Evaluation of the Environmental and Social Impact Assessment (ESIA) for the Oyu Tolgoi Copper and Gold Project

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October 2012

ELAW appreciates the opportunity to comment on the Environmental and Social Impact Assessment (ESIA) for the Oyu Tolgoi Copper and Gold Project. ELAW provides this technical review of the ESIA.

What follows is a discussion of several major flaws in the environmental analysis presented by the project proponent.

1. The project proponent should employ dry tailings disposal; failure to do so greatly increases the adverse environmental and social impacts of the project

As noted in the Guidebook for Evaluating Mining Project EIAs[1]:

> "Mine tailings are a high-volume waste that often contain toxic substances in high concentrations. There are three main alternatives for the disposal of tailings: (1) use of a wet tailings impoundment facility or 'tailings pond'; (2) dewatering and disposal of dry tailings as paste backfill or 'dry tailings disposal'; and (3) the release of tailings into the deep sea via a long pipeline or 'submarine tailings disposal.' <u>Of these alternatives, the clear choice for the environment is dry tailings disposal</u>.

Dry tailings disposal is the best choice from an environmental standpoint because it: 1) enhances the efficiency of water reuse; 2) involves a much smaller environmental footprint than other tailings disposal alternatives; a dry tailings disposal facility covers a much smaller area than a wet tailings impoundment facility; and 3) promotes the backfilling of open pits, facilitating the return of open pits to pre-mining conditions. Furthermore, if dry tailings are used as backfill, then dry tailings disposal facilities can themselves be returned to pre-mining conditions. Finally, unlike wet tailings impoundments, dry tailings disposal facilities cannot catastrophically fail.[2]

Despite all of the advantages of dry tailings disposal, the ESIA for the Oyu Tolgoi copper and gold Project has dismissed this option, favoring instead a conventional wet tailings impoundment facility. Section 5.6.2 (Tailings Management Options) of Chapter A5 of the ESIA states:

> "Tailings management options were evaluated in terms of paste (thickened and semi-solid) tailings and conventional (wet slurry) tailings, location of spigot and pond size and location[28]. Key points from the options analysis were as follows: ….
>
> - The evaluation indicated that although the use of paste was recognised as preferable due to the potential increased water recovery and savings, the review of alternatives concluded that conventional tailings was the most appropriate tailings management option. The reasons were due to operational constraints; there were significant concerns related to paste distribution and deposition in the TSF during severe winter

[1] Environmental Law Alliance Worldwide (2010) "Guidebook for Evaluating Mining Project EIAs," at page 29. http://www.elaw.org/mining-eia-guidebook

[2] For a more detailed discussion of the environmental advantages of dry tailings disposal, see: Verburg, R.B.M (2001) "Use of Paste Technology for Tailings Disposal: Potential Environmental Benefits and Requirements for Geochemical Characterization." IMWA Symposium 2001. http://www.imwa.info/docs/BeloHorizonte/UseofPaste.pdf

conditions and the difficulties of recommencing tailings pipeline flow after an interruption in winter if paste was used."

References 28 and 29 provided in the ESIA to support the company's claim that "conventional tailings [is] the most appropriate tailings management option" are as follows:

28 - Oyu Tolgoi (2009), Mongolian Feasibility Study, Attachment Section 10, Process - Tailings Storage Facility Subsection 7

29 - Golder (2005): Draft Report on "Review of Feasibility Design, Tailing Storage Facility, Oyu Tolgoi Project Mongolia" Project No 05-1362-126, Prepared by Golder Associated Ltd., May 2005

Regrettably, these key documents are not available as part of this ESIA. These key documents are not available in an appendix. These documents are not available from the project proponent's website. These documents do not seem to be publicly available anywhere. The fact that these key documents are not publicly available makes it impossible to independently verify the company's claim that conventional tailings is the most appropriate tailings management option.[3] Because the company is not providing these documents, we are left with only with this single-sentence explanation in the ESIA: "significant concerns related to paste distribution and deposition in the TSF during severe winter conditions and the difficulties of recommencing tailings pipeline flow after an interruption in winter if paste was used."

It is certainly true that the location of the Oyu Tolgoi project experiences very cold winter conditions. According to Chapter B2 of the ESIA (Climate and Climate Change): "The average temperature in … January, the coldest month of the year, -11.3˚C."

However, very cold winter conditions are not considered elsewhere to be a barrier to the use of dry tailings disposal. On the contrary, cold and arid locations are considered to strongly favor the use of dry tailings disposal over other tailings disposal options. According to a recent review of the increased application of dry/paste tailings disposal by the mining industry[4]:

"Each project needs to assess the potential applicability for filtered tailings based upon technical, economical and regulatory constraints. Experience shows the most applicable projects are those that have one or more of the following attributes:

"1. Reside in arid regions, where water conservation is crucial (e.g. Western Australia, Southwest United States, much of Africa, many regions of South America, arctic regions of Canada and Russia)

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[3] The only other document available on the project proponent's website where alternative tailings disposal options are discussed is the 2006 Oyu Tolgoi Mining and Processing EIA,[3] which states in Section 2.4 Project Alternatives: "The combined use of high-compression thickeners to increase the deposition density of tailings and of decant towers to reduce the size of the tailings pond area has the potential to reduce make-up water requirements and thereby reduce the water demand form the Gunii Hooloi well field. These water saving opportunities increase the rate of recirculation of process water and investigations are continuing as to the feasibility and cost implications."

[4] Davies, M. (2011) "Filtered dry stacked tailings – The fundamentals. In Proceedings of Tailings and Mine Waste." 2011: Vancouver, BC (emphasis added). http://www.infomine.com/publications/docs/Davies2011.pdf

> "2. Have flow sheets where economic recovery (commodity or process agent(s)) is enhanced by tailings filtration
> "3. Reside in areas where very high seismicity contraindicates some forms of conventional tailings impoundments
> "4. Reside in cold regions, where water handling is very difficult in winter
> "5. Have topographic considerations that exclude conventional dam construction and/or viable storage to dam material volume ratios
> "6. The operating and/or closure liability of a conventional tailings impoundment are in excess of the incremental increase to develop a dry stack.

