ASM Formalisation Atlas and Map Mongolia

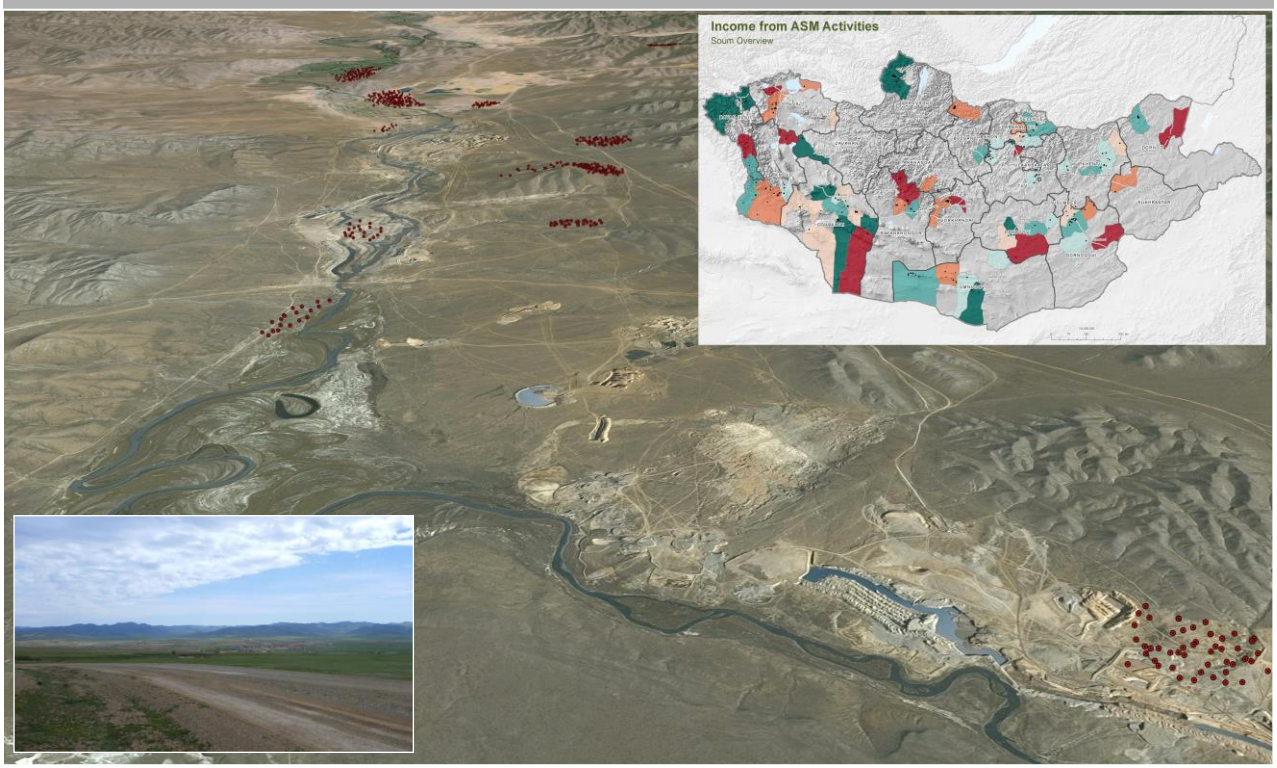
Final Project Report

Mandate 8B: Project 7F-04344.03.01/Contract: 81025298

Project period: 15.4.2014- 15.12.2014

Juerg Krauer, Matthias Engesser, CDE University of Bern

January 2015



Cover photo composite

Cover photo: 3D View on artisanal and small-scale mining sites near Zaamar, Tuv Aimag (Satellite Imagery: WorldView II 2014, provided by Google Earth); **Upper right**: One of the 21 SAM-Atlas map sheets in A3-Format: Income from ASM Activities; **Lower left:** Photo of mining site at Buregkhangai.

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Acknowledgement

CDE's Sustainable Artisanal Mining mapping team would like to thank Mr Patience Singo and Kishgee Dondov of the Swiss Development Cooperation in Ulaanbaatar for their kind support in developing the 2012 survey on artisanal and small-scale mining into a geospatial database framework for mapping and spatial analysis. Last but not least we greatly appreciate the collaborative assistance from Mrs Bolor Radnaabazar during the initial phase of the project.

Abbreviations

ArcGIS	Geoinformation System ESRI
ASTGTM	Aster Global Terrestrial Model
CDE	Centre for Development and Environment
CODEP	Coping for Desertification Programme Mongolia
COOF	Swiss Coordination Office
DSC	Desertification Study Centre
EO	Earth Observation
ESRI	Environmental System Research Institute
EIC	Environmental Information Centre
GG	Green Gold
GIT	Geographic Information Technologies
GI	Geo-Ecology Institute
GPS	Global Positioning System
HQ	Headquarters
ICT	Information and Communication Technologies
LC &LCC	Land cover & Land cover change
MoA	Ministry of Agriculture
MoIEP	Ministry of Land and Environment Protection
NAP	National Action Plan
MDGs	Millennium Development Goals
NDMS	National Desertification Monitoring System
NLMA	National Land Management Agency
NSDI	National Spatial Data Infrastructure
NSO	National Statistical Office
NUM	National University of Mongolia
OS	Operating System (i.e. Windows 8)
QB	Quickbird satellite
RFE	Rainfall Estimates (Radar and Meteosat Data)
RS	Remote sensing
SAM	Sustainable Artisanal Mining Project
SDC	Swiss Agency for Development and Cooperation
SDGs	Sustainable Development Goals
SRTM	Shuttle Radar Topography Mission
TOR	Terms of Reference
UniBE	University of Bern
WWW	World Wide Web

1 Abstract

The short report in your hand is the final document of the Mandate 8B 7F-04344.03.01 between SDC and the Centre for Development and Environment, University of Bern, concerning the joint development of a nation-wide and georeferenced **Sustainable Artisanal Mining** (SAM) database for Mongolia. The small project report covers background, the joint development of the atlas map sheets, main outcomes of the project and final conclusions.

2 Project Background and ToR

In 2012/13 the Sustainable Artisanal Mapping (SAM) project and the National Statistical Office (NSO) of Mongolia jointly conducted a survey on artisanal and small-scale mining. The survey provided highly detailed data and information on 13,400 artisanal and small scale miners in Mongolia in digital format. In detail:

- General information of artisanal and small scale miners (number, age, gender, household, education and employment)
- Formalisation and organisational status
- Infrastructure (dwelling, electricity supply, source of drinking water)
- Economic indicators (equipment, exploiting field, gross output, value added cost, intermediate consumption and investment)
- Losses, contribution, and problems

The statistical data has been linked (geo-located) to geographical sites through coordinates of the contributing mining sites at Soum level. The SAM project has the intention to develop an **'ASM formalisation atlas and map'** based on the survey for policy makers to visualize progress made in formalization within a national context. The atlas is envisaged to reinforce SAM projects HRBA approach that emphasizes on State roles to implement the current ASM legal framework. Policy and decision makers can easily visualize areas with formalization progress or lack of it and follow up with the relevant aimag and soum authorities or other responsible State institutions.

