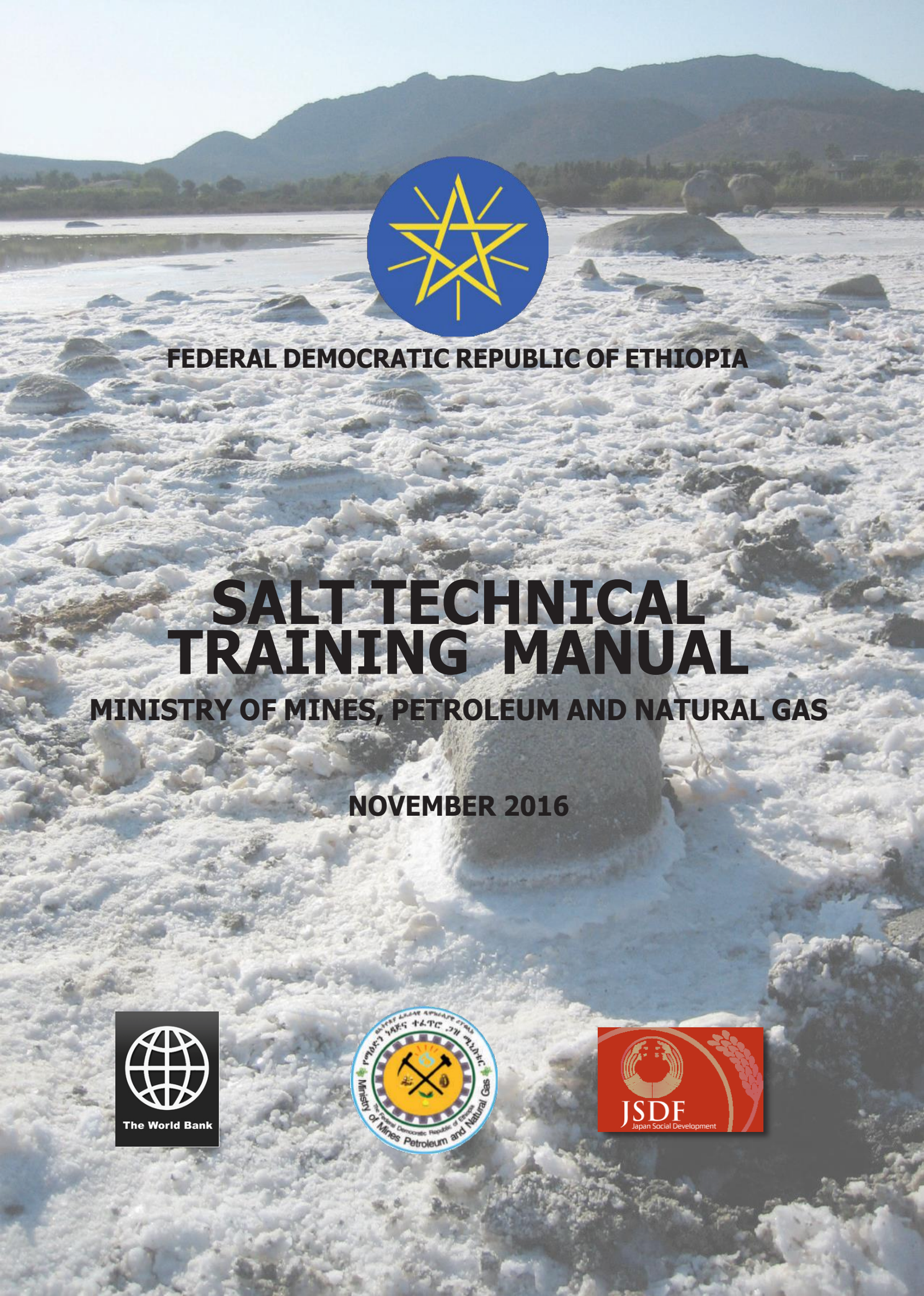


FEDERAL DEMOCRATIC REPUBLIC OF ETHIOPIA

SALT TECHNICAL TRAINING MANUAL

MINISTRY OF MINES, PETROLEUM AND NATURAL GAS

NOVEMBER 2016

The World Bank

Ministry of Mines Petroleum and Natural Gas

JSDF
Japan Social Development

FOREWORD

Estelle Levin Limited (ELL) and Sudca Development Consultants (Sudca) developed this training manual for the JSDF Project and the Government of Ethiopia's Ministry of Mines, Petroleum, and Natural Gas (MOMPNG). It was financed by the World Bank administered JSDF grant for support to improve the economic, social, and environmental sustainability of artisanal miners, with a particular emphasis on empowerment of women.

The JSDF Project is coordinated by the Women and Youth Directorate of the MoMPNG.

ELL Training Expert, Dr. Jennifer Hinton, authored the report, with contributions from: ELL Team Lead, Dr. John Tychsen; Sudca Gender Expert, Yimegnushal Takele; Sudca Environmental Expert, Andualem Taye; and ELL Project Manager, Adam Rolfe.

The publication of this manual is the product of an extensive participatory research and practical training process, which ran from April to November 2016. An initial needs assessment visit (April – May) focussed on technical mining practices, environmental management, and the role and position of women within salt mining in Afar region. This informed the design of draft training materials that were used to deliver a training to co-operatives / Women's Economic Strengthening Groups and relevant government personnel (July). Feedback from the participants and the client was incorporated into the training material and subsequent design of the training manual.

The manual prioritises:

- Adult learning techniques that maximise participation and learning-by-doing; and
- A Knowledge, Skills and Attitudes (K-S-A) approach to build capacity in technical content while empowering participants by increasing their Knowledge and Skills to create gender-responsive trainers with the Attitudes necessary to support future actions.

The manual is intended for use by a variety of audiences to guide and supplement their work, whether directly or indirectly related to Artisanal and Small-scale Mining (ASM). A non-exhaustive list of the potential users is as follows:

- The ASM Department of the MoMPNG
- MoMPNG Directorates working closely with the ASM, Environment & Community Development, Gender, Artisanal Mining Production and Marketing, Public Relations and Communications Directorates
- Regional Mining Bureaus
- Local Woreda and Kabele Officers (Gender, Mining, Environment)
- Artisanal and Small-scale Mining Cooperatives / Women's Economic Strengthening Groups
- Artisanal and Small-scale Communities

CONTENTS

This manual was edited in January 2022 to remove a picture on page 15

SECTION 1: GUIDELINES FOR TRAINERS

Any woman or man can become an excellent trainer! You *don't* need to be an expert on a topic to help others learn new skills and ideas and improve their salt mining activities.

Training is not just about giving information in a lecture. Training is about using different techniques and methods to positively change the behaviour and practices of the women and men you are training. To do this, a good trainer will use different techniques and methods to build upon trainees' existing Knowledge, Skills, and Attitudes ("K-S-A"):

- **K = Knowledge.** *This is the facts or information that women and men know.* For example, someone may *know* where salt is located but may not know how to mine it.
- **S = Skills.** *This is the ability to do something.* For example, someone may know *how* to mine salt but may not know enough about how to improve its quality and sell it at a better price.
- **A = Attitudes.** *How women and men act in or feel about a situation.* This also includes the values that people have. For example, someone may have skills and knowledge about salt mining, but doesn't have the initiative to learn how to improve salt quality.

This chapter describes: important characteristics of a good trainer; how a trainer can identify and respond to the different K-S-A needs of trainees; and different methods trainers can use to build K-S-A.