> "To date, the two most common reasons to select dry stacked filtered tailings as a management option have been to recover water for process water supply and where terrain/foundation conditions contraindicate conventional impoundments. The recovery of water is particularly important in arid environments were water is an extremely valuable resource and the water supply is regulated (e.g. Chile, Western Australia, and Mexico). This recovery of water has a cost benefit to the project, which offsets the capital and operating cost of the tailings system. It should be noted that water surcharge storage needs to be factored in to the design of a filtered tailings system. Depending upon the application this can be a small water supply reservoir or tank. Where water is relatively scarce, either year round or seasonally due to extreme cold, sending immense quantities of water to quasi-permanent storage in the voids of a conventional impoundment can severely hamper project feasibility. By reclaiming the bulk of the process water in or near the mill, far more efficient recycle is achieved Moreover, the amount of water "stored" in a dry stack facility will be typically >25 to 50% less than that in a conventional slurried impoundment even if 100% pond reclaim efficiency is achieved with the impoundment." (Emphasis added).

For example, mining projects in the territory of Nunuvut, Canada, must cope with average annual temperatures of -11.3˚C.[5] A recent report evaluating tailings disposal options for mining projects in Nunuvut states:

> "This report covers a variety of issues related to tailings management facilities and associated infrastructure with the growing concerns of climate change in Nunavut. Dry stacking combined with backfilling and/or open pit disposal are recommended as the tailings disposal techniques for future mining endeavours. These disposal methods are deemed to be the best practices for tailings disposal in Nunavut. Dry stacking is recommended for its environmental benefits of containing hazardous waste through freezing in Nunavut's cold temperatures, in both the short and long-term and the reduced footprints that are left behind. In addition, dry stacking avoids the perpetual risk surrounding other methods that require dams, which have limited lifespans, particularly with the degradation of the underlying permafrost that would occur as the climate warms."[6]

Therefore, the project proponent's claim that "severe winter conditions" at the Oyu Tolgoi location would cause serious concerns about using this option for the Oyu Tolgoi project simply lacks

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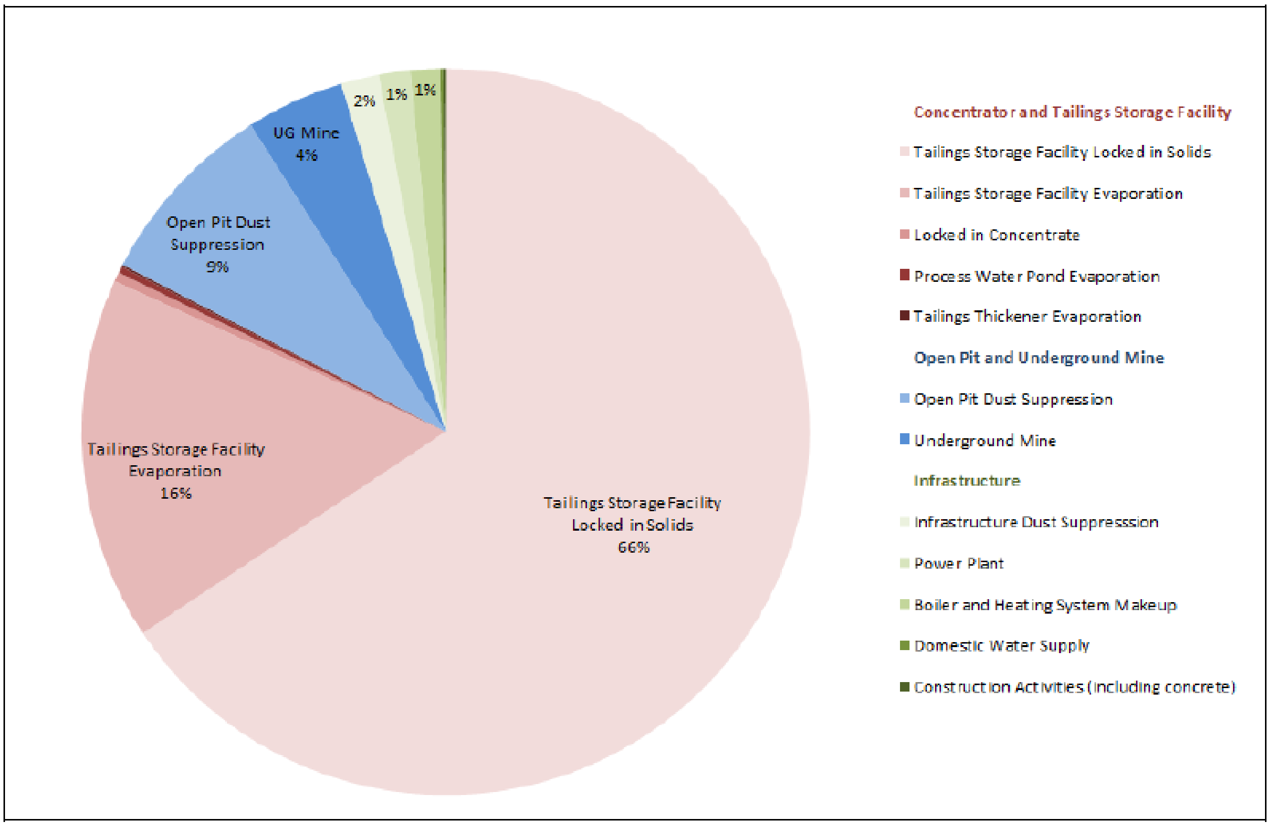
[5] Journeaux Associates (2012) "Engineering Challenges for Tailings Management Facilities and Associated Infrastructe with regard to Climate Change In Nunuvut." http://www.climatechangenunavut.ca/sites/default/files/tailings_final.pdf
[6] Ibid, at pages 93-94 (emphasis added).

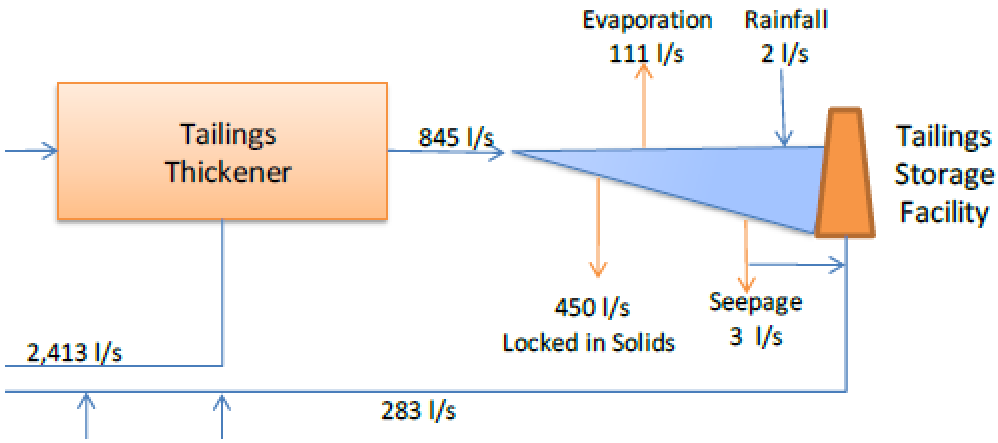
credibility, especially in light of the fact that the company is not making publicly available the key documents supporting its claim.