The Centre for Development and Environment (CDE), University of Bern

Within SDC's **Coping for Desertification Programme** (CODEP) the National Desertification Monitoring System (NDMS) was jointly developed by the Environmental Information Centre (EIC) of Mongolia, the desertification Study Centre (DSC) of the Geo-Ecological Institute (GI) of Mongolia and the **Centre for Development and Envi-**

ronment (CDE), University of Bern. As part of the Monitoring system a nation-wide geospatial reference system was developed to improve analysis and modelling of degradation and desertification processes which have increased in the last decades as reported by several researchers and published in Mongolia and abroad. The unique source of spatial information shall be used as primary foundation for the SAM database to produce multi-layered contextual maps and atlas sheets to support decision makers, governmental policy and experts in the mining sector. Due to the geographic relevance of the information the SAM team has decided to use maps as the main presentation format to communicate the statistical output. The comprehensive SAM database shall be split in a series of atlas map sheets as listed below:

1. ASM occurrence by aimag and soums (numbers of miners)
2. ASM gender by aimag
3. ASM by age by aimag
4. ASM sites by minerals (aimag, soums)
5. Average family members engaged in ASM (aimag and soums)
6. Miners organised into ASM partnerships
7. Number of small-scale miners' NGOs by aimag and soum
8. What is the reason to engage in ASM?
9. ASM safety by aimag and soum (accidents)
10. ASM occupational diseases
11. ASM health and social insurance status by aimag and soum
12. Positive livelihood changes duet o ASM
13. Communication with administrative organisations (by soum and aimag)
14. Type of challenges with administrative organisation (by soum and aimag)
15. Minerals trading by aimag and soum
16. Miners working on formal mining sites (permitted field)
17. Type of mining site permission
18. Size of rehabilitated field by aimag and soum over the last 3 years.
19. Average income and household income
20. ASM sales by aimag and soum
21. ASM tax payment by aimag and soum

Keywords: administrative units, aimag, bag, geospatial database, gender, GIS, government, household, income, infrastructure, land cover, mapping, minerals, mining, modelling, Mongolia, occupation, policy, regionalisation, remote sensing, resources management, soum, terrain model, time series analysis

Specifications: Coverage: Entire State of Mongolia
Data Sources: NDMS, NSO Mongolia, MODIS, SRTM
Software: ESRI ArcGIS 10.2 + Extensions, ERDAS 12, OSGIS

Deliverables: Atlas Templates A3, Geodatabase & Media, **A3 Templates 600dpi as pdf** and hardcopy, Geospatial Database (format ESRI gdb, on USB Flash Memory 32GB

3 SAM Database Development

It was in 2013 when SDC's National Desertification Monitoring System (NDMS) was terminated and the National Desertification Atlas of Mongolia published by the Geo-Ecological Institute (GI) and the Environmental Information Centre (EIC). A year later the English version of the Desertification Atlas of Mongolia was released and the country-wide geospatial database - developed for the maps and atlas products - was promoted as a supreme foundation for the **Sustainable Artisanal Mining** Project.

Therefore, CDE was approached by SDC's SAM team to elaborate a framework capable to integrate the standardised datasets as provided by the NSO and to prepare maps as part of a SAM atlas project. In June 2014, after signing of the contract the SAM project has started at the Centre for Development and Environment by compiling the statistical data into the geospatial framework of the NDMS project. Mismatches of SAM datasets and geospatial features, as well as misspellings of administrative units have resulted in an extended communication and an alignment process to come up with a biunique database system, taking all hierarchical administrative units (baghs, soums, aimags, and khoroos), all 13,400 miners and all questionnaires from the survey into account. A correct one-to-one assignment of all features from the survey into the geospatial mapping framework could not be established given the short period of the project, the lack of geocoded bagh data and the difficulties faced in the use of different Cyrillic drivers and limits in the coding system (as provided by NSO). Nevertheless, after further adjustments, requests for translations and synchronisations an acceptable degree between the statistical database and the geographic database could be established (Figure 1).

Cross-validation of SAM Database using NDMS Data and Imagery

Individual artisanal mining of different mineral resources in Mongolia has been a reality for more than two decades. During the early 1990s, people in Tuv, Bajanchongor, and Selenge aimag began artisanal mining, thus becoming the pioneers of this sector. They were blamed for damaging the environment and for stealing from the public wealth (Artisanal and Small-Scale Miners' Initiatives and Experiences: SAM project report. SDC, 2013).

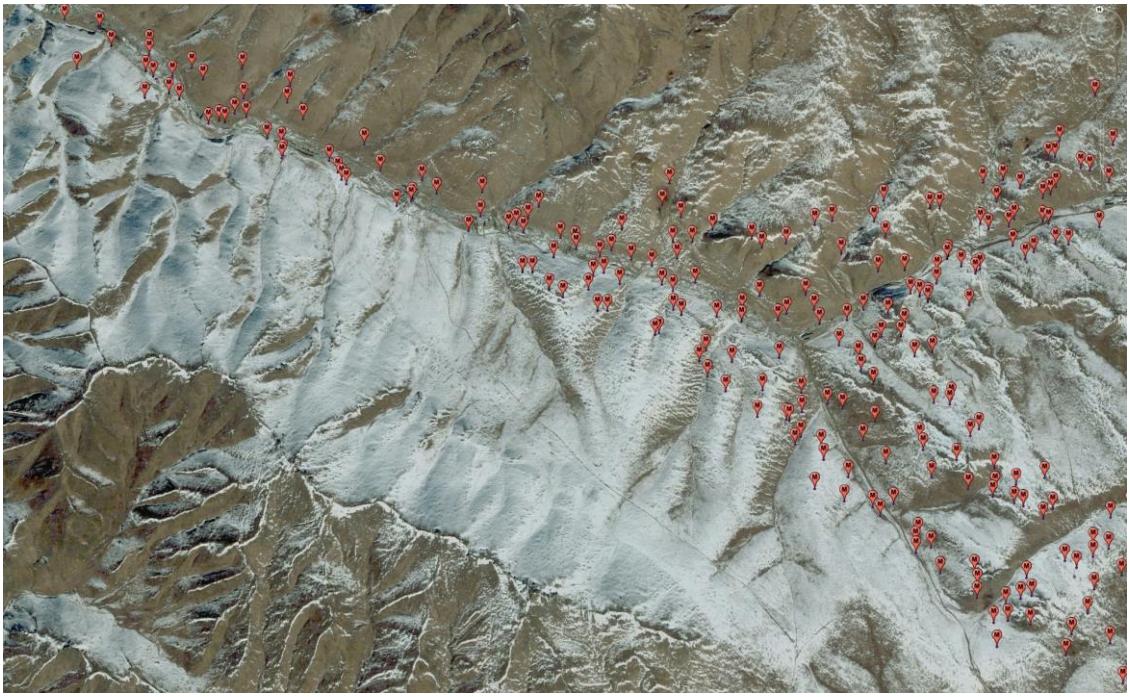


Figure 1: Geocoded ASM database: Mining sites on top of Landsat8 imagery (Buregkhangai, Bajanchongor aimag).

