WEFsat-Mining Tool
User Guidance Manual
Water, Energy, and Food security analysis tool for Mining

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Water, Energy, and Food security analysis tool for Mining

September 2015
Written by Dimple Roy, Livia Bizikova, Gabriel A. Huppé, Carter Borden and Darren Swanson

ACKNOWLEDGEMENT

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1. INTRODUCTION

PURPOSE

The purpose of the Water, Energy and Food security analysis tool for mining (WEFsat-Mining) is to help identify the potential benefits and impacts of mining on community-level water, energy and food (WEF) security to find the most effective ways of managing across these interlinked sectors. Users of the tool can explore specific actions for realizing benefits and mitigating actions as well as select and develop indicators for tracking the status of WEF security and the progress of critical actions. Users familiar with environmental and social impact assessment methods will find WEFsat-Mining intuitive and a welcome addition to their toolkit for understanding key relationships in achieving sustainable development.

CONTEXT

The Intergovernmental Forum on Mining, Minerals, Metals and Sustainable Development, a network of governments, industry and various interest groups in 48 countries, put forth its Mining Policy Framework (MPF) in 2014. The MPF calls for an optimal conversion of natural capital into human capital, the management of the natural resource base within ecosystems and continuous planning for the post-mining transition, among other aspects.

Concurrently, the World Economic Forum has consistently ranked WEF security issues among the top global risks facing governments and businesses around the world, noting that “any strategy that focuses on one part of the water-energy-food nexus without considering its interconnections risks serious unintended consequences” (World Economic Forum, 2011). WEFsat-Mining is designed to help advance the understanding of both the risks and benefits of mining operations on the interrelated issue of WEF security as key aspects of human security and sustainable development.

Population growth and economic prosperity are increasing the demand for minerals and other natural resources in unprecedented ways, placing intense localized pressures on ecosystem goods and services, including water, energy and food production and supply. Prominent events such as the global food crises of 2008 and 2011, and an ongoing series of energy and water shortages in countries around the world have demonstrated the need for coordinated action to address WEF security and their interlinked causes. As well, they have highlighted that a deterioration in the ability of WEF systems to provide for the basic needs of a population can lead to adverse socioeconomic, livelihood and human well-being effects.

Mining development creates both pressures and opportunities for WEF security in a community or a cluster of communities in the vicinity of the mine site. Communities in developing countries benefit from mining developments in many ways, such as livelihood opportunities, but at the same time are also threatened by the negative impacts of mining on basic necessities such as food, water, energy and shelter. The well-being of these communities thus depends upon the ability of community members to sustain or improve their way of life and standard of living amid the introduction of mining developments in their region. For mining companies, this means ensuring that the environment is sufficiently protected to allow these communities continued environmental goods and services such as clean water, plentiful fauna and flora, and quality food that is safe for human consumption. However, it also means that the financial benefits of mining are fairly distributed, that local people can partake in
economic and employment opportunities, that local communities are empowered to participate in decisions that affect their well-being, and that infrastructural developments (e.g., roads, bridges and water supply) are optimized with the needs of local populations in mind so as to maximize mutually beneficial outcomes. From a sustainable development perspective, it means balancing the expectations and needs of the mining company and its neighbours to ensure the long-term sustainability of linked social, economic and environmental systems affecting overall well-being.
PART 1: WEFsat-MINING AT A GLANCE

WHAT IS WEFsat-MINING?

WEFsat-Mining is IISD’s tool to understand the interface of WEF and mining that draws on the IISD Water-Energy-Food (WEF) Security Framework (Bizikova et al., 2013). This framework was designed to support practical planning and decision-support processes for landscape investment and risk management in the agricultural sector. Informed by a comprehensive literature review, this framework enables a place-based analysis of four main components that focus the obvious and underlying factors affecting a community’s ability to be WEF secure: access, availability, supporting resources and supporting policies, and each in the context of a region’s water, energy and food supply (Bizikova et al., 2013). WEFsat-Mining seeks to facilitate the operationalization of this framework in the context of mining with a focus on understanding and managing the benefits and impacts of mining on community-level WEF security.

The framework (Figure 1) begins with an analysis of how water, energy and food are available to households and communities in the study context. This requires consideration of five aspects: (a) sources and production (i.e., surface and groundwater, sources of energy and food production); (b) water treatment, energy conversion and food processing; (c) storage of water, energy and food supplies; (d) modes of distribution of water, energy and food supplies; and (e) markets (both formal and informal) for water, energy and food.

Central to the analysis framework is an understanding of how households (and communities of households) gain access to water, energy and food. Is it mostly through their purchasing power (i.e., earned income), as is typically the case in higher-income households and countries. Or is access gained through a combination of purchasing power (income, remittances from family members in other countries, credit), aid, self-production and barter, as is often the situation in lower-income households and countries?

It is then necessary to understand the types of supporting infrastructure that are relied on to ensure the access and availability of water, energy and food. Supporting infrastructure is of two types: (a) built infrastructure, referring to manmade systems including communication, transportation and waste/sanitation systems and (b) natural infrastructure, including the ecosystem goods and services associated with erosion control, storm protection, water purification, biological control, air quality maintenance and pollination.

The final component of the analysis framework requires identification of institutions and policies that directly and indirectly support the natural and built infrastructure needed to ensure access and availability of WEF sources in a community and region. This component is further broken down into two categories, namely: (a) supporting institutions, including utility boards, user associations and resource co-ops, education and training, safety oversight, law enforcement and security; (b) supporting policies and plans relating to resource use, climate change adaptation, disaster recovery and risk management, and research and development (R&D) and innovation.
WHAT ARE THE STEPS IN USING WEFsat-MINING?

The WEF security analysis tool for mining (WEFsat-Mining) is a Microsoft (MS) Excel-based tool designed to help identify the potential benefits and impacts that a proposed or existing mining operation has on WEF security.

The first step of WEFsat-Mining assesses the current status of each of the framework components for the community (or aggregation of communities) in question and how they are connected. The second step involves identifying all of the possible benefits and impacts that each of the mining components (e.g., mine operations, ore processing, general operations) might have on each of the WEF security components and their combination. This necessitates the identification of all the individual mining components comprising the proposed or existing mining development during operation and closure phases. After gaining an understanding of the potential mining benefits and impacts on each of the WEF security components, the third step of the assessment includes identifying specific actions that are necessary to help realize the potential benefits associated with mining’s influence, or mitigate the potential impacts as well as indicators for tracking the status of WEF security.