1.1 WHAT MAKES A GOOD TRAINER?

A good trainer will:

- Respect the existing knowledge, skills, and attitudes of people you are training and **build-upon** this by introducing something *new* (an idea, method, or way of working).
- Be encouraging, supportive, and patient. Understand that each person might have different training needs. Some women and men miners will need more time and encouragement than others.
- Help the women and men you are training by finding the solutions themselves.
    - Ask questions about what they know and how they think a problem can be solved.
    - Introduce new ideas and methods using your coaching and mentoring skills.

--- Talk about what they learned and how it can improve people's lives.

--- Talk about possible unintended impacts of the new method and how you can manage this.

- Remember that women and men may face different challenges speaking up or participating. A good trainer will adapt by taking steps to ensure *all* trainees benefit from training. Remember that different people have different K-S-A and you may need to adapt your methods for women, men and other groups (and may even need to train them separately).
- Keep a positive attitude! It takes time to change behaviours of trainees and a lot of practice to become a good trainer.

1.2 IDENTIFYING THE TRAINING NEEDS OF MINERS

To identify the training needs of women and men miners, you will need to:

- Decide what women and men miners *should* know and be able to do, and the attitude needed to increase their incomes, mine more safely, protect their health and the environment, and support the development of their families.
- Understand what women and men *already* know, can do and how they act or feel. Is this different for women's and men's groups? Will you need to adapt your training approach for each?

Using each section of this manual, **make and complete a table like the one below** to decide what to focus on when you are training women and men miners:

Topic	Knowledge			Skills			Attitudes		
	What miners need to KNOW about	What MEN miners already KNOW about	What WOMEN miners already KNOW about	What miners need to be able to DO	What MEN miners can already DO	What WOMEN miners already DO	What kind of attitude miners need to have	What MEN miners already know	What WOMEN miners already know
Legal Rights									
Salt Production methods									
Alternative Salt Products & Markets									
Occupational Health Issues									

Community Health and Environment									

Table 1: Men and Women KSA Analysis

For each topic, decide what *new* knowledge, skills, and attitudes your trainees need. Use this training guide to help you find the information you need to help train others.

For each topic, decide what *new* knowledge, skills, and attitudes your trainees *need*. Use this training guide to help you find the information you need to help train others. Review the differences between the men and women you will train, as well as any intra-gender particularities. How can you address these differences?

To address training needs, particularly of women trainees, you should also consider the following issues:

- Where will the training be done? Is it easy and inexpensive for trainees to access the location? How will it affect the trainees' day-to-day lives?
- When will the training be done? How long or how often will you do it? Could this create a household conflict or inconvenience for trainees? How will you address this?
- What are the costs of the training for the trainee? Think about all costs (lost income, transport, accommodation). Will they be able to afford to participate? How will you address this?

1.3 TRAINING METHODS

Use a combination of methods depending on whether you want to build Knowledge (**K**), Skills (**S**), or Attitudes (**A**).

KIND OF LEARNING	TRAINING METHODS
KNOWLEDGE [Facts, Information]	• Lectures and presentations • Readings • Songs, Films, TV, and Radio • Brainstorming, group, or one-on-one discussions
SKILLS [How to do something]	• Demonstrations • Instructions followed by hands-on practice.
ATTITUDES [Values, what people think about things, how they react to things]	• Posters and visual aids • Discussion • Role plays and simulations

Table 2: Types of learning and methods for training

You don't need to organise a training workshop to be a 'trainer'. Sometimes, the best training is done at the mine site. The most important field techniques you can use are as *coaches* or *mentors* of women and men miners. Because women and men may have different training needs, it may be useful to coach or mentor them separately.

To be an effective **coach** of artisanal miners:

1. *Focus on one method, skill, or way of working that you learned about during the training:* Think about what you learned during this training. Pick one topic that you think other miners would benefit from learning about. Remember that women and men miners might have different needs!
2. *Work with 1-3 miners at a time to teach them about the activity.*
    - Talk to the miners about why it would be useful to learn this new task or skill.
    - Demonstrate and instruct the miners on the task or skill – do it together.
    - Talk about what worked well, what did not and how they could improve next time.
3. *Once the miners are comfortable using the new skill or methods,* then introduce it to *other* miners OR focus on teaching miners about a *different* method or topic.
4. *Re-visit the miners you trained later* to make sure that they are using the method in a proper way (or perhaps have improved on the method by adapting it).

To be an effective **mentor** of artisanal miners:

1. *Give advice to women and men miners on a regular basis.* Talk to individual miners about what they think they need to know to improve their mining activities. Remember that women and men miners might have different needs!
2. *If you know about the topic* then give the miners advice on the issue on a regular basis. Work with them to find solutions together.

If you don't know about the topic then ask for advice from those that do: for example mining officers at the Woreda Regional Mining Bureau (RMB) or Ministry of Mines. They may need to do some research to help you advise fellow miners.

SECTION 2: GENDER EQUITY, RIGHTS & RESPONSIBILITIES IN ARTISANAL AND SMALL-SCALE MINING

The purpose of the present training manual is to improve the position of women miners in the mining production cycle and to enhance their benefits from mining activity.

The focus of the following sections is the improvement of **technical skills** and the **introduction of modern, efficient, environmentally friendly and gender sensitive technologies**. However, for this to contribute to impactful, meaningful, and sustainable change for women, it is integral that trainees are trained in the importance of gender equity as well as their rights, roles, and responsibilities.

By developing a better understanding of the present position of women in mining, as well as legal provisions and government responsibilities to protect and promote the role of women, this section will complement the skills learned in later sections and provide trainees with a basis for realising the benefits of the training programme when applying their new skills.

The introduction of new technologies and skills to operate them will only provide trainees with the *potential* to improve their livelihoods and the benefits of mining; an understanding of gender equity and their rights and responsibilities will permit the trainees to apply these skills in a way that *maximises their potential*.

2.1 GENDER AND DEVELOPMENT

Introduction

Women constitute 26% of the mining households in Ethiopia (ASM Baseline Survey, Sudca, 2013). When we look at the gender distribution by mineral type, women hardly participate in salt extraction and dimension stone production. They likewise have a very limited role in gemstone mining. Thus, the only area where women engage as recognised miners is gold mining, which also varies from region to region. For example, in Benshangul-Gumuz Region, females [including girls] are very actively engaged and make up 51%; while in Tigray, they represent 39% of the mining workforce. However, even in these regions, where women constitute a considerable size of the mining workforce, the gender disparities between men and women as well as boys and girls are considerable.

Does gender equity matter?

Gender equity is not just a question of being fair to women and girls or narrowing the economic and social gaps between male and females. It is a matter of national and community development. For instance, The Global Hunger Index indicates that countries with the highest levels of gender inequality show the highest levels of hunger. Thus, con-

fronting gender inequality stands out among the key elements of reducing hunger and, hence, of reducing poverty (USAID, 2011).

Domains for analysing gender inequality

ASPIRATIONS:

Children constitute a significant, although diminishing, proportion (5-10% depending on the region) of the ASM labour force in Ethiopia (EITI, 2016). Children, especially girls, are prone to high levels of non-enrolment, absenteeism, and school dropout. This has a profound impact on the aspirations of children of the present generation and the development of their communities, in much the same way as it did for previous generations.

Figure 1: Children in mining communities, particularly girls, are vulnerable to school dropout, absenteeism, or receiving no education at all. Photo from Asgede Tsimbila woreda. Tigray Region (Photo: J. Hinton)

GENDER DIVISION OF LABOR:

Women report spending two thirds of their time in mining and the rest on crop production, domestic chores and discharging their child care responsibilities. Nevertheless, despite these additional burdens, women spend as almost as much time as men mining.