Due to the fact that investigations in mining (large scale and artisanal) have dramatically increased, impact on the land surface has reached an alarming stage. CDE has investigated in a long-term analysis of land cover transformation processes as part of

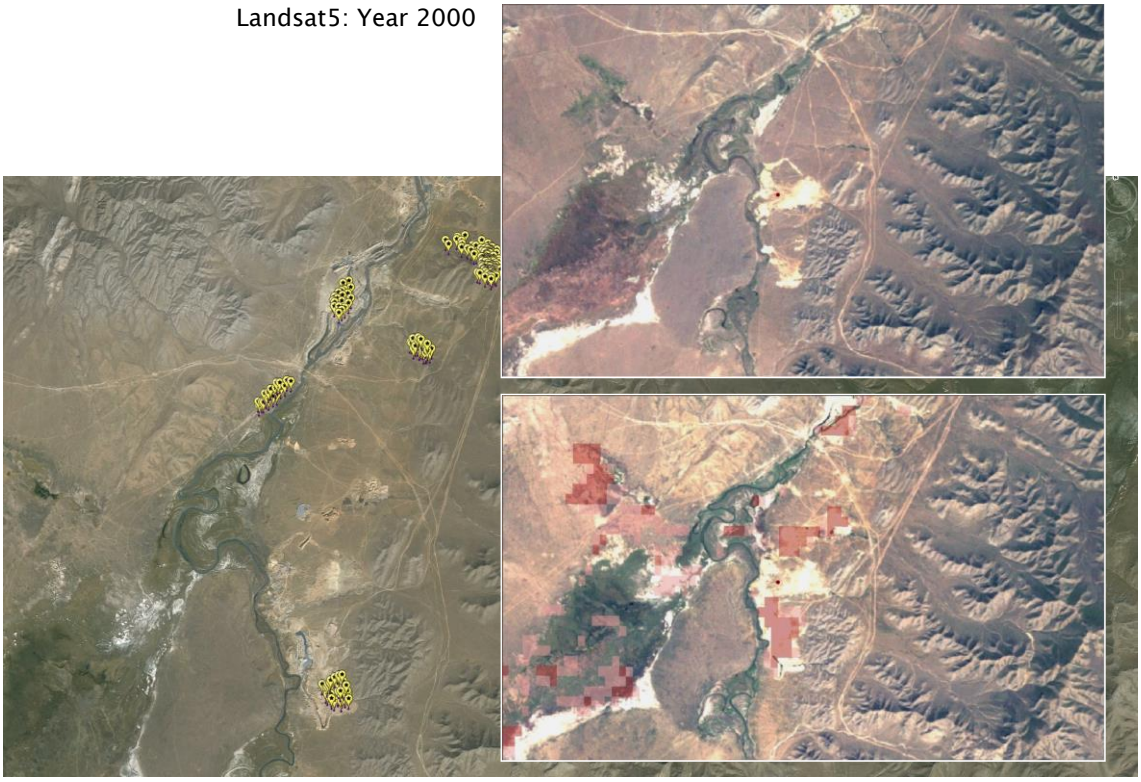


Figure 2: Change of surface conditions due to mining activities. **Lower left:** Artisanal mining sites near Zaamar, Tuv Aimag (worldview II); **Upper right:** LandsatTM5 October 2000; **Lower right**: Landsat TM5 September 2010, red: change in surface cover based on TerraMODIS NDVI bi-weekly analysis between 2000 and 2010

the National Desertification Monitoring System NDMS in Mongolia. Therefore, TerraMODIS bi-weekly time series have been used to analyse patterns of change showing mining sites with extensive alteration of the surface over the past 12 years. The image analysis shows new mining sites or extensions of existing mining areas (Figure 2).

Based on the merged database system (without georeferenced bags and city districts for Ulannbaatar) a first series of map drafts with different hill-shades and layouts have been uploaded on CDE's map server on July 18, 2014. Valuable feedback and detailed comments on format, orthography, map representation and design was provided on August 23, 2014. Based on the detailed comments the project has finally reached full swing from October 2014 onwards. Until December 2014 two more uploads have been provided – some map sheets with several revisions – so that the final drafts have been released by the contractual end of the project on December 18, 2014.

Due to SAM project close-out end of 2014 the planned CDE mission to finalise the map drafts into a pre-press format (post-script), delivery of high resolution hard copies and proof for publication couldn't take place. Therefore, communication was strengthened and feedback on drafts was intensified in the final stage of the project, so that at least the requested output has been finalised.

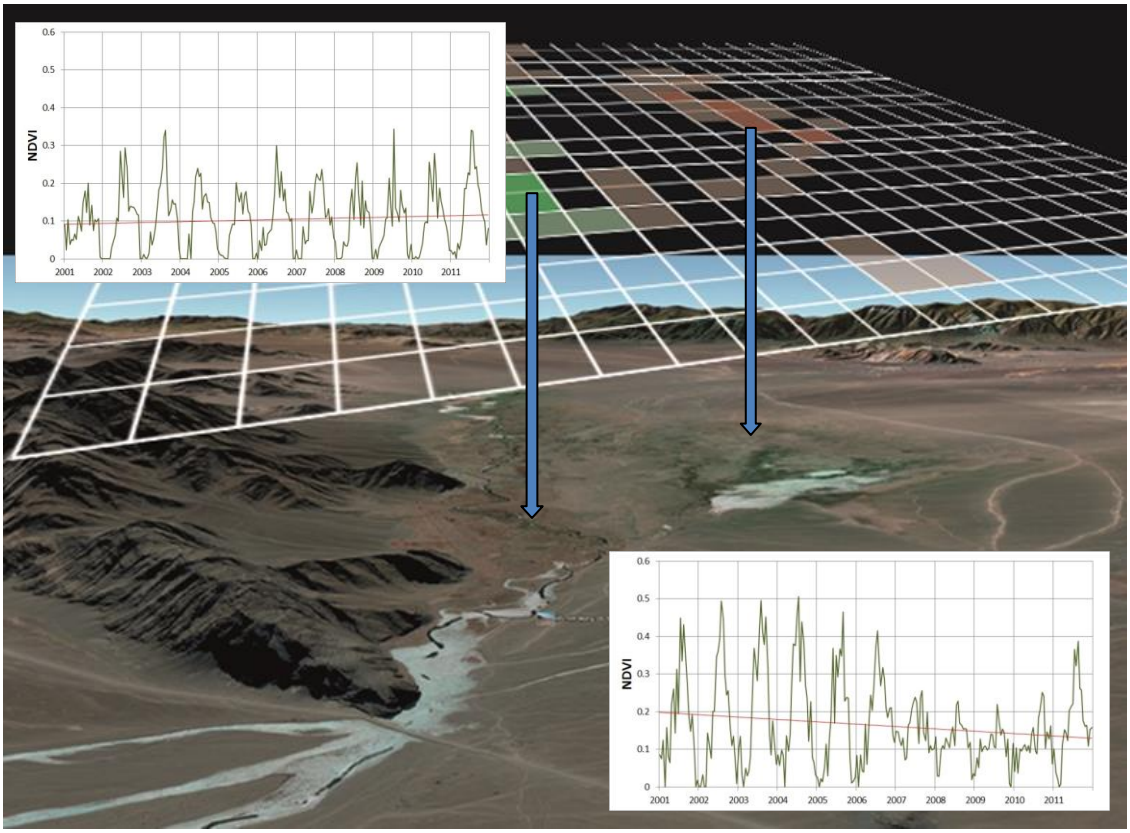


Figure 3: TerraMODIS NDVI land cover change detection analysis over 12 years. **Upper left:** Improved vegetation surface (i.e. due to land closure, afforestation, etc.). **Lower right**: decrease in surface cover (i.e. due to mining, over grazing, etc.)