### FRAMEWORK FOR ASSESSING WATER, ENERGY AND FOOD SECURITY

<table>
<thead>
<tr>
<th>SECURITY CATEGORY</th>
<th>WATER SOURCES</th>
<th>ENERGY SOURCES</th>
<th>FOOD SOURCES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Availability</td>
<td>Uses</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Processing</td>
<td></td>
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<td>Storage</td>
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<tr>
<td></td>
<td>Distribution</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>Markets</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Access</td>
<td>Purchasing Power (livelihood income, remittances, credit)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Aid (direct provision, safety nets, subsidies)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Self-Production (water wells, off-grid power, individual/community gardens)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Barter</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Supporting Infrastructure</td>
<td>Built Infrastructure (transportation, communication, waste removal)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Supporting Institutions and Policies</td>
<td>Natural Infrastructure (ecosystem services such as: erosion control, storm protection, water purification, biological control, air quality maintenance, pollination)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Institutions (utility boards, user associations and resource co-ops, education and training, safety oversight, law enforcement and security)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Policies &amp; Plans (resource use, climate change adaptation, disaster recovery, risk management, research, development (R&amp;D), and innovation)</td>
<td></td>
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</table>

Table 1. IISD’s Water-Energy-Food Security Analysis Framework. Source: IISD (2015)
and progress toward key actions. Finally, step four attempts to summarize all of this information for decision-makers.

Addressing the assessment questions is only possible through iterative deliberation with persons who are involved in implementing mining operations and are involved in any capacity in securing water, energy and food in their vicinity. The deliberative process using WEFsat-Mining is typically a combination of one-on-one meetings, virtual correspondence and multi-person workshop settings. Given this, using WEFsat-Mining in a deliberative process and setting should be led by a facilitator trained in the use of WEFsat-Mining. For information about training opportunities, contact the International Institute for Sustainable Development (IISD) at info@iisd.ca.

**HOW TO USE WEFsat-MINING?**

WEFsat-Mining engages stakeholders in an assessment of: (i) the current status (and linkages) of the availability of and access to water, energy and food, and the array of infrastructure (built and natural) and policies that support their use; (ii) the potential benefits and impacts of mining on these WEF security components; and (iii) the actions necessary to realize potential benefits and mitigate impacts. The tool also helps users identify indicators that can be used to track the status and trends of WEF security components and the potential mining benefits and impacts, along with progress toward key actions.

WEFsat-Mining consists of 10 worksheets to facilitate a comprehensive assessment of WEF security in the context of a specific community or collection of communities, as influenced by an existing or proposed mining operation (Figure 2).

A summary of each of the 10 worksheets is provided below.
**Part 1: WEFsat-Mining at a Glance**

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**SECURITY COMPONENTS**

- Availability
- Access
- Supporting Infrastructure (Built and Natural)
- Supporting Institutions and Policies

---

**ENGAGEMENT AND ASSESSMENT**

<table>
<thead>
<tr>
<th>Status and linkages</th>
<th>Potential mining benefits and impacts</th>
<th>Actions to realize benefits and mitigate impacts</th>
<th>Summary for Decision-makers</th>
</tr>
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<tbody>
<tr>
<td>2. WEF Inventory (Sources, Uses)</td>
<td>6. Mining WEF Inventory (Source, Uses)</td>
<td>9. Mining Influence Diagram</td>
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<td>3. WEF Status (current)</td>
<td>7. Mining WEF Influence</td>
<td></td>
<td></td>
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<tr>
<td>4. WEF System Diagram</td>
<td></td>
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**INDICATORS AND MONITORING**

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**Figure 2. The WEFsat-Mining Methodology**

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**Step 1: Status and Linkages**

Users describe the current status of WEF systems in terms of the characteristics of the various affected communities, how these communities make use of different energy sources and how the WEF systems are interlinked in this context.

- **Worksheet #1** – Community Profile: To identify and describe the communities that are situated within the WEF systems of the existing or proposed mining operation.

- **Worksheet #2** – WEF Inventory: To identify the sources and uses of water, energy and food in the communities and the linkages among them (i.e., electricity used to power water pumps that are used to irrigate crops).

- **Worksheet #3** – WEF Status: To describe the current status of the WEF security components relevant to each WEF source (i.e., availability, access, supporting infrastructure [built and natural], and supporting institutions and policy).

---

**Step 2: Potential Mining Benefits and Impacts**

Users describe the influence of different mining activities and processes at the operations and closure phases of the mine on the WEF system in the communities.

- **Worksheet #4** – WEF System Diagram: A systems-mapping palette to enable a facilitator to work with stakeholders to draw and visually represent the existing sources and uses of water, energy and food and how they are linked.

---

- **Worksheet #5** – Mining Profile: To describe the characteristics of the existing or proposed mining development at two specific points in time: full operations and full closure. The temporal perspective is important, as the potential benefits and impacts of mining may be different during operations and after the mine closes.

- **Worksheet #6** – Mining WEF Inventory: To describe any new water, energy and food sources introduced by the mine, as well as the new uses resulting from the mine.
• **Worksheet #7** – Mining WEF Influence: To identify the potential benefits and impacts of mining (during both operations and closure) on the availability and accessibility of key sources of water, energy and food, as well as the supporting infrastructure (both built and natural) and supporting institutions and policies.

**Step 3: Actions and Indicators**

Users identify actions to address the impacts and benefits of mining to preserve and improve WEF security, and indicators to assess and track progress in the WEF system.

• **Worksheet #8** – WEF Security Actions and Indicators: This worksheet compiles all of the potential benefits and impacts of mining in one place and enables stakeholders to work together to identify key actions to help realize potential benefits and mitigate impacts of mining. This sheet also provides menus of possible indicators that could be used to track the status and trends of the WEF security components as well as the potential mining benefits and impacts, and progress toward necessary actions.

• **Worksheet #9** – Mining Influence Diagram: This worksheet is the same as the WEF System Diagram Worksheet #4 and provides a canvas to incorporate and visually depict the specific influences of mining development on the original WEF security system.

**Step 4: Summary for Decision-Makers**

Users identify and summarize the key insights uncovered throughout the use of the tool with regards to each component of WEF security.

• **Worksheet #10** – Summary for Decision-Makers: This worksheet compiles the information from the previous worksheets into a summary format. Show and hide buttons enable users to select which information to display.

Part 2 of this User Guidance Manual takes users step-by-step through each of these worksheets.