If the company were to choose dry stacking as its tailings disposal option, the social and environmental benefits would be tremendous.

First, employing dry tailings disposal would greatly reduce the project's water demand. Figure 5.22 on page 55 of Chapter C5 of the ESIA shows that over 80% of the project's water losses will be associated with the choice of conventional tailings disposal and the associated tailings storage facility (see following page). Figure 5.23 of the ESIA on the following page of the ESIA shows that 450 liters per second would be locked into wet tailings and a further 111 liters per second would be lost from the wet tailings impoundment by evaporation.

Figure 5.22: Water Losses as a Percentage





What is so significant about these figures is that the combined losses from the tailings storage facility of 561 liters per second represents over 90% of the proposed groundwater abstraction for the project (620 liters per second). If water scarcity is a concern for this project, then the option of dry tailings disposal is an imperative.

Second, employing dry tailings disposal would allow backfilling of the open pits and underground workings. Despite the immense environmental benefits of backfilling mined areas as part of mine closure, the company is not proposing to do so. Because the ESIA released in 2012 contains no details about how the company would close the open pit and underground workings (see further discussion below), we are left to rely on these details in the 2006 Oyu Tolgoi Mining and Processing EIA, which state:

> "The general components of the reclamation program are summarized as follows:
>
> • Allow the underground workings to naturally flood over time after all potentially hazardous materials have been removed to surface. The shaft and raise openings to surface will be permanently blocked using reinforced concrete caps
>
> • Allow the Central and Southwest Open Pits to partially re-flood creating a permanent local groundwater sink and collection pond for runoff and toe seepage from the open pit waste rock dumps. Install a protective berm around the high wall to protect inadvertent access to the pit rim
>
> • Drain the supernatant pond off of the TSF, allow the TSF to dry out and cap the surface with a thin layer of coarse NAF waste rock to prevent future wind erosion of the contained tailings sands."[7]

Allowing the open pits and underground workings to flood poses the risk of serious long-term environmental hazards. Employing dry tailings disposal would enable the project proponent to backfill these areas, reducing long-term environmental hazards and enable to project proponent to achieve its stated goal (on page 2 of Section D21 of the ESIA : "to return the maximum amount of disturbed land to conditions suitable for nomadic herdsmen and their grazing animals."

Third, employing dry tailings disposal would obviate the need for a wet tailings impoundment facility, avoiding the irreversible degradation of a large land area. According to Section 4.8.4 of

[7] 2006 Oyu Tolgoi Mining and Processing EIA, at page I-62.

Chapter A5 of the EISA, two wet tailings impoundment facilities totaling 4 square kilometers would be built for the permanent storage of tailings. If dry tailings disposal facilities were used instead, they would disrupt significantly less land area and would result in only temporary degradation of land if dry tailings were returned to the open pits when active mining ceases.

2. The project carries a high risk of creating regional water scarcity

There is a wide agreement that the water demands of the Oyu Tolgoi mining project represent a threat to the availability of clean water for communities of the Southern Gobi desert, which will likely experience large growth. The key question is whether the cumulative impact of the Oyu Tolgoi mining project will cause water scarcity over the 27-year life of the project and beyond. According to a recent trip report of USAID staff to the project area:

> "The availability of water is the single greatest constraint for mining activities in the South Gobi. This region has limited rainfall and no perennial surface water bodies, thus inhabitants, livestock and wildlife are dependent almost exclusively on some permanent springs, and shallow and deep groundwater wells that are recharged by rain and snow. Deeper aquifers, many containing fossil water, will be used to supply the large quantities of water required for mining and mineral processing. ….
>
> "A recent WB Southern Gobi Regional Environmental Assessment stated that based on conservative assumptions the groundwater potential is 500,000 cubic meters/day for 25 -40 years. <u>The majority of this is fossil groundwater which is not replenished</u>. About 285,000 cubic meters/day can be withdrawn from the Southern Gobi Region's shallow aquifers altogether, assuming a conservative recharge rate of 1 millimeter per year. This rate of recharge is estimated to only add 1,000 cubic meters of new water a year. Shallow aquifers are vulnerable to pollution from wastewater, leachate from solid waste dumps and chemical spills. ….
>
> "The same WB Assessment estimated that approximately 240,000 cubic meters/day of water is required for existing and near term mining and mineral processing operations. The present total water consumption for rural/urban and livestock is approximately 40,000 cubic meters/day. Based on these conservative assumptions, there is enough groundwater to sustain projected development in the Southern Gobi Region until 2020."[8]

Once the Oyu Tolgoi mining project commences, it would continue for the estimated 27 year-life of the project, or until roughly 2040. The project would likely induce development and population growth that would persist for decades. Therefore, the key question is: Will there be enough groundwater to sustain projected development in the Southern Gobi Region until 2040 and beyond?