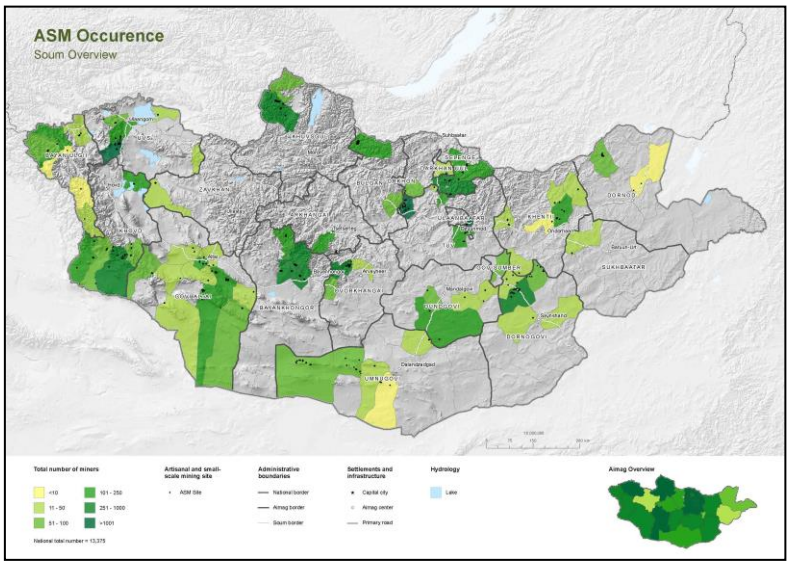
4 Project Outcome and Lessons Learned

The new merged and georeferenced ASM database has to be considered as the primary outcome of the project. At the time of project closure (Mid-December 2014) all 21 atlas map sheets reached the final draft stage according to the ToR settled in the contract. Final pre-press layout, statistical outputs and text modules which have not been part of the contract are not yet ready in a format that all map elements could be integrated for the very final publication format. Also the large format map in a target scale of 1: 2 Mio. (proposed in the initial ToR) was not yet discussed in detail. To complete the SAM atlas maps and to finalise the multi-layerd large format map (1:2 Mio.) for publication a small follow-up project is highly recommended. Due to the extraordinary difficulties in the unambiguous assignment of the NDMS and SAM databases and the time-consuming process of the development of the atlas map sheets the project was delayed in the very first periode. The project was extended in October 2014 for another two months which was still not enough to complete the difficult process of layout and visual presentation of each map sheet.