**WHAT RESOURCES ARE REQUIRED TO APPLY WEFsat-MINING?**

The resources required to use WEFsat-Mining vary according to the objectives and capabilities of the users. Depending on the availability of information and experts on a range of topics and motivation, such an analysis will take between two to six weeks to conduct all the steps in a deliberative manner, which includes some time for preparation, stakeholder consultations, data entry into the tool and data analysis. Costs will vary accordingly and are generally related to project team meetings and stakeholder consultations.
PART 2: WEFsat-MINING STEP-BY-STEP

GENERAL

Installing WEFsat-Mining on a computer:

- Download the MS Excel-based tool from the IISD website [here](#). Note: the WEFsat-Mining tool has been constructed in MS Excel v2010. Users of MS Excel for iOs systems and Open Office should use with care, as the tool has not been tested on these platforms.

Navigating through WEFsat-Mining:

- The tabs at the bottom of the Excel workbook can be navigated in sequential fashion to take users through the necessary components of the tool. The colours of these tabs are associated with each of the four steps of the tool, to which individual worksheets belong.

Entering and updating information:

- WEFsat-Mining is flexible; you can navigate back and forth among the different pages at any point in the process to revise, update and change information as needed.

- While the application does not have a word limit for the information to be entered in the different boxes, the user should be as specific as possible and use precise, concise sentences, as the information you insert will be automatically transferred across different worksheets.

Getting help and guidance:

- The User Guidance Notes found near the top of each worksheet provide guidance on how to fill in individual sections of the tool. Click on the User Guidance Notes, and a comment box will appear containing information of use to those seeking further clarification.

Example workbook:

- An example MS Excel workbook has been created entitled WEFsat-Mining Example Workbook.xlsm [here](#). This workbook presents a fictitious set of communities and mining development in order to demonstrate the type of content that is input and produced by the tool.

STEP 1: UNDERSTANDING COMMUNITY WEF STATUS AND LINKAGES

In this first step, users describe the current status of WEF systems in terms of the characteristics of the various affected communities; how these communities make use of different water, energy and food sources; and how the WEF systems are interlinked in this context.

WORKSHEET #1 - COMMUNITY PROFILE

Objective. To identify and describe the communities that are situated within the WEF sheds of the existing or proposed mining operation. Up to five communities can be profiled, with an average profile calculated in the last column. Aside from the community names, this profile information is not directly linked to the other worksheets as input, but is necessary to be able to properly address the rest of the analysis questions in the tool.

Process. Enter some basic information about the communities you wish to examine through the lens of WEF security (Table 1). This information includes:
• **General:** Information about the demographics and location of the communities.

• **Livelihoods:** Information about the reliance on mining employment versus other sources of income in the community.

• **Land Use and Food Consumption:** Information about the use of land and the sources of food that communities depend on.

• **Water Use:** Information about the sources of water that communities depend on.

• **Energy Use:** Information about access to the electric grid and sources of self-produced electricity.

---

**WEF Security Tool for Mining**

**Community Profiles**

**User Guidance Notes**

<table>
<thead>
<tr>
<th>NA = Not Available</th>
<th>Communities</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Community A</td>
</tr>
<tr>
<td><strong>Community Name</strong></td>
<td>General</td>
</tr>
<tr>
<td>Cultural Identifier</td>
<td>A</td>
</tr>
<tr>
<td>Population</td>
<td>500</td>
</tr>
<tr>
<td>Location</td>
<td>in watershed</td>
</tr>
<tr>
<td>% working in the mine</td>
<td>5</td>
</tr>
<tr>
<td>% working in mine-related services</td>
<td>2</td>
</tr>
<tr>
<td>Primary source of livelihood income</td>
<td>Government</td>
</tr>
<tr>
<td>Secondary source of livelihood income</td>
<td>Service</td>
</tr>
<tr>
<td>% livelihood income from remittances</td>
<td>10</td>
</tr>
<tr>
<td>Average household income (country $)</td>
<td>500</td>
</tr>
</tbody>
</table>

**Land Use and Food Consumption**

- Land area (km²):
  - Community A: 20
  - Community B: 5
  - Community C: 50
  - Community D: 100

- Food consumption from local sources (%):
  - Community A: 55
  - Community B: 50
  - Community C: 40
  - Community D: 35

- Food consumption from imports (%):
  - Community A: 25
  - Community B: 10
  - Community C: 20
  - Community D: 10

- Food consumption from subsistence (%):
  - Community A: 20
  - Community B: 40
  - Community C: 40
  - Community D: 55

- Total food consumption (should total 100 from rows 21-23):
  - Community A: 100
  - Community B: 100
  - Community C: 100
  - Community D: 100

**Water Use**

- Average household water use (lpd):
  - Community A: 15
  - Community B: 10
  - Community C: 10
  - Community D: 10

- Surface water source (%):
  - Community A: 80
  - Community B: 15
  - Community C: 70
  - Community D: 60

- Groundwater source (%):
  - Community A: 15
  - Community B: 80
  - Community C: 25
  - Community D: 35

- Other sources (%):
  - Community A: 5
  - Community B: 5
  - Community C: 5
  - Community D: 5

- Total water sources (should total 100 from rows 27-29):
  - Community A: 100
  - Community B: 100
  - Community C: 100
  - Community D: 100

**Energy Use**

- Households connected to electricity grid (%):
  - Community A: 40
  - Community B: 0
  - Community C: 0
  - Community D: 20

---

*Figure 3. Worksheet #1: Community Profile*
WORKSHEET #2 – WEF INVENTORY

Objective. To identify the sources and uses of water, energy and food in the communities and the linkages among them (i.e., electricity used to power water pumps that are used to irrigate crops). This worksheet thus creates a baseline inventory of existing WEF sources and uses in the community(ies) of interest AND identifies the key links between these WEF sources and uses.

Process. Use the column group hide/unhide tabs at the top of the worksheet to hide or show the Inventory and Connections information. To expose columns, select the “+” above the columns and to hide columns, select the “-” at the top of the page (Figure 4). Start by displaying only the Inventory information and, when finished, unhide and complete the Connections information.

From the drop-down menu in cell C3, select a specific community or the average community described in Worksheet #1. The questions in this and the remaining worksheet must be addressed from the perspective of either a specific community within the mine’s WEF shed or an average representation of several communities.

Completing the Inventories

Starting with the Water Section, follow this procedure:

1. Rank Use: in Cell C8 is the relative quantity of water for each of the Uses. Rank each of the Uses by either an integer (1, 2, 3, with 1 being the highest use) or the percentage of the total water used in the community (e.g., irrigation uses 75%, domestic 20% and agriculture 5%).