2.1. Future water availability rests on the unproven assumption that abstracting water from deeper aquifers would not deplete shallow aquifers

Decisions to move forward with the Oyu Tolgoi project are being made despite lack of essential information about water resources in the area. According to the USAID:

[8] USAID "Mongolia - Oyu Tolgoi Copper/Gold/Silver Mine Project Trip Report (May-June 2011) ," at pages 8-9. http://mongolia.usaid.gov/wp-content/uploads/Mongolia-Oyu-Tolgoi-Trip-Report.pdf

> "A complete analysis of groundwater availability is not available. The Russians did piecemeal assessments, but the information is scattered among different entities. It is estimated that it will take approximately two years to do a complete analysis. In the meantime, new estimates of groundwater availability continue to change as new information becomes available as mining companies continue to explore and update groundwater models."[9]

One of the most critical pieces of missing information is whether the company's plans to abstract water from a deep saline aquifer (the Gunii Hooli aquifer system) would deplete freshwater in shallow aquifers on which communities rely. According to the USAID:

> "Mining companies are planning on using deep aquifers since there will be less competition from herders and more volume of water. <u>Mining companies state that there is no communication between the shallow and deep aquifers however, if pressed, there is no proven evidence in the public domain to validate their claim</u>."[10]

The ESIA does not supply the missing evidence that there is no communication between shallow and deep aquifers in the project. Instead, the following assessment is presented, in which evidence of hydraulic connections between shallow and deep aquifers in the project are admitted:

> "Impacts from the dewatering of the Gunii Hooloi aquifer on the shallow and near-surface aquifers will occur only if there is sufficient hydraulic connection between the localized shallow and the regional deep aquifer. <u>The impact could occur through enhanced vertical leakage through the overlying low permeability formations. Similarly impacts could occur where there is a connection created by a borehole (either deep, and screened through shallow sediments, or shallow and penetrating the deeper, upper aquifer horizon)</u>.
>
> "The modelling undertaken by Oyu Tolgoi has taken account of leakage from the upper formations into the main aquifer to assess water supply potential, and will be refined further during 2012 to assess leakage through the whole upper formation to the surface. This will allow the influence of the pumping on the very shallow aquifers in the ephemeral systems used by the herders to be included in the model. Given the thick sequences of relatively low permeability clays at basin margins, the current conceptualisation indicates that there is unlikely to be significant leakage from the shallow alluvial aquifers used by the hand-dug herder wells, and where any such leakage occurs it will induce water level changes which are orders of magnitude less than that caused by the herders use and seasonal recharge of the shallow sediments within the stream beds. <u>The exception to this is the single deeper drilled well at the eastern extent of the system, and given the depth in this well and more limited aquicludes system, there may be an impact and this will require close monitoring and management</u>."[11]

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[9] Ibid.
[10] Ibid.
[11] ESIA for the Oyu Tolgoi Copper and Gold project, Chapter C5 at page 28.

2.2. Future water availability rests on unproven assumptions that additional water supply projects would be feasible and successful

According to the USAID:

> "Given the known mineral resources in the area, and continual discovery of new reserves, including a site 40 km north of OT – there is concern whether there will be enough groundwater for not only current and future mining operations, including coal-fired power plants, but also for the growth of the soum centers with associated development activities. An analysis has not been undertaken to look at the probable multiple demands on these deep aquifers. Although most stakeholders stated that the idea of transferring water from the north was not in discussion because the northern lakes are drying up, the GoM is still considering this option and is actively pursuing discussions with outside developers."[12]

Providing water for the growth of soum centers with associated development activities poses a different and greater challenge than providing water for additional mining projects; while additional mining projects, like the Oyu Tolgoi project, can make do with relatively saline water from deep aquifers, people require clean water with very low salinities that is only available from surface water or shallow aquifers. Chapter C13 (Cumulative Impacts) of the ESIA presents the following assessment:

> "The extent of underground water resources in Southern Mongolia is not known with any precision; however it is considered that fossil groundwater is the most extensive resource. "It appears that there is sufficient groundwater potential to accommodate demand growth until at least 2020. Based on a fairly high estimate of possible demand growth, the demand for water resources in Southern Mongolia could grow from the current consumption of around 50,000 m3/day to around 350,000 m3/day in 2020. A conservative estimate of the extent of water resources in the area suggests there is groundwater potential for 500,000 m3/day (this figure varies between the different regional studies).
>
> "Development of a water supply system relying on the abstraction of groundwater reserves could cost in the order of US$ 260 million, of which around US$ 35 million would be required for investigative studies and drilling to identify reliable wells.
>
> "An alternative option would be to supply Southern Mongolia with surface water, piped from either the Kherlen or the Orhon Rivers. The capital cost of these options would be at least US$ 400 million each. This option is not supported by Oyu Tolgoi on economic, environmental and political grounds.
>
> "The option of groundwater supply is preferable not only because it is cheaper, but because the capital costs can be spread across time and space, as particular mining and town developments proceed. Environmental issues associated with the use of surface water are also likely to be highly significant.

[12] USAID "Mongolia - Oyu Tolgoi Copper/Gold/Silver Mine Project Trip Report (May-June 2011)," at page 9. http://mongolia.usaid.gov/wp-content/uploads/Mongolia-Oyu-Tolgoi-Trip-Report.pdf

> "There may eventually be a need for the construction of water pipelines from the Kherlen or Orhon Rivers. But over the next decade the priority will be to rely on groundwater resources in the region, and to increase knowledge of the extent of those resources through a programme of studies and drilling. It is likely that additional studies will reveal additional resources beyond those assumed in the conservative estimate of groundwater potential of 500,000 m3/day."[13]

> "The current population of Khanbogd is expected to increase rapidly from c. 2,000 to 20,000 as the Oyu Tolgoi Project and related services mature. At Khanbogd, the community water supply is envisaged to move from individual and community wells which exploit a shallow aquifer in the soum centre, towards a reticulated system which draws water from a deeper unexploited aquifer system located north of the soum centre. The location and design of the supply wells is currently the subject of on-going studies by Oyu Tolgoi. Groundwater models will be refined to develop a sustainable supply system (inferred to be recharged annually by rainfall on Khanbogd and Duruji Mountain) which will link into a reticulated water supply designed by others. The design will aim to avoid impacts on local herder wells by exploiting a deeper aquifer unit than those used by the herders, and to provide a sustainable water resource for urban development, subject to regulatory approvals."[14]

> "On a regional level, and based on conservative assumptions, there is considered enough groundwater to sustain projected regional development until 2020. There is insufficient information to support an analysis of the detailed spatial distribution of groundwater potential across the South Gobi Region, and, while the aggregate figures cited may give an indication of the overall limits that the Region's water resources may impose on growth, they do not provide a good basis for detailed project planning."[15]

This is highly revealing assessment. First, the project proponent uses 2020 as an endpoint for assessing the adequacy of water supply for the project when, in fact, the life of the project and its induced growth would persist at least until 2040.

Second, although the project proponent correctly acknowledges the desirability of meeting cumulative and induced water demands by abstraction of shallow aquifers, it acknowledges that the location and extent of these shallow aquifers is not presently known.