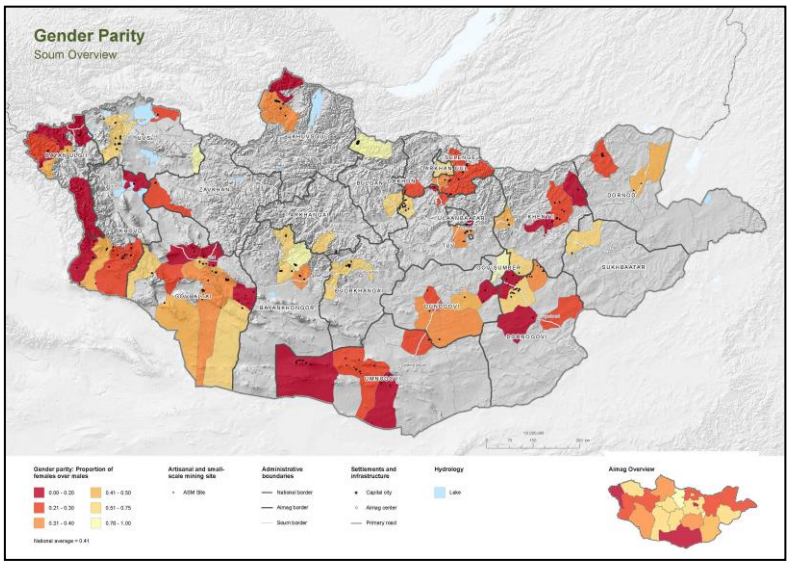
5 Appendices

Appendix 1: SAM Atlas Map Sheets and Charts

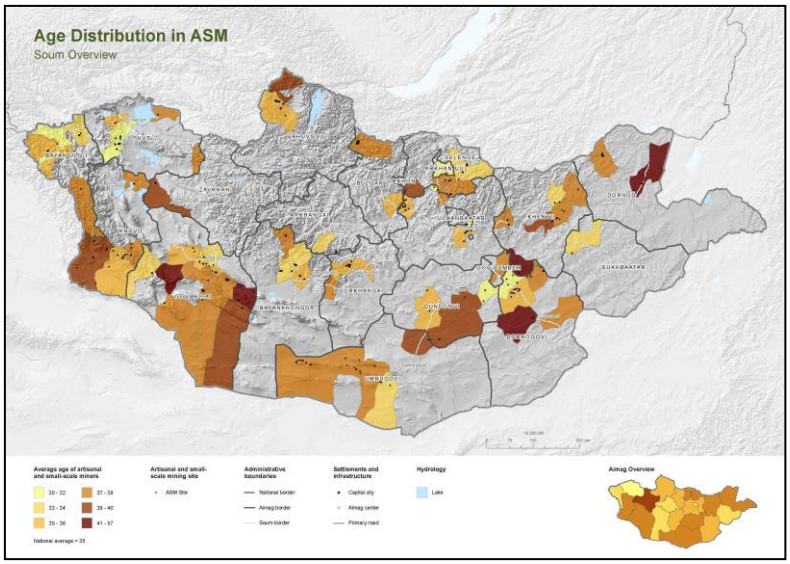
01 Soum Miners



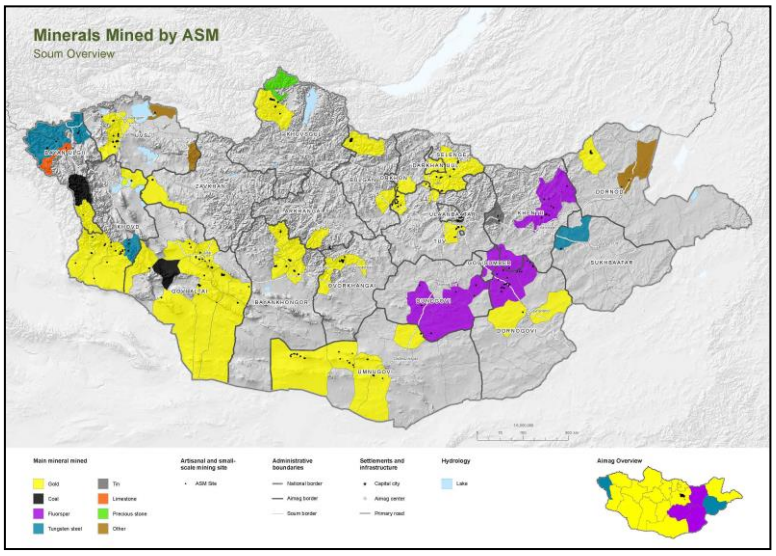
02 Soum Gender



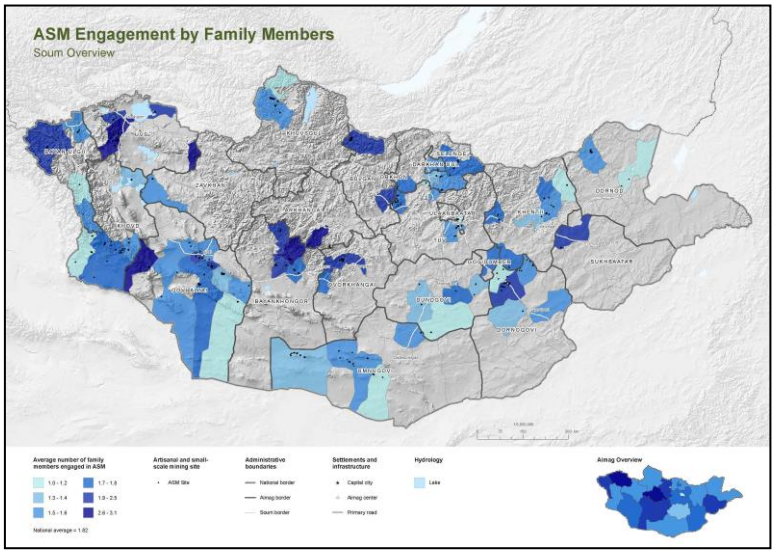
03 Soum Age



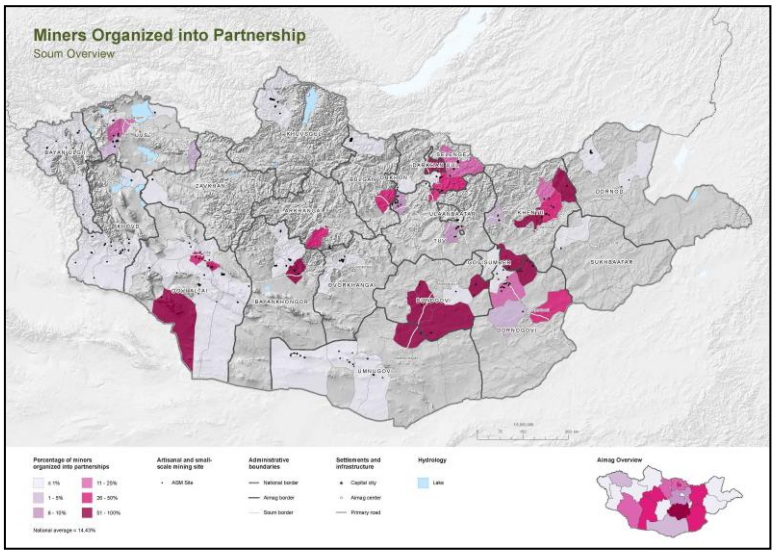
04 Site Minerals



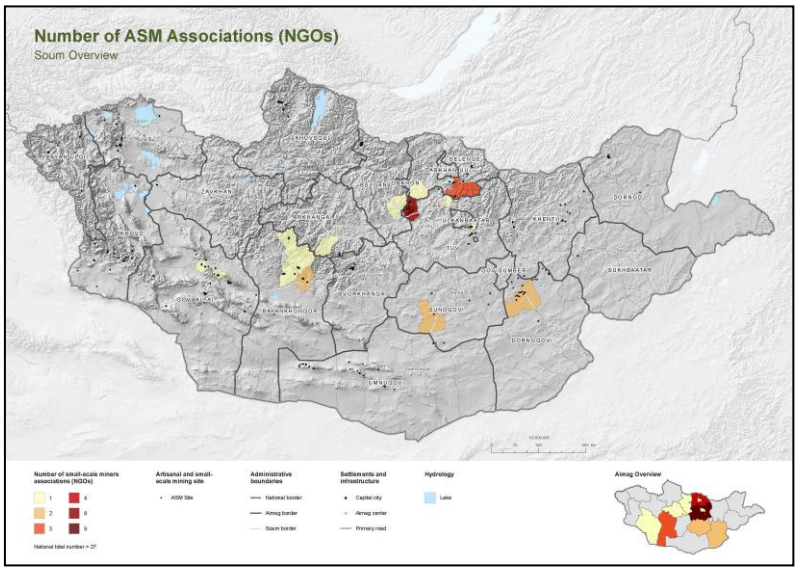