2. Percentage of Sources: Fill in the percentage that each Source supplies each Use. The percentage of all the Sources should total 100% at the bottom of each Use column to ensure all the Sources have been identified. Sources that are significant (i.e., greater than 5% by default) will be labelled with a “Y” in the Relevant column (column L).

Note: effort should be given to provide an accurate percentage of each Source, but these numbers are not linked to other parts of the tool, so approximate or best guesses are sufficient. The information provides context for addressing the questions in the remaining sheets.

3. Use Descriptions: For each Source manually fill in the Use Description in column M.

4. Repeat steps 1–3 for the Energy and Food sections.

Completing the Connections

For Sources that are flagged as significant in the Relevant column (column L), identify and describe the relevant connections to the other Sources using the following steps:

5. Identifying Source connections: Select the Source Code of the other sources that are connected. Drop-down menus in columns S, V and Y contain the Source Codes. If multiple sources support the active Source choose the dominant Source and list the others in the description cell. Comments contained in the header titled Key at the top of the column contain a list of Source Codes.

6. Identify the connection direction: From the drop-down menu, choose 1 (enabling, an upward arrow) if the connected Source helps to make the source available, or -1 (consuming, downward arrow) if the connected Source actually results in some consumption of the active Source. A value of zero denotes no connection and is represented by a circle. Comments associated with the header titled Key at the top of the column describe what the numerical values represent.

7. Description: For each connection, provide a narrative to elaborate the nature of the connection.
For more detailed guidance on how to use the WEF Inventory worksheet, refer to the comments in the tool’s User Guidance Notes cell located near the top of the worksheet.

**Figure 4.** Worksheet #2 WEF Inventory Base
**WORKSHEET #3 – WEF STATUS-BASE**

**Objective.** To describe the current status of the WEF security components relevant to each WEF source (i.e., availability, access, supporting infrastructure [built and natural], and supporting institutions and policy).

**Process.** For each relevant WEF source identified in Worksheet #2, input descriptions for the current state of each of the WEF security components in column A (see the Introduction Worksheet for definitions).

To facilitate the completion of the worksheet, hide Sources that are not significant. Sources that were identified as relevant in Worksheet #2 have a “Y” flag beside the Source name in row 7. All other Sources on this sheet—those with an “N” flag—can be hidden by selecting the columns and right-clicking the Hide tab. This cleans up the view of the sheet to include only those columns that require input.

For each relevant Source column, identify the status of the WEF components (rows) as follows:

1. **Flag the importance of the WEF component.** Flag the importance of each WEF component to the Source using the drop-down menus in columns D, U, etc., as either a “0” (component not important for this source); “1” (somewhat important); “2” (important); or “3” (component very important to this source). The flag in column B reveals the maximum importance for all Sources for that specific WEF component row (rows can be hidden to show only those with a specific relevance threshold).

2. **Describe the status of the WEF component.** In the adjacent cell, input text to describe the current state of the component in qualitative and/or quantitative terms.

3. **Repeat steps 1 and 2 for all relevant Source columns.**

---

<table>
<thead>
<tr>
<th>Source Description</th>
<th>Source Name</th>
<th>Status of Water Use Charges</th>
<th>Status of Groundwater Use Charges</th>
<th>Status of Storage Water Use Charges</th>
<th>Status of Raw Waste Harvest Use Charges</th>
<th>Status of Other Use Charges</th>
<th>Source (Water Use Classes)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Makara</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>Cooling, food, drink</td>
</tr>
<tr>
<td>Purchasing power/Build</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Self-production (water, irrigation, etc., including water)</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Banks</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Self-Infrastructure</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Transportation/Communication</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Waste removal/disposal</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Natural Infrastructure</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td></td>
</tr>
</tbody>
</table>

*Figure 5. Worksheet #3 WEF Status-Base*
**WORKSHEET #4 – WEF SYSTEM DIAGRAM**

**Objective.** A systems-mapping palette to enable a facilitator to work with stakeholders to visually and collaboratively draw the existing sources and uses of water, energy and food and their linkages.

**Process.** Based on the results from the WEF Inventory Base (Worksheet #2), use the shapes in the palette (columns W-AK) to draw a systems diagram of the community’s WEF Sources and Uses, including their connections (Figure 6). The figure below shows an illustrative diagram, but every use will differ.

To use the Palette, copy the shapes and drag them onto the drawing space.

Note on participatory engagement: in a participatory setting, this diagram can be used as the starting point for filling out Worksheet #2.

![Figure 6. Worksheet #4: WEF Diagram Base](image-url)
STEP 2: IDENTIFYING POTENTIAL MINING BENEFITS AND IMPACTS

In this second step, users describe the influence of different mining activities and processes at the operations and closure phases of the mine on the WEF system in the communities.

WORKSHEET #5 – MINING PROFILE

Objective. To describe the characteristics of the existing or proposed mining development at two specific points in time: full operations and full closure. The temporal perspective is important as the potential benefits and impacts of mining may be different during operations and after the mine closes. This profile information is not directly linked to the other worksheets as input, but is necessary to be able to properly address the rest of the analysis questions in the tool.

Process. Enter some basic information about the mining project you wish to examine through the lens of WEF security (Figure 7). This information includes:

- **General**: Information about the high-level parameters of the mine, including the type of ore, mining method and the stage of mining.
- **Mine personnel**: Information about the level of mine employment and representation of employees.
- **Land use**: Information about the mine’s use of land and type of land disturbed.
- **Water use**: Information about the mine’s use of surface water and groundwater.
- **Energy use**: Information about the mine’s electricity production and demand by primary and secondary sources.
- **Food use**: Information about the level of food production and demand associated with the mine.
- **Waste**: Information about the mine’s production of different wastes, including water effluents, leach piles, tailing piles, waste rock and process waste.
## WORKSHEET #6 – WEF INVENTORY MINE

### Objective
To describe any new WEF sources introduced by the mine, as well as the new uses resulting from the mine. The purpose of this worksheet is to understand how the mining development might change the existing sources of water, energy and food, how these are used by the community and their connections.