Third, although the project proponent correctly acknowledges that projects 'to supply Southern Mongolia with surface water, piped from either the Kherlen or the Orhon Rivers' should not be supported on environmental grounds, it admits that 'there may eventually be a need for the construction of water pipelines from the Kherlen or Orhon Rivers.'

At the very least, there is inadequate information about how long-term demand for water can be met, rendering it premature for decision-makers to approve or invest in the Oyu Tolgoi project.

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[13] ESIA for the Oyu Tolgoi Copper and Gold project, Chapter C13, at pages 8-9 (emphasis added).
[14] ESIA for the Oyu Tolgoi Copper and Gold project, Chapter C13, at page 23 (emphasis added).
[15] ESIA for the Oyu Tolgoi Copper and Gold project, Chapter C13, at page 29.

2.3. Future water availability rests on the assumption that mine pit dewatering would not deplete springs on which communities and wildlife rely

According to the recent trip report of USAID staff to the project area:

> "Mine dewatering is also an issue since the resulting cone of depression has the potential to lower the water table. The EIA assumes a radius of 5 km around the mine which will cause shallow wells to dry up. Considerably larger areas of land could be affected by mine dewatering, where lowering of the surface water table will dry up springs and shallow wells."[16]

The ESIA does not contain a satisfactory answer to the question of whether mine pit dewatering would dry up springs. The ESIA presents the following assessment:

> "As the Project moves into operations, the creation of the open pit will result in more extensive dewatering of the quaternary and recent sediments and the underlying weathered and fractured bedrock in the area of the pit, some of which form surficial aquifers. Initial studies were undertaken in 2004-6 to assess the potential impact of the pit and underground mine on the groundwater, using the limited hydrological data available, to provide Oyu Tolgoi with an assessment of the potential worst case water inflows to the pit and assess the area of influence. The modelling used a number of scenarios, which took account of the possibility of subsidence around the underground block caving which could cause the surficial groundwater to flow into the block caving. These models, which used conservative assumptions (e.g. no internal flow barriers and just four modelled units – alluvial, soil, weathered bedrock and bedrock), predicted an ellipsoid cone of depression which was approximately 10 km by 8 km for the 1 m drawdown contour. The 1 m contour was, given the conservative nature of the model, taken as equivalent to the maximum areal extent of any potential drawdown as it was considered to overestimate the extent of any zone of influence of the pit dewatering.
>
> "Since this initial modelling there have been a significant number of additional boreholes drilled, including those used for the construction water supply, which has provided a better appreciation of the layering of the sediments and their relative hydraulic conductivities. Oyu Tolgoi has commissioned a revision of the groundwater model for the mining licence which will include undertaking hydraulic testing on the various formations and other geotechnical testing. This work is underway and a new model will be developed in 2012. As an interim step the original simplistic model has been revisited and re-run using more realistic (lower) hydraulic conductivities based on recent hydraulic testing data gathered from the Mine Licence Area.
>
> "This re-run of the model predicted a smaller cone of depression, with the 1 m drawdown contour being approximately 5 km from the mine at the end of the open pit mining extending beneath the WRD and a section of the Undai and its diversion, and the majority of the TSF. The 1 m drawdown contour in the interim model is also used as an approximation to the maximum extent of any drawdown as the hydrogeological data used in this model is

[16] USAID "Mongolia - Oyu Tolgoi Copper/Gold/Silver Mine Project Trip Report (May-June 2011)," at page 13 (emphasis added). http://mongolia.usaid.gov/wp-content/uploads/Mongolia-Oyu-Tolgoi-Trip-Report.pdf

> insufficient to refine the outer edge of the groundwater area with greater confidence. Within this area there are no other groundwater users such as herders or springs (other than the Bor Ovoo) or any groundwater dependant flora (see Chapter B7A: Biodiversity Baseline); this reflects the fact that herder wells were relocated from within the area covered by the initial model when a larger area of influence was modeled."[17]

The key deficiency of this assessment is the choice of a 1 meter drawdown contour. While 1 meter may be a sufficient depth to predict impacts to shallow wells, which would in most cases be deeper than 1 meter, it is not of a sufficient depth to predict impacts on springs. Virtually any significant lowering of the groundwater table would interfere with surface water emanating from springs. A drawdown contour of a half-meter or quarter-meter could extend much further than 5 km from the mine and therefore impact surface water emanating from springs over this much larger area.

3. The project proponent has not disclosed essential details of its plans to close and remediate mining facilities

Page 76 of Chapter A4 of the ESIA states:

> "A Preliminary Mine Closure Plan (PMCP) has been prepared for the Project. This was submitted to the Government of Mongolia in April 2010 as part of an approved Mongolian Feasibility Study. A Mine Closure and Reclamation Framework document (Chapter D21) is included in this ESIA. This sets out the key principles and requirements which Oyu Tolgoi will implement as international good practice as contained within the Rio Tinto mine closure standard33 and in the IFC EHS Guidelines for Mining and the EU Mine Waste Directive (2006/21/EC). As part of the development of the Project, a Mine Closure Plan is being developed and will be completed in mid-2012. This will define in greater detail how Oyu Tolgoi will meet the requirements of the Rio Tinto mine closure standard, Mongolian regulatory requirements and international good practice."

Page 1 of Chapter D21 of the ESIA further clarifies:

> "As part of the development of the Oyu Tolgoi Project, a Mine Closure Management Plan is being developed. This document sets out the objectives, principles and standards against which that Plan is being developed and in the absence of that Plan being completed, sets out key Oyu Tolgoi commitments with regard to mine closure.
>
> "In accordance with the Rio Tinto Corporate Closure Standard, the intent of the Mine Closure Management Plan is to ensure that the Oyu Tolgoi Project is left in a condition which minimises adverse impacts on the human and natural environment, and that a legacy remains which makes a positive contribution to sustainable development. A central principle in the Plan will be to return the maximum amount of disturbed land to conditions suitable for nomadic herdsmen and their grazing animals. Another key principle in the Plan is to ensure that, at any time, if the Project is forced to closed for any unforeseen reason during its operational lifetime (either permanently or temporarily) prior to the planned permanent closure date, that there will be sufficient funds available to ensure that all necessary closure management and monitoring activities can be undertaken.

[17] ESIA for the Oyu Tolgoi Copper and Gold project, Chapter C5 at pages 19-21.