05 Soum Family Members



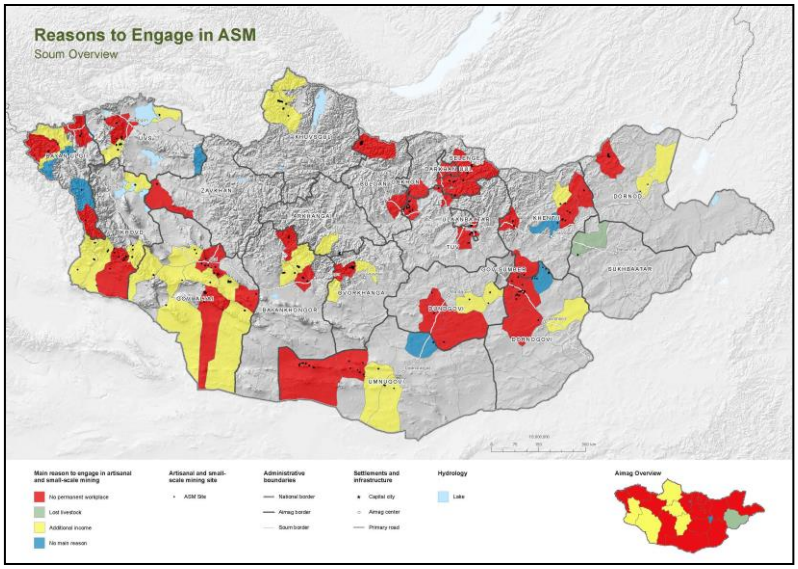
06 Soum Partnership



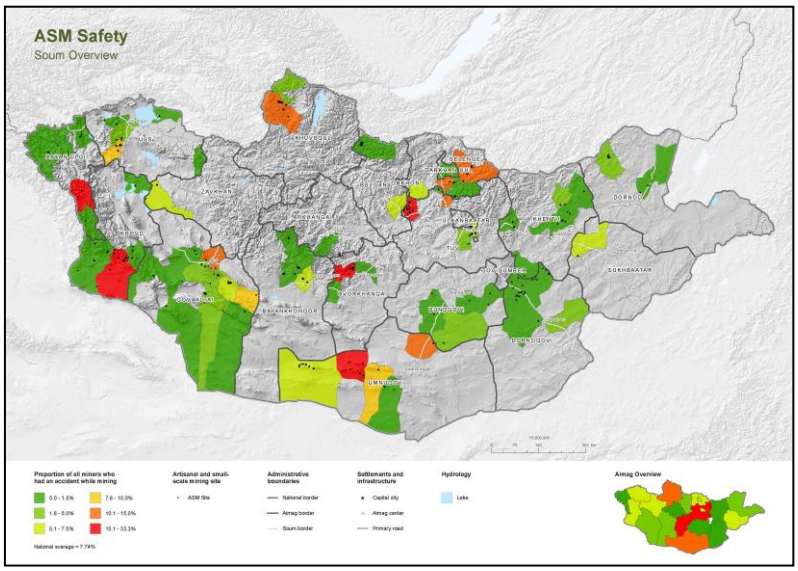
07 Soum NGOs



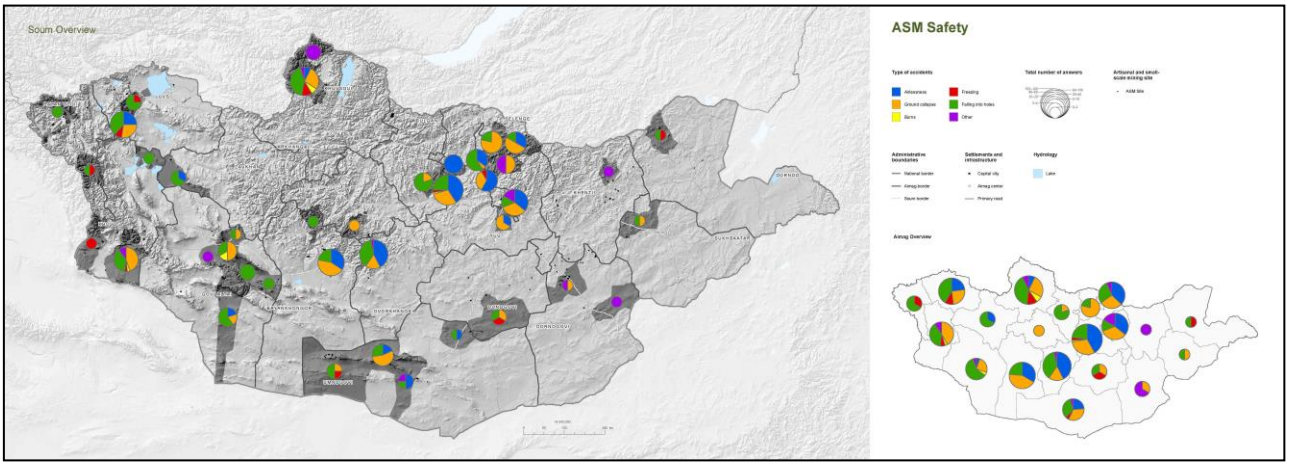
08 Soum Reasons



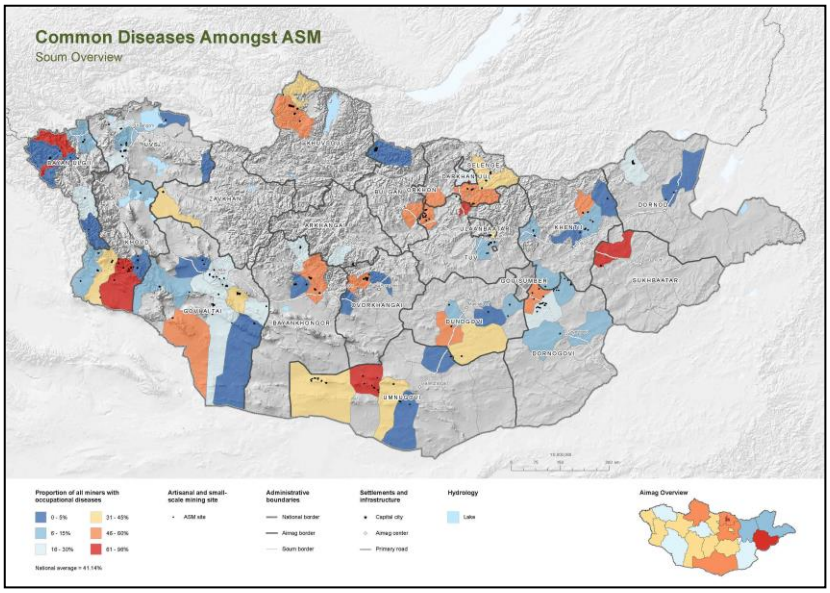
09 Soum Safety



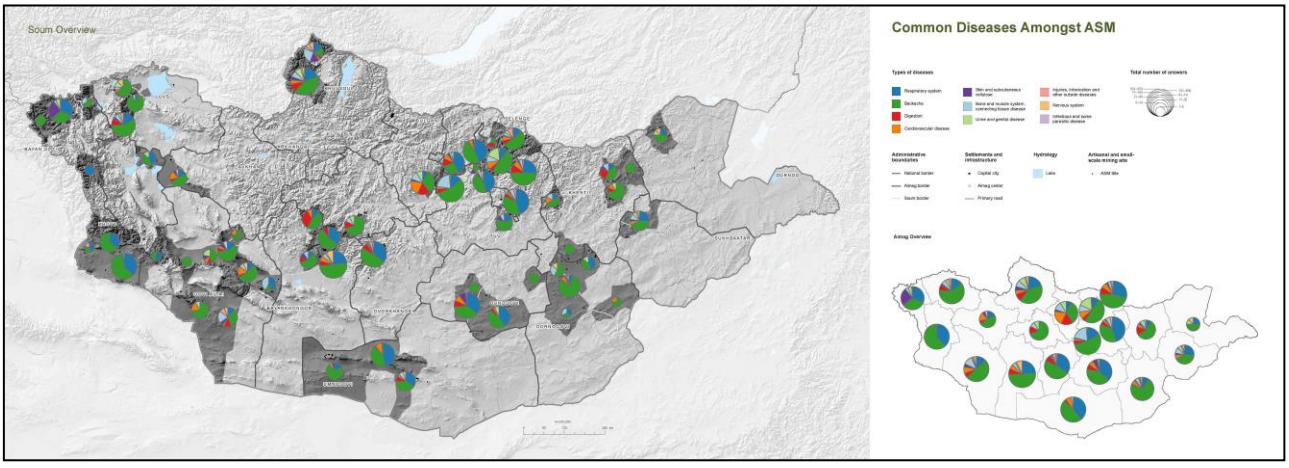
09a Soum Safety Types