All of the above factors result in a disproportionate work burden for women and girls, impacting their development and aspirations. In turn this can also determine their social status. Often the problems detailed above are confounded in female headed households.

Figure 2: Photo from Menge Woreda. Benshangul Gumuz Region (Photo: J. Hinton)

ACCESS TO AND CONTROL OVER ASSETS AND RESOURCES:

Ownership of the majority of household assets such as family land holdings, houses, livestock, income, etc. in the mining communities is primarily the reserve of men.

PARTICIPATION AND DECISION MAKING:

Women are reported as having the most decision making power over income *they* have generated. Where they are not involved in income generating activities, whether from social or cultural exclusion, there is a risk that gains (including those resulting from increased productivity leading to higher income in ASM households) could be misused. This could actually worsen the existing situation of women and girls if they are obligated to take on additional work burdens but restricted from accessing the improved income. This risk could be heightened if, for instance, machinery were to be co-opted by men. Conversely, assessment demonstrates that ASM women who actively participate tend to have a stronger voice in community/collective issues, relative to their inputs at the household (HH) level.

INSTITUTIONAL CAPACITY AND COLLABORATION AMONG PARTNERS:

Some major factors slowing down the gender mainstreaming process in artisanal mining include: limited staff capacity in government to integrate gender; weak collaboration and interconnectedness across gender offices; and persistence of unorganised and highly individualised mining operations.

OTHER SOCIAL PROBLEMS:

Many women around the mining areas are engaged in low paying and/or risky livelihood activities such as food vending, catering, sale of goods, and/or sex work. The resultant marginalisation can increase women and children's exposure to child abuse, human trafficking, HIV, gender-based violence, and/or harmful traditional practices. Lack of knowledge about safety rules and on the need to use safety equipment, accompanied with exposure to toxic and poisonous chemicals is also an issue. The domestic division of labour means the workloads of women are reportedly increased by deforestation and its associated impacts on availability of water and firewood.

2.2 LEGAL RIGHTS AND RESPONSIBILITIES OF WOMEN AND MEN MINERS

The development of you, your family, and your community depends on whether the rights of women, men, boys and girls are **respected, protected,** and **fulfilled!** To do this, women and men miners have to fulfil *responsibilities* while the government needs to discharge its *obligations.*

What are the rights of women and men miners?

According to the Constitution and the Mining Proclamations of Ethiopia:

- **Eligibility for License:** No person is required to possess financial resources, technical, and professional competence in order to acquire an artisanal mining license. (Art.2, The Mining Proclamation, MOM 2010)
- **All nationals** can apply through their Regional Mining Bureau for an artisanal license (Proclamation No. 816/2013).

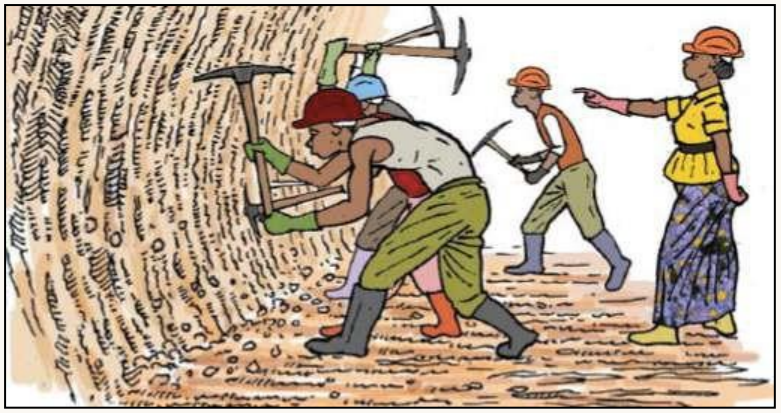


Figure 3: Both women and men have the right to work in different areas of the mine (Source: Hinton et al, 2009)

- An artisanal license is **valid for a period specified in the license (not exceeding two years)** and is non-renewable (Proclamation No. 816/2013).
- The **maximum area** to be covered by a single license shall be 5,000m^2 for artisanal mining operations.
- One can't be a holder of two licenses at a time. (Art. 10, Council of Ministers, 1994)
- **The right to be organised**: ASM workers have the right to form associations or cooperatives to improve their conditions of work and economic well-being.
- Women workers have the right to equal pay for equal work. (The Constitution Art. 42)
- **Small-scale and special small-scale mining licenses** are granted for an initial period of up to 10 years and can be renewed for 5 years (Proclamation No. 816/2013). Please consult with your Regional Mining Bureau for further information.

- **Environmental impact:** Artisanal miners are not required to submit an environmental impact assessment or to allocate funds to cover the costs of rehabilitation of environmental impact. (Art. 60, Council of Ministers, 1994)

Legal rights concerning equal opportunities, equal pay for equal work and non-discrimination

- Women shall, in the enjoyment of rights and protections provided for by the Constitution, have equal rights with men. Women have equal rights with men in marriage. (The Constitution Art. 35)
- Women have the right to acquire, administer, control, use, and transfer property. In particular, they have equal rights with men with respect to use, transfer, administration and control of land. They shall also enjoy equal treatment in the inheritance of property. (The Constitution Art. 35)
- Every Ethiopian has the right to engage freely in economic activity and to pursue a livelihood of his choice anywhere within the national territory. (The Constitution Art. 41)

Legal rights concerning safe working conditions

- To prevent harm arising from pregnancy and childbirth and in order to safeguard their health, women have the right of access to family planning education, information, and capacity. (The Constitution Art. 35)
- Workers have the right to enjoy a healthy and safe working environment.

Legal rights concerning access to justice

- Everyone has the right to bring a justiciable matter to, and to obtain a decision or judgment by, a court of law or any other competent body with judicial power. (The Constitution Art. 37)

The responsibilities of women and men miners

- **Royalty:** The amount of royalty payable by the holders of artisanal and small-scale mining licenses shall be at the rate fixed by the laws of the states. (Art. 63, Council of Ministers, 1994)
- **Order of Processing of Applications:** An application submitted for a large scale mining license shall take precedence over applications for small-scale and artisanal mining licensees, and an application for small-scale mining

license shall take precedence over an application for artisanal mining license; (Art. 13, Council of Ministers, 1994)

- **Revoking a License**: The Licensing Authority may, after giving 90 days prior written notice, revoke an artisanal mining license, but preferential treatment or compensation shall be given to the licensee. (Art. 32, Council of Ministers, 1994)
- **Termination of a License**: Mining rights shall terminate if a license expires without being renewed or licensees acted unlawfully. (Art. 77, Council of Ministers, 1994)

Legal rights of children

- Every child has the right to life; to nationality; to know and be cared for by his or her parents or legal guardians; not to be subject to exploitative practices, neither to be required nor permitted to perform work which may be hazardous or harmful to his or her education, health or well-being; to be free of corporal punishment or cruel and inhumane treatment in schools and other institutions responsible for the care of children. (The Constitution Art. 36)

Figure 4: Children's Rights

- In all actions concerning children undertaken, the primary consideration shall be the best interest of the child. Children born out of wedlock shall have the same rights as children born in wedlock. The State shall accord special protection to orphans. (The Constitution Art. 36)
- Under special circumstances, children of age 14 and above can engage in safe paid works, but subject to limitations in working hours, not to work during weekends, and not to work overtime.
- Alternative education should be provided for young girls and boys engaged in the mining activities;
- Parents/guardians are responsible for ensuring that both girls and boys enjoy their right to rest, play, and attend school.