"Once completed, the Plan will describe Oyu Tolgoi's objectives with respect to the mine closure, the standards and regulatory requirements to be met with regard to mine closure and the actions that will be undertaken taken to achieve these and to prevent or minimise adverse impact from the mine site. The Plan will include a description of the monitoring plans which will be put in place to determine the effectiveness of management and mitigation actions.

"The Mine Closure Management Plan is currently in development and is planned for completion in mid-2012. This Framework Plan outlines the principles and objectives that will form the basis of the Mine Closure Management Plan that is currently under preparation."

As noted in the Guidebook for Evaluating Mining Project EIAs:

"The most serious and far-reaching environmental consequences of mining projects occur after mining ceases, during the closure period. Waste rock piles, open pits, tailings impoundments, and leach piles left behind and unattended by the mining company can begin generating and releasing highly toxic wastewaters that can cause immense damage to water resources and aquatic life. …

"A mining project should not be approved unless the mining company has put forward a detailed, workable, and adequately funded plan to prevent environmental impacts for decades after mining ceases, and restore the ecology of the mine site as closely as possible to pre-mining conditions."[18]

Here, the mining company has not put forward any detailed plan about how it would prevent environmental impacts from occurring at the waste rock piles, open pits, tailings impoundment, and underground workings it would leave behind. This leaves the public and decision-makers, including the World Bank/IFC, the EDRB, and the Government of Mongolia incapable of determining whether the company has a plan for preventing environmental impacts that is workable and adequately funded.

4. The project proponent has not disclosed essential details of its plans to manage mining waste

The IFC/World Bank Group recommends the following measures for the management of waste rock dumps for protection of water quality:

"The overburden and waste rock is often disposed of in constructed waste rock dumps. Management of these dumps during the mine life cycle is important to protect human health, safety and the environment. Recommendations for management of waste rock dumps include the following:

[18] Environmental Law Alliance Worldwide (2010) "Guidebook for Evaluating Mining Project EIAs," at page 72. http://www.elaw.org/mining-eia-guidebook

"Dumps should be planned with appropriate terrace and lift height specifications based on the nature of the material and local geotechnical considerations to minimize erosion and reduce safety risks;

"Management of Potentially Acid Generating (PAG) wastes should be undertaken as described in the guidance.

"Potential change of geotechnical properties in dumps due to chemical or biologically catalyzed weathering should be considered. This can reduce the dumped spoils significantly in grain size and mineralogy, resulting in high ratios of clay fraction and a significantly decreased stability towards geotechnical failure. These changes in geotechnical properties (notably cohesion, internal angle of friction) apply especially to facilities which are not decommissioned with a proper cover system, which would prevent precipitation from percolating into the dump's body. Design of new facilities has to provide for such potential deterioration of geotechnical properties with higher factors of safety. Stability / safety assessments of existing facilities should take these potential changes into account."[19]

The EMP should include a detailed discussion of how it would incorporate the above measures to prevent water quality impacts of overburden and waste rock dumps.

Instead, in the ESIA, the contents of Chapter D9: (Waste Rock Management Plan) state:

"This section is intentionally omitted and will be included with the operations phase management plans which will be prepared in due course."

If a mining project calls for the creation of a wet tailings impoundment, then the IFC/World Bank Group recommends the following management strategies to protect water quality:

• "Any diversion drains, ditches, and stream channels to divert water from surrounding catchment areas away from the tailings structure should be built to the flood event recurrence interval standards...;

• Seepage management and related stability analysis should be a key consideration in design and operation of tailings storage facilities. This is likely to require a specific piezometer based monitoring system for seepage water levels within the structure wall and downstream of it, which should be maintained throughout its life cycle;

• Consideration of zero discharge tailings facilities and completion of a full water balance and risk assessment for the mine process circuit including storage reservoirs and tailings dams. Consideration of use of natural or synthetic liners to minimize risks;

• Design specification should take into consideration the probable maximum flood event and the required freeboard to safely contain it (depending on site specific risks) across the planned life of the tailings dam, including its decommissioned phase;

[19] IFC/World Bank (December 2007) "Environmental,Health and Safety Guidelines for Mining."
http://www1.ifc.org/wps/wcm/connect/1f4dc28048855af4879cd76a6515bb18/Final%2B-%2BMining.pdf

• On-land disposal in a system that can isolate acid leachate-generating material from oxidation or percolating water, such as a tailings impoundment with dam and subsequent dewatering and capping;

• On- land disposal alternatives should be designed, constructed and operated according to internationally recognized geotechnical safety standards;"[20]

The environmental management plan for a proposed mining project should include a discussion of how the wet tailings impoundment would be managed, consistent with the above principles.

Instead, in the ESIA, the contents of Chapter D10 (Tailings Management Plan) state:

> "This section is intentionally omitted and will be included with the operations-phase management plans which will be prepared in due course."

The ESIA for the Oyu Tolgoi project is an indispensable planning tool, and there is no justification for delaying submission of waste rock and tailing management plans until a later time. The operators of the Oyu Tolgoi project have already commenced construction activities and do not require additional information in order to present detailed waste rock and tailing management plans for public review.

5. The project proponent has not disclosed the monetary costs of carbon emissions associated with the life of the project

Averting catastrophic global warming is the most pressing challenge of our generation. Therefore, it is imperative that any assessment of the impacts of a very carbon-intensive project such as the Oyu Tolgoi project, must assess its impact on global levels of greenhouse gases.

Chapter C2 (Climate and Air Quality) of the ESIA contains such an assessment. The main findings of this assessment are presented below:

> "According to the current estimate, <u>the total annual average greenhouse gas emissions for the Oyu Tolgoi Project during the construction phase will be 1,350,000 tonnes CO2-eq / year.</u>
>
> "The key direct sources of GHG during the construction phase include the operation of mobile and stationary construction equipment using diesel fuel. ….
>
> "The direct emissions of GHGs during the operational phase of the Project will mainly arise as a result of coal combustion from the CHP (the major source) and diesel consumption from vehicles and the DPS. <u>It is estimated that the annual average emissions of greenhouse gases during the operational phase will be 1,850,000 tonnes CO2-eq /year</u>."

There is a major flaw with this assessment: it fails to carry the analysis a necessary step further and provide quantitative information about <u>the social cost of the project's greenhouse gas emissions</u>.