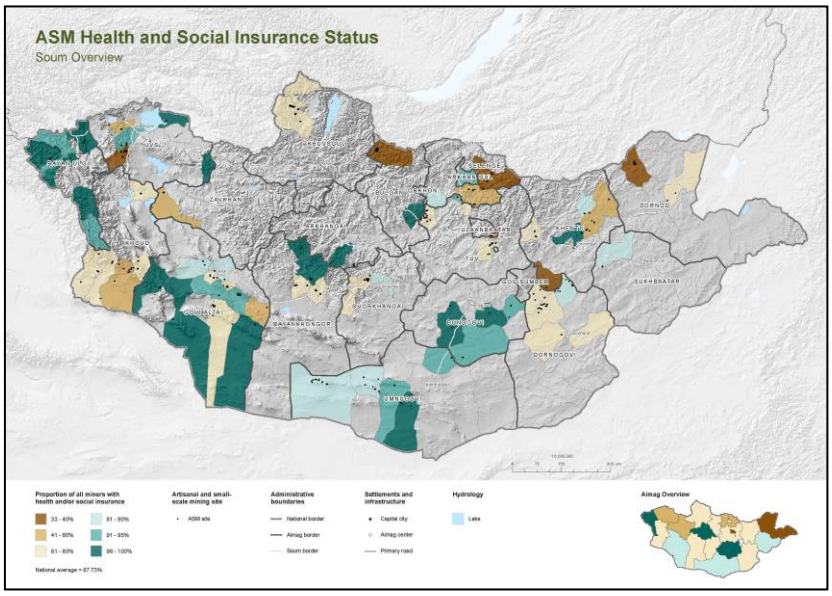
10 Soum Diseases



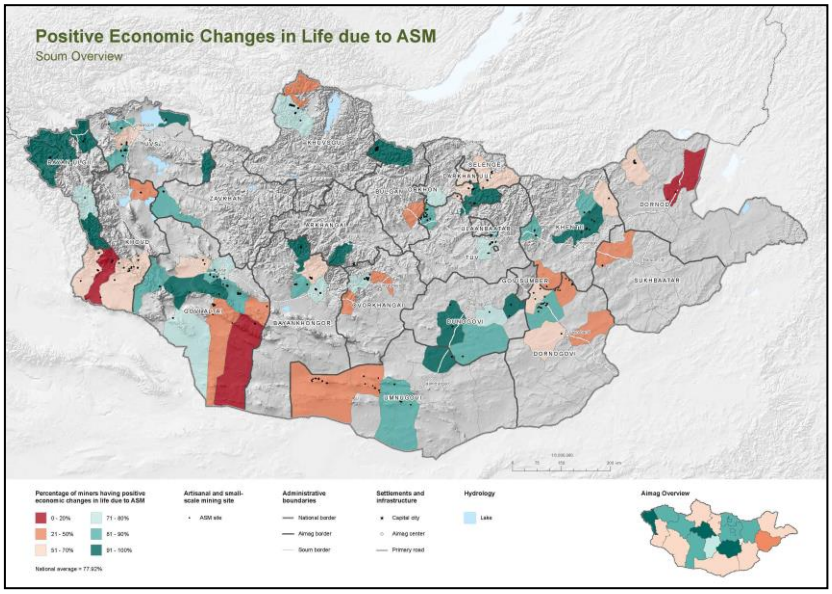
10a Soum Diseases Types



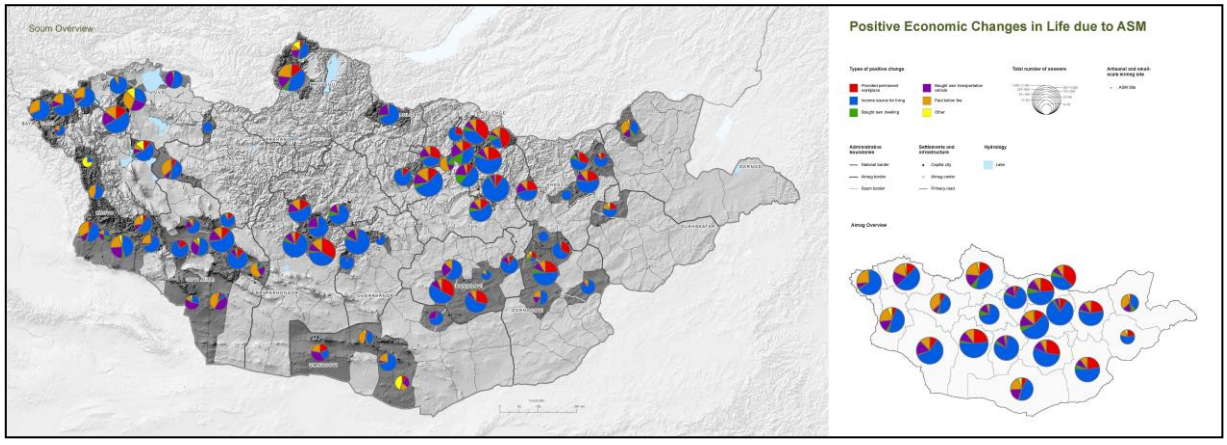
11 Soum Insurance



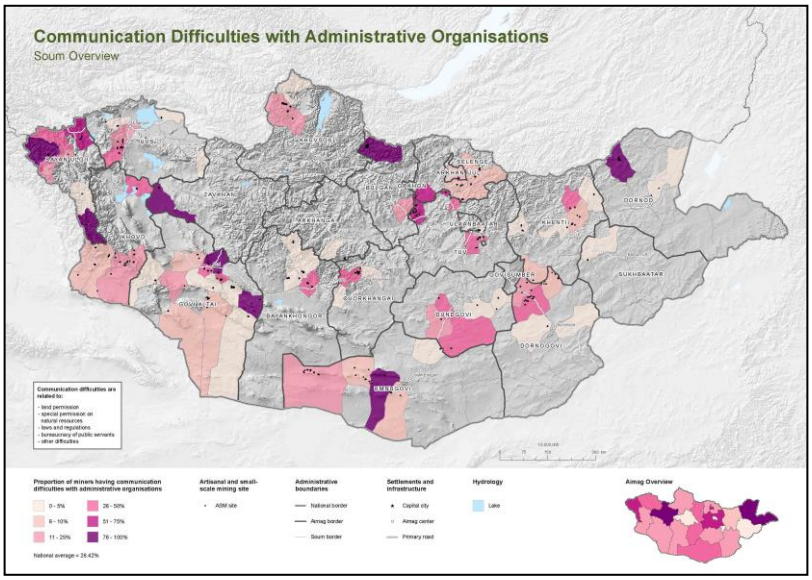
12 Soum Positive Changes



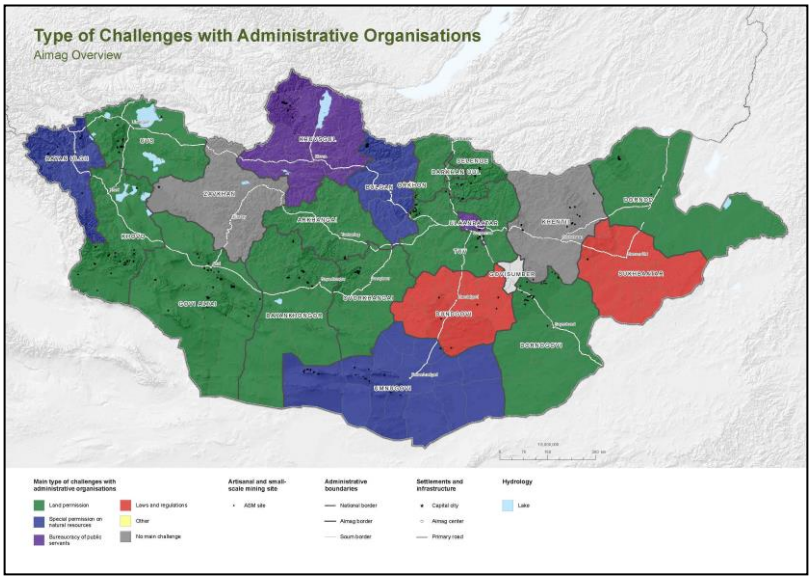
12a Soum Positive Changes Types



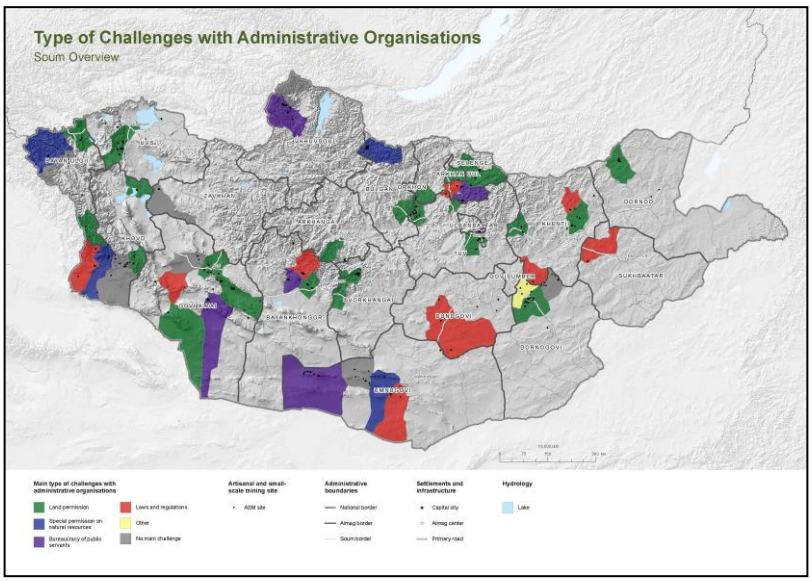