2.3 OBLIGATIONS OF THE GOVERNMENT

The Government of Ethiopia has a legal obligation to **respect, protect,** and **fulfil** the rights of its citizens. A few examples of important obligations of government include to:

- Fairly and without discrimination - on the basis of gender, class, or ethnicity - ensure that mandates (including those mandates of Regional Mining Bureau and Woreda offices related to technical assistance and advice to artisanal miners) are fulfilled;
- The State shall enforce the right of women to eliminate the influences of harmful customs. Laws, customs, and practices that oppress or cause bodily or mental harm to women are prohibited (The Constitution Art. 35);
- Provide training on legal right of women artisanal and small-scale miners to apply human rights and gender equality principles (avoid physical harassments and psychological torture);
- Create awareness to protect against the sexual exploitation of women and girls by workers, traders and those who are engaged in other jobs around mining areas;
- Prevent harassment and discrimination;
- Strengthen the legal trading system in collaboration with responsible bodies such as police and trade bureaus to support women artisanal miners;
- Set-up mechanisms to protect the economic interests of girls who work for relatives, friends of the family, or guardians;
- Make sure women, women's organisations and associations are active participants in decision making, for example in consultations and meetings;
- Identify and address local and associational sources of conflict in artisanal and small-scale mining communities and promote conflict resolution, since women are often the prime victims of conflicts that arise. In addition, it must ensure active participation of women in resolving conflicts;
- Develop regular and gender sensitive assessment and monitoring techniques to overcome the hurdles to positive change and to support the development of women in artisanal mining;
- Ensure that the rights of other land users are protected; and
- **Provide Assistance -** The government may provide incentives and assistance to artisanal mining carried out by cooperatives. (Art. 75, Council of Ministers, 1994)

2.4 WHAT TO DO WHEN RIGHTS ARE NOT RESPECTED, PROTECTED, AND FULFILLED?

- **Appeal Procedures:** Any person who is aggrieved by any administrative decision of the Licensing Authority pursuant to Proclamation 816/2013 may apply to the officials of the Licensing Authority hierarchically [Woreda - Regional -Federal] (Art. 79, Council of Ministers, 1994).
- After one has exhausted the administrative remedies with the Licensing Authority, they may apply to the competent court for the review of an administrative decision contemplated in sub-article (1).
- In the case of any criminal act (such as sexual or physical violence or denial of payments), the victim may take their case to the local police or the relevant government administrative body for justice.

SECTION 3: SYSTEM OF SALT PRODUCTION

The main steps in salt production in Afar Region are shown below. The economic, environmental, and occupational safety and health issues are different at each step in salt production. To understand the training needs of miners at your site, answer these questions:

- What jobs do your trainees do at each step? How are they currently doing these jobs?
- Do men and women do different jobs? Are they using different tools and methods?
- *At each step,* what do women and men need to know about and be able to do in order to: make more money, work more safely, and protect the environment?

3.1 SALT RECOVERY FROM BRINE

Main steps in salt production include (Fig. 5):

1. Pumping brine from salt lake into first pan;
2. Initial evaporation and removal of sediment (typically 3-7 days);
3. Transferring brine to second pan, evaporation and precipitation of non-salt minerals (typically 3-7 days);
4. Transferring brine to third pan until all liquid completely evaporates (typically 7-14 days). Salt crust is broken, scraped, and collected.
5. Stockpiling and selling salt.

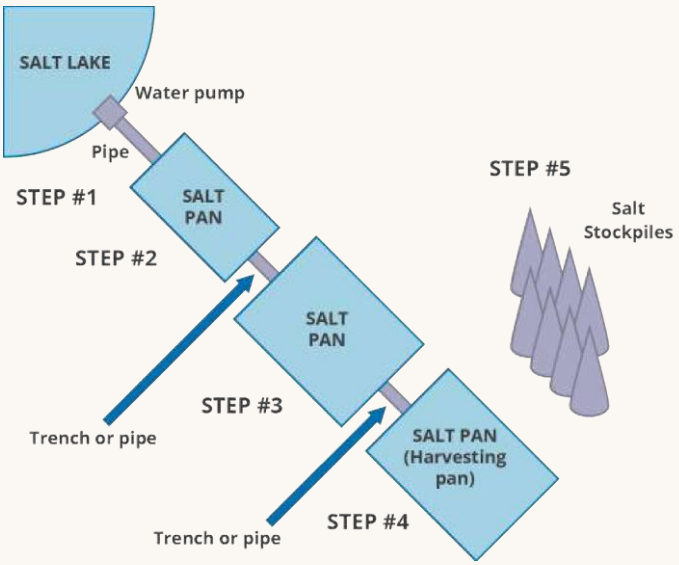


Figure 5: Main Steps in Salt Production in Afar Region

SECTION 4: IMPROVED SALT PRODUCTION METHODS

Salt water or “brine” is made up of water, dissolved salt, and other dissolved minerals. As the water evaporates, salt and these other minerals become more and more concentrated until they begin to crystallise in solid form. The salt that is produced is actually made up of pure salt (NaCl) *mixed with* other minerals and sometimes impurities like mud and sand.

In order to improve salt production, women and men miners should take steps to:

- Improve the *quality* of salt by removing other minerals and impurities from the final product. Higher quality salt should bring a better sale price!
- Improve the *quantity* of salt by minimising the amount of time that brine stays in each pan.

This section talks about ways to do this by improving: (i) selection of the location, shape, and size of salt pans; (ii) construction of salt pans; and (iii) optimising the time that brine spends in each pan (not too long, not too short).

4.1 SALT PAN LOCATION, SHAPE, AND SIZE

The location for salt pans should consider (Fig. 6):

- A large enough area for the size of pans. Areas free of vegetation will be easier to prepare (and reduce environmental effects);
- The first salt pan should be at a slightly higher elevation than the second and third pans to ease the flow of brine from one pan to the next. Often, this is not possible so the second pan should be slightly deeper than the third. The third pan should be the deepest.
- The pans should be close enough to the salt lake to reduce pumping distances (so a smaller, cheaper water pump can be used) but far enough from the lake to account for changing water levels and to reduce impacts to the near-lake vegetation

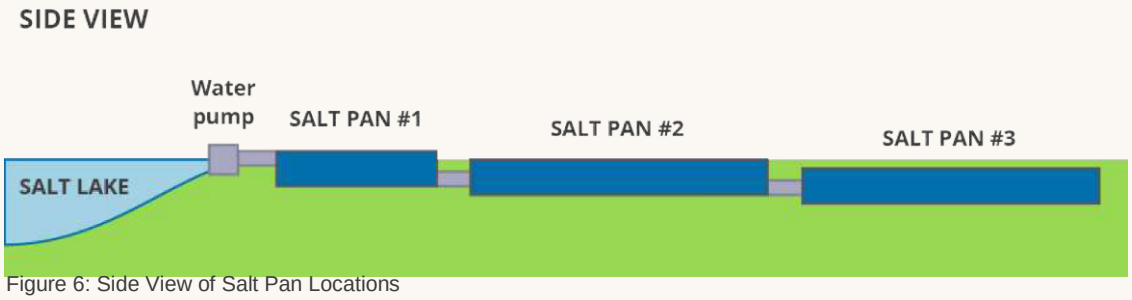


Figure 6: Side View of Salt Pan Locations
Each salt pan is slightly deeper (or at a lower elevation) than the previous to help brine flow into the next pan.

Salt pans are often square or rectangular in shape and sizes vary a lot (Fig. 7). In some places, salt miners make small pans of only 4-5m by 6-7m so they can manage them in smaller groups of workers (e.g. 3-6 people). In many places in Afar, pans are very large, up to 150m by 200m or more, and worked by groups of 15-30 people.