### Process
Assess Changes in the Source/Use INVENTORY

Begin by flagging any change in Source or use using the drop down menus in rows 8, 20 and 32 and adding a text description of the changes in column E (Figure 8). Changes can also be made to the percentages in the Source/Use tables as necessary. These steps are described in detail below:

---

### General

<table>
<thead>
<tr>
<th>Name of Mine Operation:</th>
<th>ABD Mine</th>
</tr>
</thead>
<tbody>
<tr>
<td>Company:</td>
<td>ABD Mining Company</td>
</tr>
<tr>
<td>Primary Ore Being Mined:</td>
<td>Copper</td>
</tr>
<tr>
<td>Primary Mining Method:</td>
<td>Open-pit</td>
</tr>
<tr>
<td>Year started:</td>
<td>2015</td>
</tr>
<tr>
<td>Previously mined?</td>
<td>Y</td>
</tr>
<tr>
<td>Current Stage of Mining:</td>
<td>Development</td>
</tr>
</tbody>
</table>

### Full Operation

<table>
<thead>
<tr>
<th>Mine Personnel</th>
<th>Description</th>
<th>Quantity</th>
<th>Unit</th>
<th>Description</th>
<th>Quantity</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>% of employees</td>
<td>50%</td>
<td>50</td>
<td>%</td>
<td>100%</td>
<td>100</td>
<td>%</td>
</tr>
<tr>
<td>Average salary of local employees:</td>
<td>5000</td>
<td>5000</td>
<td>$</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Land use</td>
<td>Description</td>
<td>Quantity</td>
<td>Unit</td>
<td>Description</td>
<td>Quantity</td>
<td>Unit</td>
</tr>
<tr>
<td>Roads:</td>
<td>10 km</td>
<td>3 km</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total mine footprint:</td>
<td>20 km²</td>
<td>1 km²</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Land use distributed:</td>
<td>6 km²</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Z: Forest</td>
<td>10 km²</td>
<td>8 km²</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>B: Water</td>
<td>5 km²</td>
<td>1 km²</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Water use:

<table>
<thead>
<tr>
<th>Source</th>
<th>Description</th>
<th>Quantity</th>
<th>Unit</th>
<th>Description</th>
<th>Quantity</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Surface water use:</td>
<td>300 Ml/y</td>
<td>100 Ml/y</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Groundwater use:</td>
<td>1000 Ml/y</td>
<td>100 Ml/y</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Energy use:

<table>
<thead>
<tr>
<th>Source</th>
<th>Description</th>
<th>Quantity</th>
<th>Unit</th>
<th>Description</th>
<th>Quantity</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Primary electricity source:</td>
<td>5000 kWh</td>
<td>1500 kWh</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Secondary electricity source:</td>
<td>5000 kWh</td>
<td>1500 kWh</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total electricity generated:</td>
<td>5000 kWh</td>
<td>1500 kWh</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Food use:

<table>
<thead>
<tr>
<th>Source</th>
<th>Description</th>
<th>Quantity</th>
<th>Unit</th>
<th>Description</th>
<th>Quantity</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Food produced onsite:</td>
<td>none</td>
<td>50%</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Food purchased locally:</td>
<td>75%</td>
<td>From central market</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Food imported:</td>
<td>25%</td>
<td>None</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Waste

<table>
<thead>
<tr>
<th>Source</th>
<th>Description</th>
<th>Quantity</th>
<th>Unit</th>
<th>Description</th>
<th>Quantity</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Waste from mine dewatering to surface water:</td>
<td>0 m³</td>
<td>0 m³</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Waste from mine dewatering to groundwater:</td>
<td>0 m³</td>
<td>0 m³</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

---

### Figure 7: Worksheet #5 Mine Profile
1. **Change in Sources**: Indicate the expected change of a Source in column D. A drop-down menu is activated when the cell is selected. Options in the drop-down menu are described in the red comment tab and include: -2 (↓) = definite decrease in source availability, -1 (↘) = slight to uncertain decrease in source availability, 0 (0) = no change in availability, 1 (↗) = slight to uncertain increase in availability, and 2 (↑) = definite increase in availability. Note: Sources can be created or eliminated with the introduction of mining, and these should be reflected in the table.

2. **Change in Uses**: Indicate the expected change in the Use in rows 9, 21 and 33. Options in the drop-down menu are described in the red comment tab and include: -2 (↓) = definite decrease in use, -1 (↘) = slight to uncertain decrease in use, 0 (0) = no change in use, 1 (↗) = slight to uncertain increase in use, and 2 (↑) = definite increase in use. Note: mining can be introduced as a Use for instances where the mine is within or directly adjacent to the community.

3. **Change in the Source-Use Percentages**: Adjust the percentage that each Source supplies each Use to reflect the expected change due to mining. The percentage of all the Sources should total 100% at the bottom of each Use column to ensure all the sources have been identified. Sources that are relevant will be labeled with a “Y” in the column titled Relevant. Note: effort should be made to provide an accurate percentage of Source, but these numbers are not linked to other part of the tool, so approximate or best guesses from knowledgeable stakeholders is sufficient. The information provides context for addressing the questions in the worksheets #7 and #8.

4. **Listing Use Categories**: For each Source, manually update the Use Description in column P.

---

**Assessing Changes in Connections**

5. **Change in Connection**: Next, flag any changes in the connections among WEF sources using the drop-down menus in columns V, Z and AD and manually change the connection descriptions accordingly.

The Source to Source connections follow the same logic as in Worksheet #2, and initial connections and directions are directly linked to Worksheet #2. Use the drop-down menus to select the expected change in the original Source to Source connection. Options are -2 (↓) = definite decrease in source availability, -1 (↘) = slight to uncertain decrease in source availability, 0 (0) = no change in availability, 1 (↗) = slight to uncertain increase in availability, and 2 (↑) = definite increase in availability.

Note: Source to Source connections can be created or eliminated with the introduction of mining and should be reflected in the table. New or eliminated connections should be identified by editing the Source Code and Prior Connection Direction columns. Comments associated with the header titled Key at the top of the column contain a list of Source Codes.

**Page Display Guidance**: Use the column group hide/unhide tabs at the top of the worksheet to hide or show the Inventory and Connections information. To expose columns, select the “+” above the columns and to hide columns, select the “-“. For ease, start by displaying only the Inventory information and when finished, unhide and complete the Connections information.

**Additional Info**: In the Source-Use Inventory Percentages, there is a threshold for minimum significance below which the source will not be consider relevant for the use. Thresholds for each WEF system can be set in the Properties sheet that is normally hidden. Default thresholds for each WEF system are set at 5%. See the Properties Tab section on how to edit these thresholds.
WORKSHEET #7 – MINING WEF INFLUENCE

Objective. To identify the potential benefits and impacts of mining (during both operations and closure stages) on the availability and accessibility of key sources of water, energy and food as well as the supporting infrastructure (both built and natural) and supporting institutions and policies.