[20] Ibid., at pages 6-7.

In March 2010, when the World Bank appraised a $3.75 million loan to South Africa for the Eskom Investment Support Project, it included such an analysis.

> "Including the social cost of carbon-dioxide emissions: For each project, the economic assessment is also carried out incorporating the value of CO_2 emissions. For Medupi, this value is added as a cost of generating power. For each of the renewable energy projects and the railway project, this value is represented by the avoided cost due to displacement of CO_2 emissions (i.e., it is added as an economic benefit). This analysis uses a figure of $29/ton CO_2 which is based on the Stern review."[21]

Applying this same value of the social cost of carbon from the Stern Review[22], enables the following quantitative assessment of the project's predicted greenhouse gas emissions associated with construction and operation.

		Social Cost of Carbon (Stern Review)		
	Totals	$	29.00	$/tCO2
Construction	1,349,798	$	39,144,142.00	$/tCO2
Production - after 1 year	1,857,019	$	53,853,551.00	$/tCO2
Production - after 5 years	9,285,095	$	269,267,755.00	$/tCO2
Production - after 10 years	18,570,190	$	538,535,510.00	$/tCO2
Production - after 27 years	50,139,513	$	1,454,045,877.00	$/tCO2
Total (construction + 27 years of production)		**$**	**1,493,190,019.00**	$/tCO2

There is extensive debate about the value of the social cost of carbon, with some experts showing that the social cost of carbon should be $112/ton CO_2.[23]

At any rate, the World Bank uses a value of $29/ton for the social cost of carbon, which should be viewed as a conservative estimate. Using this value, the present-day value of the lifetime social cost of the Oyu Tolgoi project would be nearly $1.5 billion ($1,493,190,000). This social cost of the Oyu Tolgoi project ought to weigh heavily on government decision-makers and investors considering approvals for the project.

6. The project proponent's biodiversity conservation strategy is flawed

The Central Asian Gobi Desert is an ecoregion unlike any other in the world. It is home to species found nowhere else in the world, several which have endangered or threatened species. There is genuine concern that the Oyu Tolgoi project would cause further pressures on these endangered or threatened species. According to the USAID:

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[21] World Bank (March 2010) "Project Appraisal Document on a Proposed Loan in the Amount of US$3,750 Million to Eskom Holdings Limited Guaranteed by Republic of South Africa for an Eskom Investment Support Project," at page 48.

[22] Stern, N. (2007) "The economics of climate change: The Stern review." Cambridge: Cambridge University Press

[23] Ackerman, F. Stockholm Environment Institute-US Center, Tufts University (2010) Damage Estimates and the Social Cost of Carbon: The Need for Change Memo for EPA/DOE Workshop on IAMs and SCC Estimates, November 18-19, 2010. http://sei-us.org//Publications_PDF/SEI-Ackerman-Critique-of-Damage-Estimates-2010.pdf

"High profile species that will be impacted by the OT project are: Mongolian Wild Ass - khulan (Equus hemionus – threatened), Goitered (Black-tail) Gazelle (Gazella subgutturosa - vulnerable), Mongolian Gazelle (Procapra gutturosa – near threatened), Houbara Bustard (Chlamydotis undulate - vulnerable), and Saker Falcon (Flaco Cherrug - endangered). Below is a brief description of two species that are included in the assessment currently being undertaken by OT's international biodiversity consultants.

Khulan: The khulan are listed in Appendix I of the Convention on the International Trade in Endangered Species of Fauna and Flora and are regarded as threatened with extinction by the World Conservation Union. They have also been added to Appendix II of the Convention on Migratory Species. The majority of the khulan population is found in the southeast Gobi where a WB study was conducted in 2006 to gain a better understanding of the pressures facing this species. The study concluded that infrastructure development in the Gobi poses a significant threat to the khulan. ....

"Houbara Bustard: The Houbara bustard is dependent on desert and semi-desert shrub lands. The Mongolian Gobi is the easternmost part of its global breeding range. Throughout its range, habitat loss and degradation, collision with powerlines, and poaching are key threats to its survival. This species normally occupies open habitat and requires zero or minimum disturbance to successfully breed and raise chicks. Houbara bustards are easily disturbed off their nesting areas thus roads and increased livestock grazing raise concerns for this species. They are also disturbed by tall structures such as transmission towers since the towers can be used by large raptors as perches for preying on the Houbara bustard. The Saker Falcon preys on Houbara bustards and is known to use transmission towers as nesting and perching sites."[24]

From the Baseline Assessment of the ESIA it is clear that the area proposed for this mine includes critical habitat for a substantial number of internationally recognized species at risk. The report states:

"The Oyu Tolgoi AoI, despite its location in an extreme continental environment with generally sparse vegetation and scant surface waters, supports a diverse fauna with populations of global conservation significance for a number of globally and/or nationally threatened species, among which the Asiatic wild ass or khulan, the goitered or black-tailed gazelle, the houbara bustard, and the saker falcon stand out. Many of the fauna demonstrate migratory or nomadic behaviour as a strategy for coping with the seasonal and geographic climatic variability that drives the availability of resources. Due to the near absence of permanent surface waters, no fish and only a single amphibian species are known from the Oyu Tolgoi AoI. Reptiles, especially toad-headed agamas, are very common during the warm months and these provide important food resources for predatory birds and mammals. Diverse bird assemblages are common and the area supports important breeding populations of globally threatened species, particularly in the Galba Gobi Important Bird Area. Despite the general aridity of the region, artificial ponds constructed by the Oyu Tolgoi Project

[24] USAID "Mongolia - Oyu Tolgoi Copper/Gold/Silver Mine Project Trip Report (May-June 2011)," at pages 6-7. http://mongolia.usaid.gov/wp-content/uploads/Mongolia-Oyu-Tolgoi-Trip-Report.pdf

> attract aquatic birds and migrants. Small mammals are generally nocturnal but burrows are commonly observed across the landscape. Both wild and domesticated large herbivores are key elements of the regional ecosystems and these depend on the ability to move freely across the landscape to track changing patterns of available forage plants. The survival of globally threatened fauna of the South Gobi and the Oyu Tolgoi AoI will depend upon the sound development of natural resource extraction and transportation and electrical transmission infrastructure, as well as control of illegal hunting and competition with domesticated livestock for key water and forage resources"

An area with such critical ecological value and resources should be protected to the greatest extent possible. There are many critical flaws in the project proponents' plan for protecting biodiversity. We highlight two major areas of concern below.