The larger the pan, the more salt can be harvested; but building a large pan takes more investment of time, labour by workers, and one or two water pumps. Small pans can be easier for fewer people to manage and (because water can be manually channelled from a lake) don't need a water pump; but they have *much* lower production than big pans.

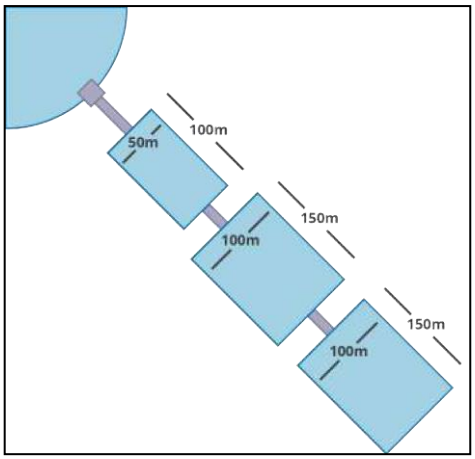


Figure 7: Salt pans are constructed in different sizes, shapes and layouts depending on miners' resources and the area where they are working.

Before salt pans are constructed, miners should agree on a suitable size and location. The area should be marked out on the ground before digging (hopefully using a tape measure), to ensure the digging teams are working in the right place and to the right depths.

4.2 SALT PAN CONSTRUCTION

Out-of-lake salt pans are constructed by digging shallow pits into the earth. The soil removed is used to create embankments (the sides of the pans) that keep in the brine. The embankments should be high enough to keep the water in (about 0.5m).

Figure 8: Sides of the pan are typically made up of the soil dug from the pan bottom

Although some companies use an excavator or bulldozer to dig salt pans, it is quite expensive to rent this equipment. Most salt miners dig the pans manually using picks, hoes, and spades (Fig. 9).

One of the biggest issues with salt *quality* is the presence of other minerals and impurities (such as mud or sand) in the final product. This can come from the brine collected from the salt lake *or* from the sides and bottom of the pans.

Some ways to improve the <u>quality</u> of salt is to:

1. Invest in sheets of heavy, black plastic to prevent dirt, soil, and sand from the sides and bottom of the pan from mixing with the brine (Fig. 10). Black plastic is also useful because it will speed up evaporation.

   To select and install the proper liner:

Figure 9: Common tools (picks, spades and shoves) used in salt pan construction. (Photo J. Hinton)

- Use heavy polyurethane liners that are specially made to be salt resistant. Cheap, thin plastic will break down quickly and need to be replaced often.
- Cover the entire bottom and *sides* of pans #1 and #2 and make sure that the overlap between plastic sheets is well-sealed using a salt resistant sealant. If the connection is not sealed, the brine will escape under the liner. Do *not* line the third salt pan because it will be punctured (get holes) when the salt is being harvested.

2. Line the trenches that connect the ponds to ensure that the soil from the trenches doesn't mix with the brine. Heavy, plastic salt resistant pipes can also be used but black plastic liner is cheaper.
3. At least once per season, clean out the *waste* material that settles at the bottom of pans #1 and #2. If these build up in the pans, they can re-dissolve into the new brine as a new batch of salt is being processed.
4. Either submersible (underwater) or above-ground water pumps (or both) are used to pump brine from the salt lake. As brine is being pumped, it can disturb the sediments in the lake and introduce more impurities (mud, dirt, sand) into the brine that will reduce the quality of salt.

Submersible pumps are completely underwater (including the motor) and should be placed in the salt lake in an area that has little mud and silt. If the water pump is above ground, fix the end of the inlet hose (where water enters the hosepipe) in an area that has little mud and silt. If your water pump does not work, your production will stop! Make sure you: do not let your pump run dry; keep your pump free of dirt and gravel; and include money in your operating budget to maintain your pump regularly and repair it as needed.

4.3 HOW LONG SHOULD BRINE BE KEPT IN EACH PAN?

As water evaporates from the brine pumped from the lake, salt becomes *more concentrated* until it forms salt crystals in the third pan that is ready for harvesting. In Afar Region, this process takes 13-14 days in the dry season and 28-30 days in the rainy season.

Figure 10: Black plastic liners installed at one mine site

Each of the three salt pans serves a different purpose:

- *Pan #1 is used to settle particles of mud and dirt from the brine pumped from the salt lake and start the evaporation process*. Most salt miners in Afar keep brine in this pan for about 3 days in the dry season and about 7 days in the rainy season. After this, the channel (trench) between Pan #1 and #2 is opened and brine is drained into Pan #2.
- *Pan #2 is used to settle remaining mud and dirt and precipitate out (crystallise) other types of minerals* (not the final salt product NaCl). As discussed in Section 5, most of these minerals are waste but some may have an additional value. Brine is usually kept in Pan #2 for about 3 days in the dry season and 7 days in the rainy season. After this, the channel (trench) between Pan #2 and #3 is opened and brine is drained into Pan #3.
- *Pan #3 is used to evaporate all remaining water in the brine, leaving the salt product behind*. This usually takes about 7 days in the dry season and 14 days in the rainy season. Next, the salt product is harvested by scraping or breaking and shovelling the salt crystals into big stockpiles for storage until they are sold (Fig. 11).

As brine is evaporating in the third pan, a new batch of brine is pumped from the salt lake into Pan #1 to start the production process again. This means that the sooner brine can be transferred into the neighbouring pan, the sooner the next production cycle can start. *Faster production means more production in a shorter period of time.*

Figure 11: Salt miners using picks to break up salt crystals during harvesting

Most salt miners estimate the time needed for brine to spend in each pan based on their experience.

Women and men salt miners can speed up the production process by buying and using a simple salt meter (Baume meter). The salt meter tells them how salty the brine is becoming and can be used to ensure that the shortest time necessary is spent producing one “batch” of salt.

To use the salt meter (Fig. 12)[1]:

- *Pump brine into Pan #1. When the salt meter reads 6.5° Be,* transfer brine to Pan #2.
- *When the salt meter in Pan #2 reads 17° Be,* transfer the brine to Pan #3.
- *When the salt meter in Pan #3 reads 29-30° Be,* transfer any remaining brine to a fourth collection pond. Salt in Pan #3 can begin to be harvested after any remaining solution dries out.

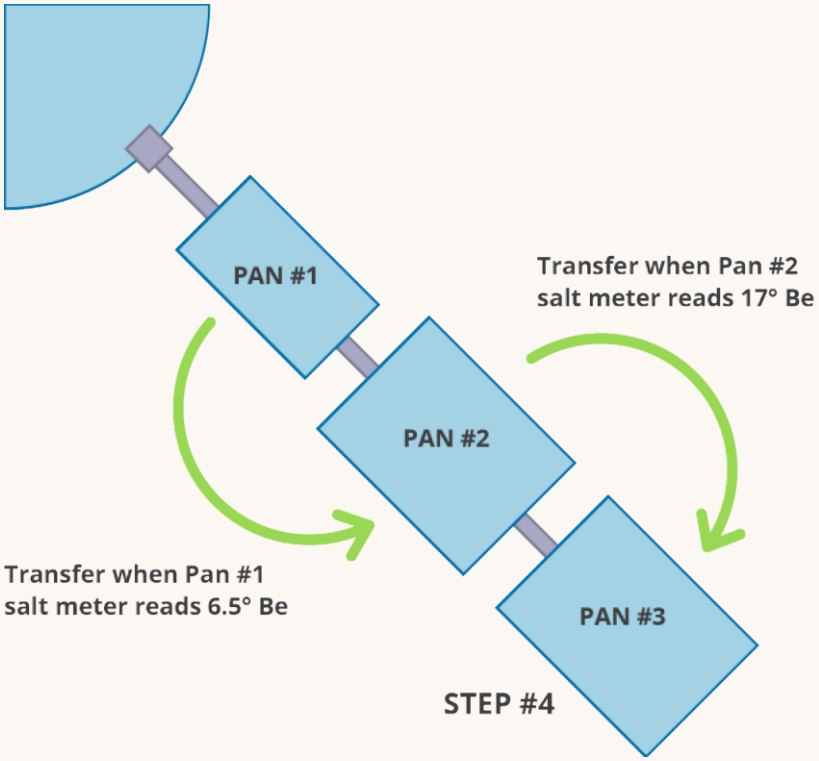


Figure 12: By testing the brine, miners can determine the best “holding time” needed to increase salt production