Process. The sheet is in the same format as Worksheet #3, but columns have been added to record the change in the WEF security component (Figure 8).

Warning: do not add rows or columns to the worksheet. The code used to load and save data to the WEF-SC/active Source Category matrices references particular cells. Adding columns or rows will alter the worksheet and render it unusable.

Hide Inactive/Unhide Active Source Categories

The first step is to hide Source columns that were not flagged as relevant. New Sources that were identified as relevant in Worksheet #6 have a “Y” flag beside the source name row. All other sources on this sheet (those with an “N” flag) can be hidden by selecting the columns and right-clicking the Hide tab. This limits the view in the sheet to include only those Sources that require input. Once hidden, column and row headers can be hidden under the View Menu to produce a cleaner looking page.

Assess the Potential Benefits and Impacts of Mining on the WEF Security Components

The steps for describing the potential benefits and impacts of mining on the WEF security components are:

1. Select Mining Stage and Aspect and Load Data: Under the worksheet title, select the Mining Stage (B4) and Process (B5) to be assessed. Drop-down menus in the cells guide the selection process. A description of the mining aspect is presented in the cell below the selected process. Once the mining stage and aspect have been selected, click the Upload Data button to load the relevant information into the worksheet. A prompt appears asking “Apply Data Filters?” Answer “yes” if you want the default filters applied—this automatically removes WEF security components that typically are not relevant for the specific mining aspect.

Figure 8. Worksheet #6: WEF Inventory-Mine
2. Describe the Change in Use and Source: For each Source, describe the anticipated change of the Source due to mining (row 12) and the change in Use due to mining (row 11).

3. Describe the Potential Benefits and Impacts: For each Source, describe the potential benefit or impact on the WEF security component due to mining. The first column is the Baseline value from Worksheet #3 and need not be edited. The second column indicates the relative change in the WEF security component. Options are provided in the drop-down menu and include: -2 (↓) = definite decrease in Source availability, -1 (↘) = slight decrease in source availability, 0 (0) = no change in availability, 1 (↗) = slight increase in availability, and 2 (↑) = definite increase in availability. Provide a description of the change in the column to the right. Note: the default comment is the original WEF Status from Worksheet #3. When the description cell is edited, the text becomes red to indicate that it has been altered from the Baseline, indicating a change due to mining.

4. Save Edits: When you are done describing potential benefits and impacts, click the Save Data button. A prompt appears asking “Apply Data Filters?” Answer yes if you want the default filters applied—this automatically removes WEF security components that typically are not relevant for the specific mining aspect.

Note: save your work frequently! It is mandatory to save the edits before proceeding, as the results will not be carried forward to Worksheet # 8 and will be overwritten when loading the next Upload Data button or Reset Data is prompted.

5. Repeat Steps 1–4 for Each Mining Stage and Process.

Resetting Data: The data for a particular mining stage and aspect can be reset to Baseline values or cleared completely by clicking the Reset Data button. The filter dialogue box applies here as described before.

Row Headers Descriptions

The WEF Security Components, the associated maximum baseline score from Worksheet #3, and the maximum “+” change (positive) and “-“ change (negative) for all the Sources in the current loaded Mining Stage and Process are presented in the first four columns on the left (Figure 7). This provides a quick overview on the WEF Security components deemed influenced by mining for all the relevant Sources. Filters on these columns can be applied to filter out less relevant WEF security criteria. To activate a filter, select the cell in the column to be filtered (indicated with a small downward triangle in a box), then select the elements you want displayed from the menu (Figure 8). Selecting “X” from the list will maintain the headers. Figure 9 illustrates the effects of hiding rows based on the selection.
Figure 9. Worksheet #7 WEF-Influence-Mine
Figure 10. Filter Menu that appears when the filter tab is activated. In this example, all rows with a 2, 3, Baseline, and "X" will appear. All others will be hidden. Note: choosing "X" will maintain the headers such as Availability and Access, as observed in Figure 9.
Figure 11. Effect of Filters in Viewing Data. The top image has no filters applied, whereas the bottom image has filters applied to the Baseline column to show only rows with the values 2, 3, Baseline and “X.” Note that the Storage and Markets WEF Security Components have been hidden, as their Baseline values were 0 and 1 respectively.
STEP 3: EXPLORING ACTIONS AND INDICATORS

In this third step, users identify actions to address the impacts and benefits of mining to maintain and improve WEF security, and indicators to assess and track progress in the WEF system.

WORKSHEET #8A & #8B – WEF SECURITY ACTIONS AND INDICATORS

Objective. These two worksheets compile all of the potential benefits and impacts of mining in one place and enable stakeholders to work together to identify key actions to help realize potential benefits and mitigate impacts of mining. These sheets also provide menus of possible indicators (where available) that could be used to: i) track the status and trends of the WEF Security components, ii) track the potential mining benefits and impacts, and iii) track progress toward necessary actions. While Worksheet #8a focuses on the stage of mine operations, Worksheet #8b focuses on mine closure.

Process. These two worksheets display all of the saved information from Worksheet #7 for the operational and closure phases of mining, respectively (Figure 10). Directional arrows are used to summarize the potential benefits (upward arrows) and impacts (downward arrows) of mining. Text elaborating on the benefits and impacts is also provided next to the arrow.

Descriptions of the Information Displayed

Baseline (column G): the associated maximum baseline importance score for each WEF security component from Worksheet #3.

+ Change (column D): the maximum “+” change (positive) from Worksheet #7

- Change (column E): the maximum “-” change (negative) from Worksheet #7

Filters on these columns can be applied to filter out less relevant WEF Security components. To activate a filter, select the cell in the column to be filtered (indicated with a small downward triangle in a box), then select the elements you want displayed from the menu (Figure 8). Selecting “X” from the list will maintain the headers. Figure 13 illustrates the effects of hiding rows based on the selection.

Baseline (column G): column G is the Baseline value from Worksheet #3 and need not be edited.

Mining Aspects (columns H, I, J, K, L): For each Source a composite of Worksheet #7 is provided in columns H through L and include: 1. Mine Extraction, 2. Mine Waste, 3. Mine Process, 4. Economic Development, 5. General Facilities. Arrows indicate changes recorded in Worksheet #7 with the values -2 (↓) = definite decrease in source availability, -1 (↘) = slight to uncertain decrease in source availability, 0 (0) = no change in availability, 1 (↗) = slight to uncertain increase in availability, and 2 (↑) = definite increase in availability. The description column reflects the comments for each process with the number in front of the comment indicating the mining process to which the comment is associated. Note: only comments for cells having significance (first column) greater than the Relevance Threshold will displayed. The Relevance Threshold can be set in the yellow cell under the worksheet title depending on the level of targeting required. Set the Relevance Threshold to “0” if all comments are to be displayed.

