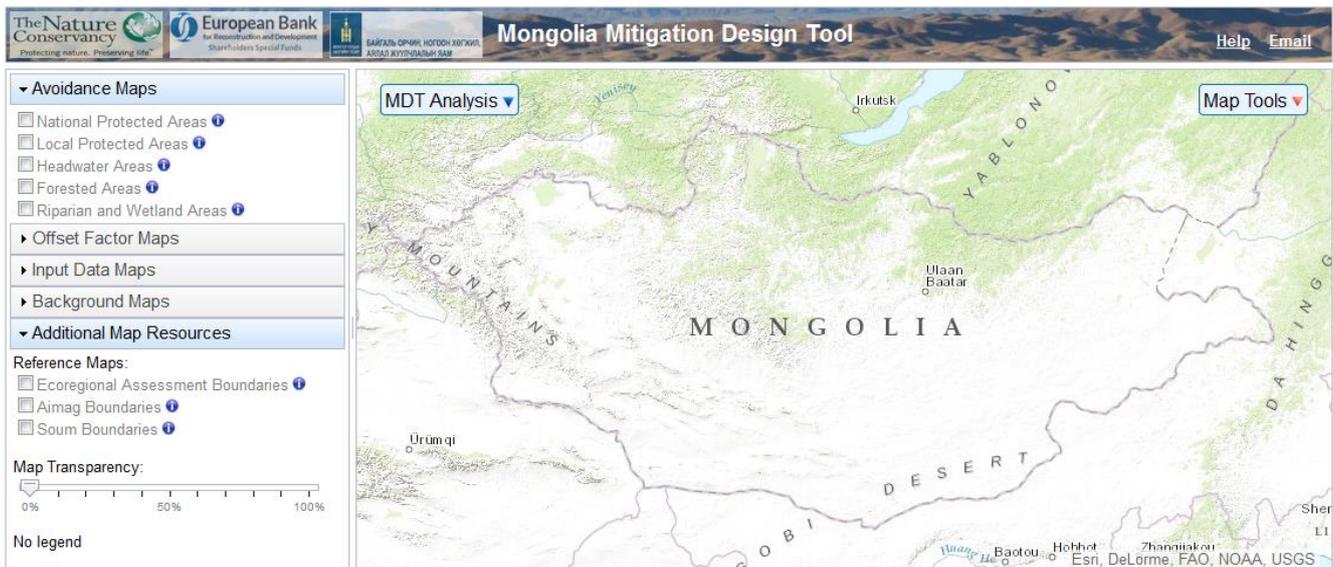
Fig. 2 MDT-Web application

Task 4i: Training and Capacity Building for use of the 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

 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

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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 which 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 MEGD with the development plan prior to the application being built.

Table 1. 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).

Presentations and Demonstrations

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 2. Presentations given associated with MDT

Presentation	Date	Audience
EBRD Project Planning	Dec. 2014	TNC, EBRD, MEGD
MDT Update	Sept. 2015	MEGD Managers
MDT Update	Dev.2015	EIA companies
MDT Update	Jan. 2016	MEGD Managers and Provincial regulators
MDT Update	Mar. 2016	MEGD Managers and Provincial regulators
MDT Update	Apr.2016	Omnogobi, Dornogobi – provincial regulators

Training

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
March 30, 2016	Federal and Provincial Government Regulators
March 31, 2016	EIA Consultants and Mining Companies

Mongolia Mitigation Design Tool Web Portal

Finally the MMDT Web Portal was developed to aid TNC in distributing all information, data and applications produced by this effort (Fig. 3). 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.
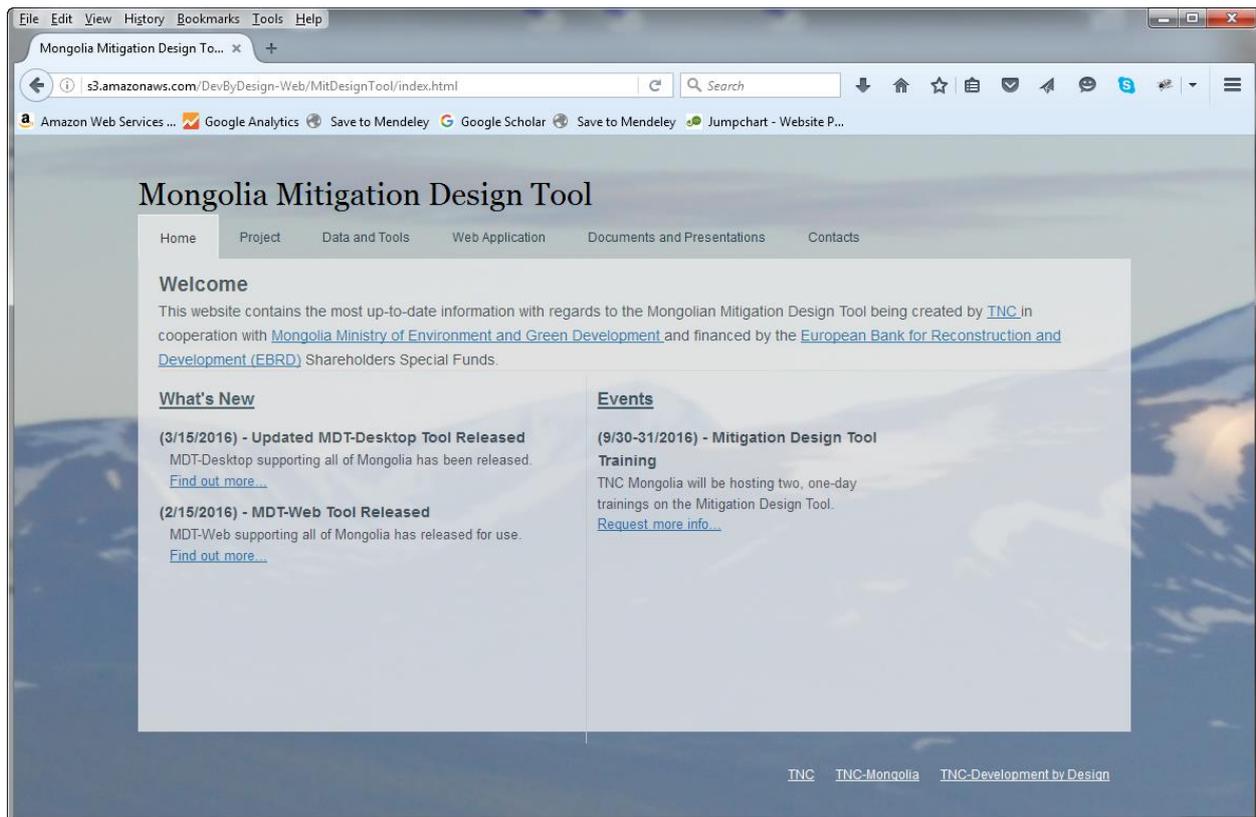
Fig. 3 Homepage for Mongolia Mitigation Design Tool web portal

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 MEGD will need to find a methodology to continue this maintenance.   Discussions between Mongolia TNC and MEGD 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, additional requests and functionality is enviably going to be asked by users. 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 MEGD will need to incorporate this into their long-range maintenance vision of the MDT.