[1] Priester, M., Hentschel, T. and Benthin, B., 1993, *Tools for Mining: Techniques and Processes for Small-scaleSmall-scale Mining,* GTZ/German Appropriate Technology Exchange (GATE) publ., Braunschweig, Vieweg, 547p.

SECTION 5: DIFFERENT SALT PRODUCTS

When most people think of 'salt', they think of its use in food for humans. Salt actually has many uses, including in animal feed, preservation of food, soaps, tanning leather, setting dyes in fabrics, and in production of plastics and paper. Other minerals can also be produced as bi-products of salt production.

This section describes a few opportunities for salt producers that can be explored by women and men miners, the support organisations working with them, and their local government mines offices.

5.1 DIFFERENT SALT PRODUCTS

Most salt produced in Afar Region is bought from miners and then: (i) iodized and used to meet demands of the Ethiopian market for table salt; or (ii) used in leather tanning or other industries.

Women and men salt miners could also consider locally producing and selling:

Animal Feed

Salt is often given to livestock (cattle, goats) to help the animals keep their appetites, especially in drought conditions. Often this isn't 'pure' salt, but a mixture of salt mixed with low-quality minerals:

- The minerals left behind in Pan #2 could be locally used or bagged and sold to local markets.
- In short, 0.5 kg of the low-quality salt mineral product should be added to every 100kg of animal feed.

Salt Preservation of Food

One of the oldest ways to keep food edible for a long time is by curing with salt. This can be done for beef, goat's meat, chicken, fish and other meats as well as for vegetables like beans. This is usually done in one of two ways:

- *Brine curing:* meat or vegetables are immersed in brine in a sealed container for several days.

  Dry curing: dried salt is rubbed on the outside of meat. After the first salt rub, the meat is hung in a cloth bag away in a clean shed or structure. The meat is then rubbed again with salt after about 4 days and again 10 days

later. Generally, for every kilogram of meat, it should hang for about 2-3 days.

The exact amount of dry salt or brine and number of days needed for curing depends on the weight of food to be preserved. The Regional Mining Bureau or Woreda Mines Office can do simple research to find the right recipe for your needs. For those salt miners who also keep livestock, this can be a useful way to keep meat or vegetables for household or community use or to create a new product to sell to local markets.

Salt Bi-Products

Brine is made up of water with salt (NaCl) and many other minerals such as: (i) sodium chloride with soda ash (trona); (ii) sodium sulphate (gypsum); (iii) potassium sulfate; (iv)potassium bromide; and other substances. Although these are *impurities* (if your goal is to produce pure salt for human consumption), some of these impurities also have their own markets.

For example, gypsum can be recovered, bagged, and sold for use in plaster, soaps, cement, and as a fertiliser. It can be recovered from pan #2 using the method described in Section 4.3.

To use a salt meter (Baume meter) to recover gypsum (Fig. 13) [2]:

- *Pump brine into Pan #1. When the salt meter reads 6.5° Be* then transfer brine to Pan #2.
- *When the salt meter in Pan #2 reads 17° Be* then transfer the brine to Pan #3.

The minerals that are left behind in Pan #2 should mainly be made up of gypsum.

Test this method with assistance with Regional Mining Bureau Officers and Woreda Mines Officers. They can test the material and give you advice on how to find a market for this bi-product.

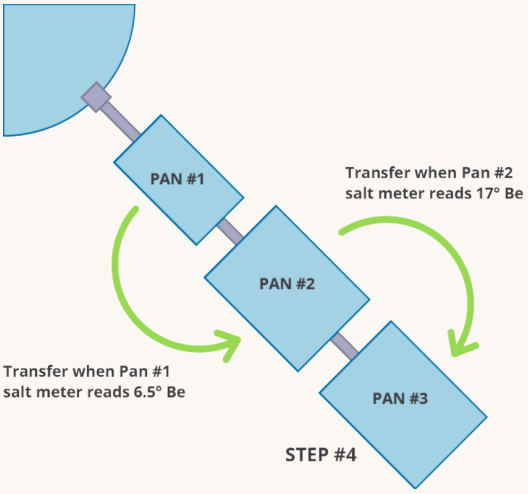


Figure 13: By testing the brine, miners can determine the best “holding time” needed to increase salt production

[2] Priester, M., Hentschel, T. and Benthin, B., 1993, *Tools for Mining: Techniques and Processes for Small-scale Mining,* GTZ/German Appropriate Technology Exchange (GATE) publ., Braunschweig, Vieweg, 547p.

SECTION 6: MAIN HEALTH ISSUES IN SALT MINING

Repeated exposure to salt and brine can result in serious health issues. Salt mining takes place in remote, hot, dry areas that can result in other occupational and community health issues. This section describes some of the main health issues faced by salt miners and their families and ways to address them.

Figure 14: Constant salt exposure can cause wounds to heal slowly or even make them worse (Photos: J. Hinton)

6.1 OCCUPATIONAL SAFETY AND HEALTH

The main risks of repeated salt exposure are:

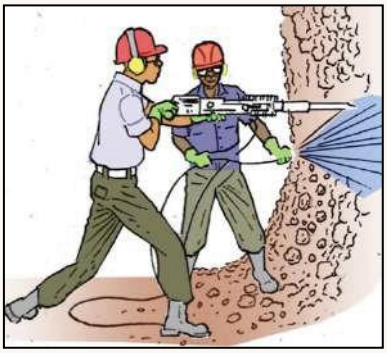
- Slow healing or worsening of wounds. Salt and brine slow the healing process and can even eat away at wounds, making them worse;
- Eye irritation;
- Rashes and skin problems;
- Respiratory problems (problems with lungs, breathing); and
- Severe dehydration, which can also worsen other health problems (such as diarrhoea).

The main ways to prevent, reduce, and manage impacts of salt exposure are discussed below.

Use Suitable Personal Protection Equipment (PPE)

To reduce salt exposure, salt miners should:

- Wear gloves when harvesting or handling salt.
- Wear safety goggles throughout the salt mining area, especially when it is dusty, and always when harvesting salt.
- Wear rubber boots when walking in the salt mining area.
- Wear a dust mask to reduce inhalation of salt dust.



PROTECTIVE EYE GOOGLES, GLOVES AND RUBBER BOOTS

A DUST MASK HELPS PREVENT DUST INHALATION

Figure 15: Use the right protective gear for the job

Create spaces with shade and ensure workers take breaks

Many salt mining areas lack trees and structures that would provide protection from the sun and temperatures that can be extremely high. Heat stress and heat exhaustion can have serious health effects on women and men, boys and girls working in salt mining areas. Miners should work together to make small covered areas where they can take regular breaks and get relief from the sun throughout the workday. Inexpensive shade can be made using: Wooden poles to support a roof of grasses or a tarpaulin. This small investment can make a big difference for the health and wellbeing of miners.