Actions (column N): The actions that need to be input for this worksheet describing how to achieve the potential mining benefit or mitigate the impact.

Indicators (columns P, Q, R): These three columns are for identifying Status Indicators, Pressure Indicators and Action Indicators. The Action column describes actions taken to enhance
benefits and mitigate impacts with mining activities.

**Indicator List (cell B8):** When one of the indicator cells is selected for a specific Source, the grey Indicator List button can be used to display a suggested list of relevant indicators and also to add your own indicator.

**Managing the Screen View**

**Hide Inactive/Unhide Active Sources:** The first step is to hide inactive and unhide Source Categories identified in Worksheet #6. New Source Categories that were identified as active in Worksheet #6 have a “Y” flag beside the Source name row. All other sources on this sheet (those with an “N” flag) can be hidden by selecting the columns and right-clicking the Hide tab. This limits the view in the sheet to include only those Source Categories that require input. Once hidden, column and row headers can be hidden under the View Menu to produce a cleaner looking page.

**Hide/Displaying Actions and Indicators Columns:** Associated with each Source are Actions and Indicators columns that can be hidden or displayed using group hide/unhide buttons at the top of the worksheet. To display columns, select the “+” above the columns and to hide columns, select the “-“. For ease, start by displaying only the Actions column information then expand to the Indicators column when ready.

**Identifying Actions and Indicators**

For each Source, conduct the following:

1. **Describe Actions:** Unhide Actions column and review baseline value from Worksheet #3 for the WEF security component that are significant.

2. **Identifying Indicators:** Using the group hide/unhide button, unhide the Indicators columns (Figure 13). For significant WEF security components, list the Status Indicators, Pressure Indicators and Action Indicators in the appropriate columns. To guide list development, the workbook contains pre-determined lists of relevant indicators. To access the list, click in the desired cell to be edited then click the Indicator List button on the upper left corner of the worksheet. A dialogue box containing a list of suggested indicators will appear. Select the relevant Indicator(s) and/or input your own Indicator in the “user defined” space of the menu tab and click OK. To delete an indicator, simply click on the selected indicator again, and it will remove the highlight from the menu tab and the indicator will be deleted by clicking OK.

3. **Repeat steps 1 and 2 for all WEF security components that are significant to the Source. Repeat for all relevant Sources.**
About the Indicator Menus

The Indicator Menus were generated from the example indicators reviewed and listed in the WEF Resource Book for Mining. These indicators are stored in a database embedded in the WEFsat-Mining tool. This menu can be modified so that it can be improved over time with experience.
WORKSHEET #9 – MINING INFLUENCE DIAGRAM

Objective. This worksheet is the same as the WEF System Diagram Worksheet #4 and provides a canvas to incorporate and visually depict the specific influences of mining development on the original WEF security system.

Process. Begin by copying the diagram from Worksheet #4. Modify the diagram to account for any altered or new water, energy and/or food Sources potentially introduced through mining (or sources that are lost). For existing Sources and Uses that have been changed, select the shape or connection and change the outline to dashed by selecting the shape, right clicking => Format Shape (or Format Object) => Line Style => Dash Type then select the dashed option. For new shapes or connections, use the Palette, copy the shapes and drag them onto the drawing space. Note: dashed lines represent altered Sources/Uses and the dotted shapes and lines in the palette represent new Sources, Uses and Connections.

Note on participatory engagement: In a participatory setting, this diagram can be used as the starting point for filling out Worksheet #6.

Figure 14. Worksheet #9 WEF Mine Diagram
STEP 4: SUMMARIZING FOR DECISION-MAKERS

In this fourth step, users identify and summarize the key insights uncovered throughout the use of the tool with regards to each component of WEF security.

WORKSHEET #10 – SUMMARY FOR DECISION-MAKERS

Objective. This worksheet enables users to manually compile the key information from the previous worksheets into a summary format. Show and hide buttons enable users to select which information to display. By completing this summary sheet, users distill the insights gleaned in previous worksheets, so this final tab helps users conclude with a summary of lessons learned areas to address for future improvement, in terms of: (i) the key mining benefits and impacts for each of the WEF Security components; (ii) the key actions for realizing benefits and mitigating impacts; and (iii) the set of indicators that should be tracked for each WEF security component.

Process

Sources

List the key water, energy and food sources in the Sources cell along with the key status indicators.

Key Connections

Include a description of key WEF connections for the Sources and Purchasing Power components and for others as needed. Draw from Worksheets #2 and #6 for connection details.

Mining Benefits and Impacts

Use Worksheets #8a and #8b to identify the key benefits and impacts on each of the WEF security components and the relevant indicators.

Key Actions

Use Worksheets #8a and #8b to identify the key actions necessary to realize key benefits and mitigate key impacts, and the relevant key performance indicators.

Indicator Summary Guidance

The total number of indicators listed should not exceed 50 for practical purposes.

The summary for decision-makers is meant to help mining companies, governments and other decision-makers involved in mine development understand the implications of mining on regional WEF security and manage them as best possible. For this reason, the summary for decision-makers should be presented factually and clearly, keeping in mind the specific needs and goals of the audience. Language used should be clear, concise and understandable to a non-technical audience.
**Figure 15. Worksheet #10: Executive Summary**

<table>
<thead>
<tr>
<th>Security Component</th>
<th>Key Insights</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Availability</strong></td>
<td><strong>Sources</strong></td>
</tr>
<tr>
<td>Water:</td>
<td>- Surface Water (exceedances of ph, SO4, constituents of concern)</td>
</tr>
<tr>
<td></td>
<td>- Groundwater (exceedances of ph, SO4, constituents of concern)</td>
</tr>
<tr>
<td>Energy:</td>
<td>- Biomass</td>
</tr>
<tr>
<td></td>
<td>- Diesel/Petrol (% change in price)</td>
</tr>
<tr>
<td></td>
<td>- Hydropower</td>
</tr>
<tr>
<td>Food</td>
<td>- Self-produced</td>
</tr>
<tr>
<td></td>
<td>- Purchased locally (% change in local fish catchers)</td>
</tr>
<tr>
<td></td>
<td>- Imported</td>
</tr>
</tbody>
</table>

**Key WEF Connections & Indicators:** Diesel and electricity grid provide power for: pumps to irrigate local crops (surface water sources) and to distribute water to livestock (surface and groundwater sources) as well as provide power for food preparation, refrigeration, and energy use of households. Although irrigated crops are not a primary source of local food, there is some reliance on local livestock for achieving protein balance. Annual duration of power outages.