6.1. Many of the mitigation strategies are unrealistic and poorly planned.

The ESIA clearly establishes that there will be many direct and indirect impacts on the flora and fauna of the region where the mine operations will occur. Table 6.1 in the "Flora and Fauna Construction Management Plan" includes the construction phase mitigation measures to be taken. We feel that many of these strategies do not meet the standards necessary for approval of this project.

One mitigation strategy to protect water resources will be to "divert the Undai River channel to maintain surface and subsurface water flows within the Undai River downstream of the Mine Licence [spelling from original] Area" (p. 9). Massive water diversion affects multiple habitats (old river bed and new) and jeopardizes water quality (increased sedimentation from running over new ground) and quantity. It is difficult to imagine how the subsurface water flows will be successfully diverted.

A second mitigation strategy to protect water resources will be to "install a replacement spring downstream of the mining K which will be fed by the diverted Undai base flow and ensure replacement spring mimics the ecological functions of Bor Ovoo spring in terms of maintaining similar surface and subsurface flow patterns and seasonal variations throughout the year" (p. 9). It stretches the bounds of ecological reason that it will be possible to easily install a new spring in this habitat, let alone one that mimics the ecological functions of an existing spring.

To reduce impacts from disturbance, "where impacts to an item or items of environmental or cultural significance are unavoidable, all practicable steps will be taken to minimize the degree of impact" (p. 10). "Practicable steps" are never defined, rendering this mitigation action essentially meaningless.

"Where practicable, clearance of vegetation identified as containing potential breeding resources for fauna is to be conducted outside of breeding periods" (p. 10). This measure may reduce immediate mortality impacts but does not address the issue of habitat loss come the next breeding season.

"Oyu Tolgoi will leave the open pit areas (e.g., borrow pits), waste dumps and TSF in a condition that adequately protects long term safety of animals and the public" (p.12). Without details on this "condition" it is impossible to assess the legitimacy of this statement.

6.2. The Offset Strategies and Net Positive Impact Forecast (NPIF) are poorly calculated and inadequate

The ESIA for the Oyu Tolgoi mining project presents an analysis asserting that the project would be beneficial for biodiversity as a result of mitigation activities. The following table is presented in Appendix 4 of the ESIA (an identical table is presented on page 60 of Chapter C6 of the ESIA), purporting to show the number of individuals of particular species lost as a result of project activities or saved by proposed mitigation activities.

Table 2. Projected net position in 2036 for priority biodiversity features addressed by the offsets strategy (Quality Hectares)

Name	Direct & indirect habitat loss (1000 ha)	Quality of habitat lost (0-1)	Loss from increased hunting (1000 QH)	Residual loss (1000 QH)	Gain from hunting control (1000 QH)	Gain from rangeland manage-ment (1000 QH)	Predicted overall offset gain (1000 QH)	Net position (1000 QH)	NPI?
Mongolian Chesney[1]	9	0.9		8	0	21	21	13	Yes
Asiatic Wild Ass	155	0.5	392	470	530	21	551	59	Yes
Argali	30	0.5	392	407	530	21	551	122	Yes
Goitered Gazelle	130	0.5	392	458	530	21	551	72	Yes
Mongolian Gazelle	76	0.5	392	431	530	21	551	99	Yes
Swan Goose	0			0	0	0	0		Yes[2]
Ferruginous Duck	0			0	0	0	0		Yes[2]
Short-toed Snake-eagle	9	0.9		8	0	21	21	13	Yes[2]
Saker Falcon	9	0.9		8	0	21	21	13	Yes[2]
Egyptian Vulture	9	0.9		8	0	21	21	13	Yes[2]
Great Bustard	71	0.9		64	0	21	21	-43	No[2,3]
Houbara Bustard	71	0.9		64	0	21	21	-43	No[2,3]
Relict Gull	0			0	0	0	0		Yes[2]
Pallas' Sandgrouse	9	0.9		8	0	21	21	13	Yes[2]
Yellow-breasted Bunting	9	0.9		8	0	21	21	13	Yes
Mongolian Ground-Jay	9	0.9		8	0	21	21	13	Yes
Granite Outcrop Floral Communities[4]	0			0	0	0	0	0	Yes
Riverine Elm Trees	0			0	0	+	+	+	Yes[5]
Tall Saxaul Forest	+	?	-	+	+	+	+	+	Yes[6]
Eastern Gobi desert-steppe	5.5	0.9		5	0	9	9	4	Yes
Alashan Plateau semi-desert	3.5	0.9		3	0	12	12	9	Yes

[1] Assumed here to represent all 18 'very rare' plants known or predicted from the project area
[2] Assuming mitigation is put in place on all OT powerlines plus an additional >64km of non-OT powerlines
[3] Yes if there is an appropriate additional offset
[4] Even though these are not predicted to be impacted, they are included here since they are a Critical Habitat-qualifying biodiversity value in the area
[5] Yes if the three translocated trees survive; offset gains depend on specific offset site
[6] Yes assuming adequate control of illegal collecting (not quantified)

However, if one examines this assessment closely, numerous implausible assumptions are readily apparent.

First, this table, simply put, has no biological credibility. The calculations in many instances—according to the document itself—are "essentially based on expert opinion and educated guess work rather than empirical evidence" (p. 16, NPIF). What is the value added of doing precise calculations with invented data? Without accurate data, it is impossible to usefully interpret the Table and it certainly cannot be used to justify construction or operation of the Oyu Tolgoi mine.

Second, there are repeated references to "improved rangeland management" but what that improved management will consist of is never defined. Improved management would have to be an improvement over current conditions, where water and land resources still exist and the roads have not been built that will provide easy hunting access. It is difficult to know where and how the Oyu Tolgoi proponents will offer genuine improvements as they offer no examples or details.

Third, the calculations in the Table <u>do not even add up correctly</u> for the net position of the Asiatic Wild Ass, Argali, Goitered Gazlle, and Mongolian Gazelle.

Finally, the predicted overall offset gains of all the mammals (551) and birds (21) is exactly the same – regardless of species. Each of these species may inhabit the projected area differently and migrate with different behaviors being affected uniquely. Assuming that all of mammal and bird species behave in the same manner in relation to power lines and fragmented habitat due to roads and fences is simply implausible.