Wash with fresh water after handling salt or working in the salt mining area

To reduce salt exposure, salt miners should clean salt dust from their skin using fresh water.

Many salt mining areas do not have enough nearby fresh water and people (usually women) must walk great distances to collect it. This can take several hours of work and also expose the women, boys, and girls involved in water collection to other serious health risks (such as dehydration, heat exposure).

Figure 16: Rainwater falls onto this iron sheet rooftop and is diverted into a large tank.

Ways to increase access to fresh water include:

- Collecting rainwater in large tanks by capturing run-off from iron sheet roofs (Fig. 16).

- Investing in a water desalinisation system. This can be quite simple, involving evaporation using clear plastic sheets or a glass cover (Fig. 17). If resources are available, solar powered desalinisation systems can work much faster (Fig. 18).

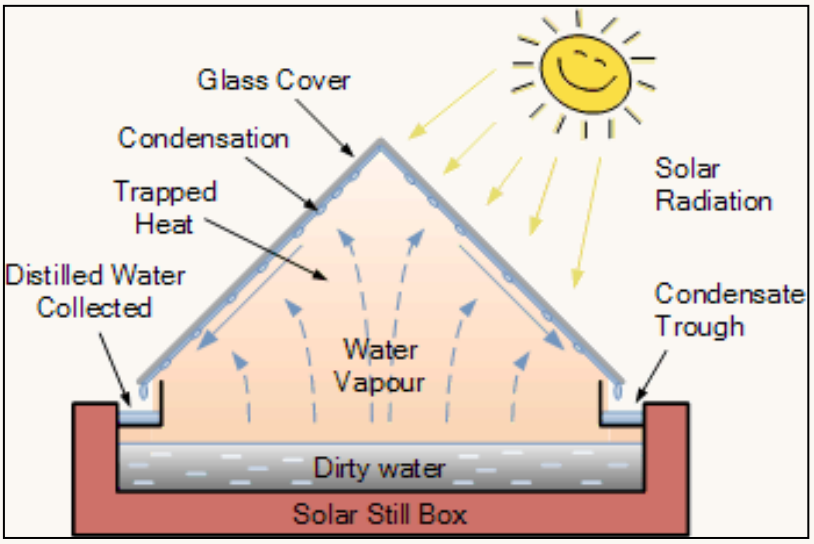


Figure 17: Fresh water can be produced by "distillation" of salt water or brine using a simple-to-set-up system using plastic sheets or covers, trays, and buckets (Source: www.alternative-energy-tutorials.com)

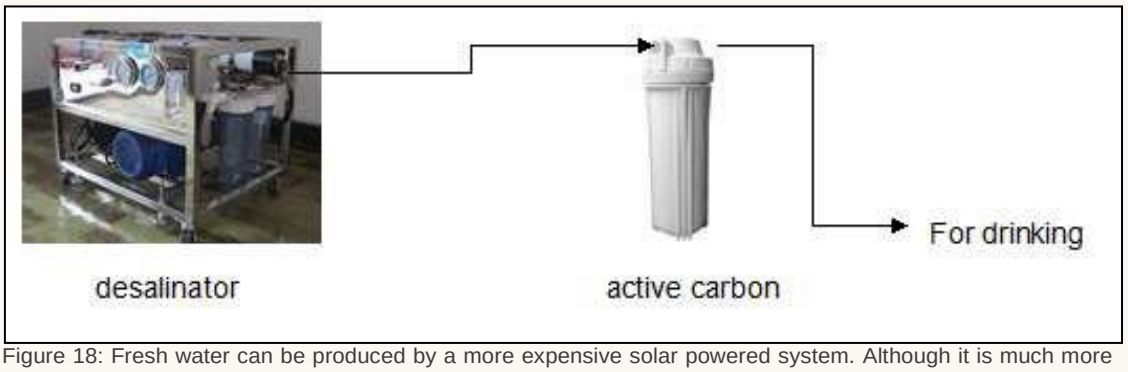


Figure 18: Fresh water can be produced by a more expensive solar powered system. Although it is much more expensive than evaporation method, it can treat much higher volumes of water very quickly

Keep Children Away from the Salt Mining Area

Children are especially vulnerable to health and safety risks from salt mining. Health impacts can negatively affect children's growth and development, affecting them into adulthood.

Miners and mining families should make and follow strict rules that prohibit boys and girls from entering and working in the mining area and ensure both boys and girls attend school regularly.

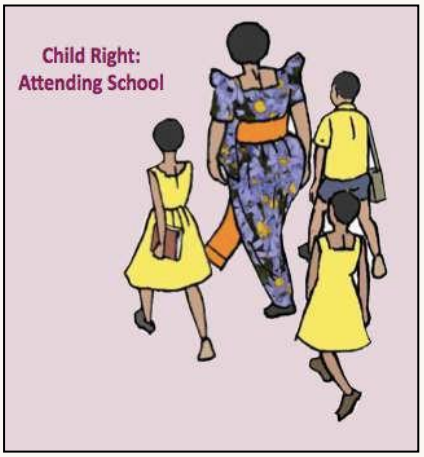


Figure 19: Protect boys' and girls' health and wellbeing. Ensure children stay out of salt mining areas and go to school. (Source: Hinton et al, 2011)

6.2 COMMUNITY HEALTH

Salt mining communities face many other health challenges, especially sanitation-related diseases, like cholera and typhoid. To prevent and manage sanitation-related diseases, community members should work together to do the following:

Keep Fresh Water Safe and Clean

- Keep water free from dust, dirt, and insects by keeping fresh water in separate containers and covering pots with clothes (Fig. 20).
- *Never* drink water after it has been used for washing dishes, utensils, or by humans for bathing.

Figure 20: Keep water storage areas clean and cover pots holding water. (Source: Hinton et al, 2011)

Use Solar Treatment of "Clean Water"

Boiling water is a good way to kill germs and bacteria in water collected from boreholes, wells, or watering holes. Wood and charcoal are often difficult to get in many parts of Afar Region, so solar treatment is an alternative for relatively clean but untreated water. Follow the steps in Figure 21 to help improve quality of water used for drinking.

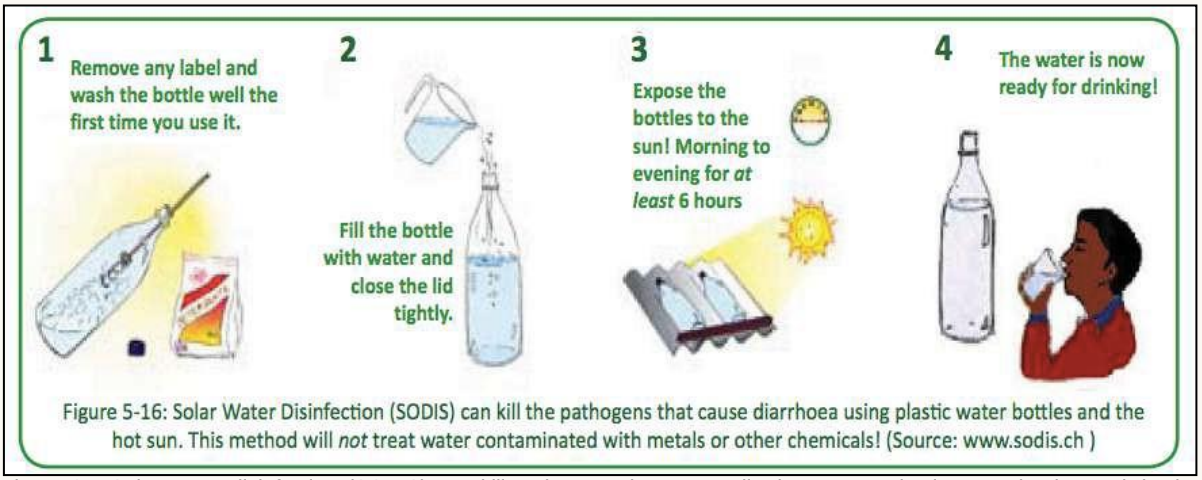


Figure 21: Solar water disinfection (SODIS) can kill pathogens that cause diarrhoea. Use plastic water bottles and the hot sun (Source: www.sodis.ch)