**Key Benefits and Impacts & Indicators:** Mine development has brought increased connectivity to grid electricity. Some concern degradation of grid connectivity and reliability on mine closure due to decrease in infrastructure investment capability. Annual investment in grid maintenance.

Runoff and seepage from waste rock and tailings piles has potential to impact surface water and groundwater sources in region. Annual concentration of runoff and effluent from mine waste facilities: ph and metal concentration of surface water and groundwater sources.

**Key Actions & Indicators:** Establishment of closure fund for short-term investment in electricity grid following mine closure, combined with a corresponding increase in government investment in grid maintenance locally. Annual investment in local grid maintenance.

Water quality monitoring system to measure effluent volume and quality both during and after closure. Construction of engine, soil covers for mine waste rock and tailings facilities. Construction of permanent seepage collection and treatment systems for closure. Cost of bond for financing annual operation and maintenance costs of covers and treatment systems. Monitoring system in place data publicly available online; soil cover closure design complete; soil cover constructed; seepage treatment system closure design complete; seepage treatment system constructed; amount of closure bond.
GUIDANCE FOR EXPERT USERS

There are two hidden programming worksheets in WEFsat-Mining: (1) the Properties tab and (2) the Indicator Reference (IndicatorRef) tab. The Properties tab contains a series of references that formulas, data validation and macros use and has been established to provide an easy means of changing these options. The IndicatorRef tab contains the lists of indicators that are presented in the ListBox in the Indicator Selection dialogue box (Figure 13) that is activated in Worksheets #8a and #8b. To access these hidden worksheets, right-click on any worksheet tab and select Unhide.

PROPERTIES TAB

This sheet contains all the references used by macros and functions in the various sheets (see Figure 14–Figure 16). Comments associated with the title reflect what each section pertains to in the workbook.
**Data Matrix:** Number of rows/columns in the data matrix on Worksheet #7. Used by the macros on that sheet to copy and move blocks of data. If rows or columns are added to the data matrix, these will have to be modified along with all the storage matrices and other references.

**Mine Related Activities:** Reference used by the macros supporting Worksheet #7.

**Index** is used to determine the column to choose in the tables below for applying the filters of active/inactive WEF Security components.

**Load Rows** indicates the row for storage the data matrix for each stage and mining process.

**Description** is the text in the cell below the mining process choice in Worksheet #7.

**Table** is accessed by an index formula in Worksheet #7 and then used by the filter command embedded in the macros to show/hide rows.

---

**Figure 17.** Functionality of Properties Worksheet, Part 2

<table>
<thead>
<tr>
<th>WEF Status Relevant</th>
<th>Operational</th>
<th>Closure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Available</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Processing/treatment/conversion</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Timing of delivery</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Distribution</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Retail (market prices)</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Access</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Purchasing Power</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Aid (direct provision, safety nets, subsidies)</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Self-production (water wells, off-grid power, individual/community gardens)</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Barter</td>
<td>X</td>
<td>X</td>
</tr>
</tbody>
</table>

---

**Data Matrix:**

| Data Matrix | Number of rows/columns in the data matrix on Worksheet #7. Used by the macros on that sheet to copy and move blocks of data. If rows or columns are added to the data matrix, these will have to be modified along with all the storage matrices and other references.

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**Figure 17.** Functionality of Properties Worksheet, Part 2

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<tr>
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<td>Access</td>
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<td>X</td>
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<tr>
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**Figure 17.** Functionality of Properties Worksheet, Part 2

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<td>X</td>
<td>X</td>
</tr>
</tbody>
</table>
### Indicator Guide Matrix

Sets the reference column and row for the indicator lists for the Indicator Dialogue Box on Worksheets 8a, 8b. Row 102 is the column in Worksheets 8a, 8b, and the starting row of the indicator list is associated with each WEF Security component. This will need to be edited if rows/columns are inserted/deleted on either Worksheets 8a or 8b or the IndicatorRef worksheet.

![Indicator Guide Matrix](image)

---

**Figure 18.** Functionality of Properties Worksheet, Part 3
INDICATOR REFERENCE TAB

The IndicatorRef tab is the database of indicators that supports the Indicator Selection dialogue box activated when the Indicator List button is clicked on Worksheets #8a and #8b. The top of the column of indicators lists either the title of the WEF Security component (in italics) that the indicator set pertains to (also includes rows for Change in Source, Change in Use). For example, row 5 (Figure 17) is the header for the indicator set associated with the Change in Source row (row 10) in Worksheets #8a and #8b and the Change in Use row (row 9 of Worksheets #8a and #8b) starts in row 68 of this worksheet. State, pressure and action indicator sets are available for water (blue header), energy (yellow header) and food (green header) systems. The list is used to populate the listbox in the Indicator Selection dialogue box. The indicators are compiled from the tables in the Water-Energy-Food Resource Book for Mining, where specific citations are listed in the reference section.

Changing the Indicator Database

Indicators can be added, edited or deleted directly in the cells, but a maximum of 499 characters will be shown in the listbox for each indicator. The number of indicators appearing in the listbox is denoted by the number in the upper right-hand column associated with the WEF Security component. For example, if 10 indicators are listed in this sheet but the number is only 8, only the first 8 indicators will be shown in the listbox.

Selected Indicators: The active column indicates which indicators have been selected (“Y”) or unselected (“N”). The cell to the right of the indicator is associated with its status.

User-defined indicators are listed as a text string in the cell below the Indicator List title and above the indicator list. Edits here will appear in the User-Defined Indicators text box in the Indicator Selection dialogue box.

Warning: It is not advisable to insert/delete rows or columns in this sheet. If columns or rows are added or deleted then the macro supporting the Indicator Selection dialogue box will not reference the correct cells. To rectify, then, the Indicatory Guide Matrix in the Properties sheet will need to be modified to reflect the change in rows/columns.
### Figure 19: Indicator Reference Tab

Note: Food indicators are listed to the right.
ADDITIONAL INFORMATION

CONTACT INFORMATION

To inquire about training and application opportunities contact:

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International Institute for Sustainable Development
Email: info@iisd.ca

REFERENCES