Avoid Contamination during Food Preparation

Poor hygiene can result in rapid transmission of sanitation related illnesses like cholera and typhoid. To help prevent this, community members should:

- Build and use 'hands-free' hand washing stations using a simply jerry can to prevent transmission to other hand washers (Fig. 22).
- Wash cooking utensils and pots in clean water (water that *has not* been used for handwashing etc.).
- *Thoroughly* wash (in clean water) and cook any vegetables that have been grown in "night soil" (soil made from human waste) and/or watered with wash water.

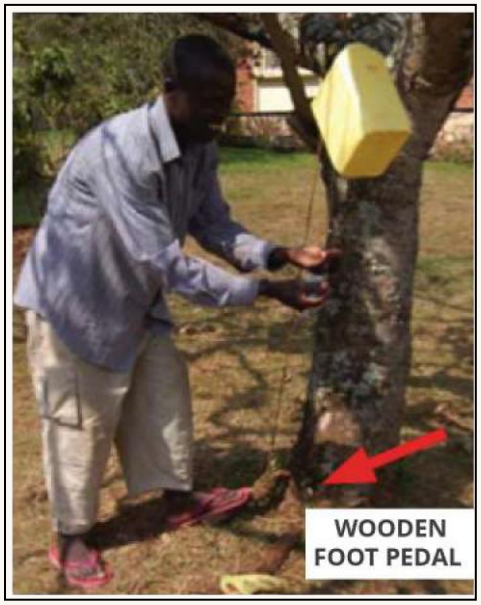


Figure 22: No-touch Handwashing. Punch a hole in a jerrycan, use a rope and piece of wood (foot pedal) to avoid touching and contaminating the water container (Photo: J. Hinton)

Recognise and Treat Symptoms

Symptoms of cholera, typhoid, and malaria can have similar symptoms but all three can be serious and need rapid response.

- Some of the main symptoms to look for are detailed in Figure 23. When women, men, boys, or girls have any of these or other symptoms of concern, seek medical treatment immediately.
- Keep the patient hydrated with plenty of clean drinking water and/or juices. Oral rehydration salts (ORS) should be taken if the patient has diarrhoea.
- Seek medical diagnosis to confirm the illness (malaria, cholera, typhoid, or another illness) and ensure the patient gets rapid, appropriate treatment.

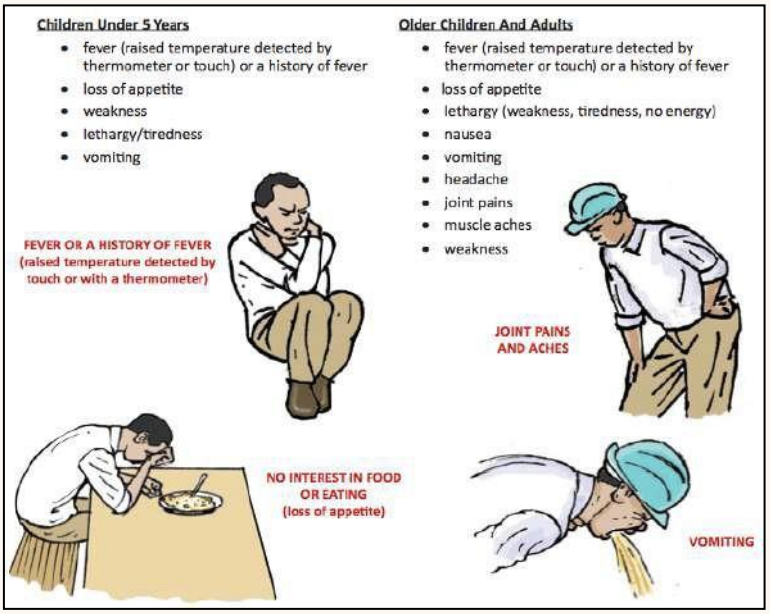


Figure 23: Common symptoms of malaria and hygiene-related illnesses (such as cholera or typhoid)

Work with community members to prevent and manage community health issues

Preventing and managing community health issues in your community will require increased awareness and efforts by each community member – men, women, boys, and girls. Hold meetings to share knowledge and ideas and together decide to take actions to prevent and manage sanitation-related disease and illness and other community health issues.

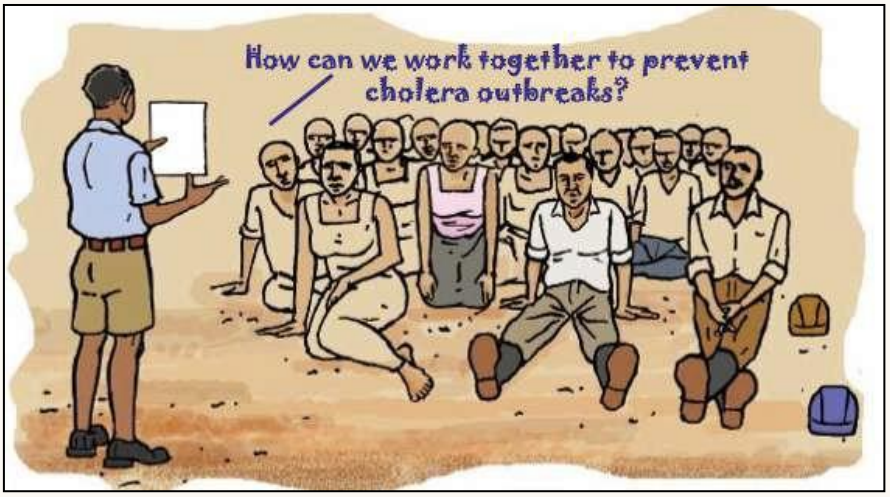


Figure 24: Community members should work together. Request training and sensitisation by local government health workers; share knowledge, information and ideas and agree on actions needed to prevent and manage community and occupational health issues

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The publication of this manual is the product of an extensive participatory research and practical pilot training programme. The technical training manual focusses on adult learning techniques that maximise participation and learning-by-doing, empowering participants with the Knowledge, Skills and Attitudes (K-S-A) to build capacity in technical content as well as increasing knowledge and skills to become gender-responsive trainers and have the attitudes needed to support future action by trainees.

The manual is intended for use by a variety of audiences: A non-exhaustive list of the potential users is as follows:

- The Artisanal and Small-Scale Mining Department of the MoMPNG

- MoMPNG Directorates working closely with the ASM, Environment & Community Development, Gender, Artisanal Mining Production and Marketing, Public Relations and Communications Directorates

- Regional Mining Bureaus

- Local Woreda and Kebele Officers (Gender, Mining, Environment)

- Artisanal and Small-scale Mining Cooperatives / Women's Economic Strengthening Groups

- Artisanal and Small-scale Mining Communities