13 Soum Communication Difficulties



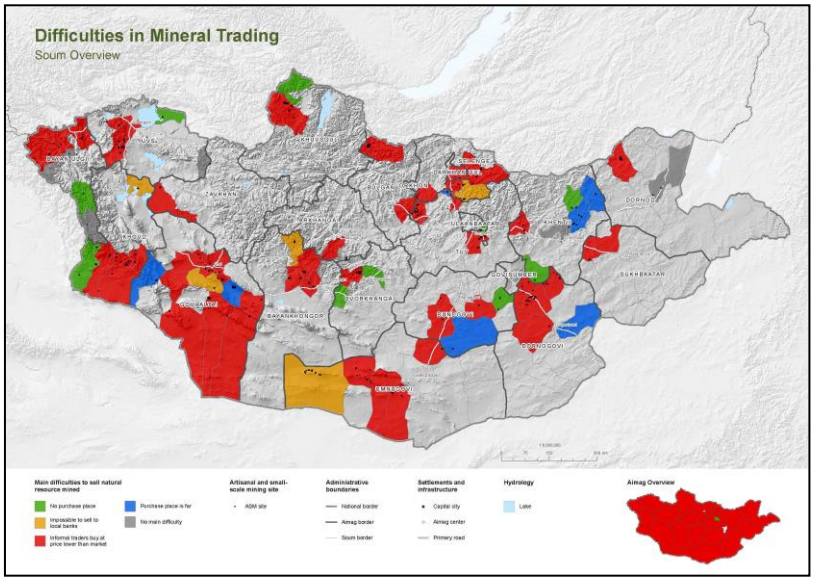
14 Aimag Challenges



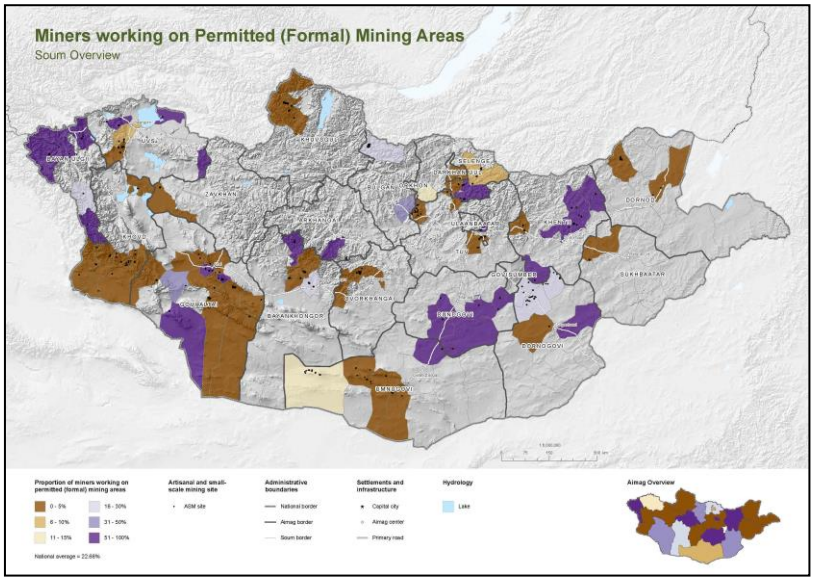
14 Soum Challenges



15 Soum Trading Difficulties



16 Soum Permit



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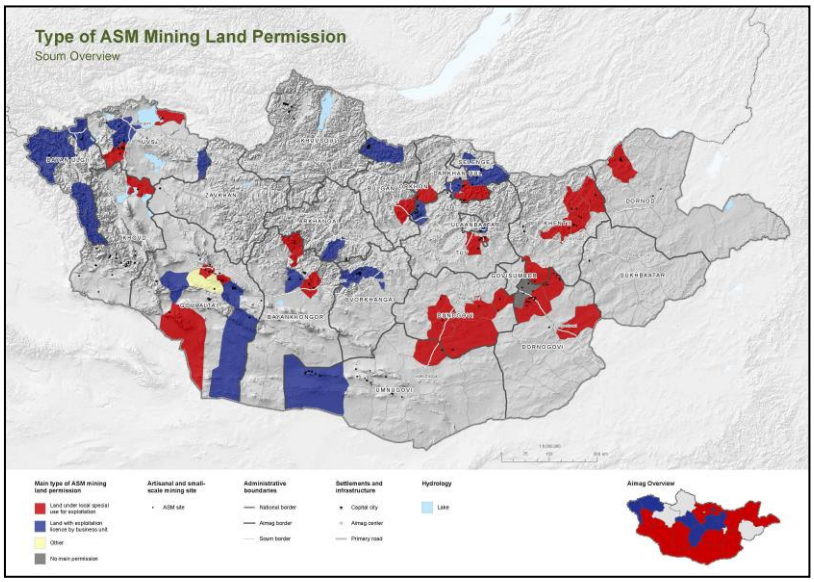
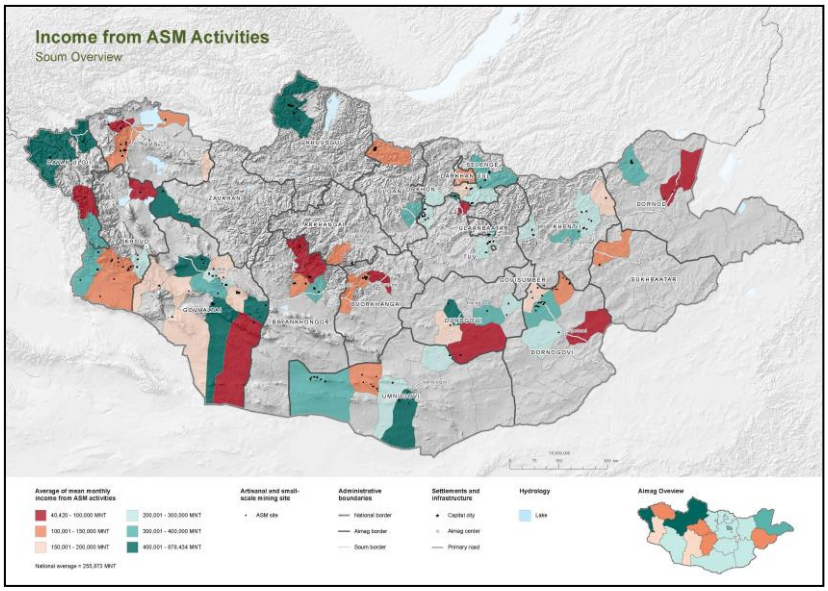
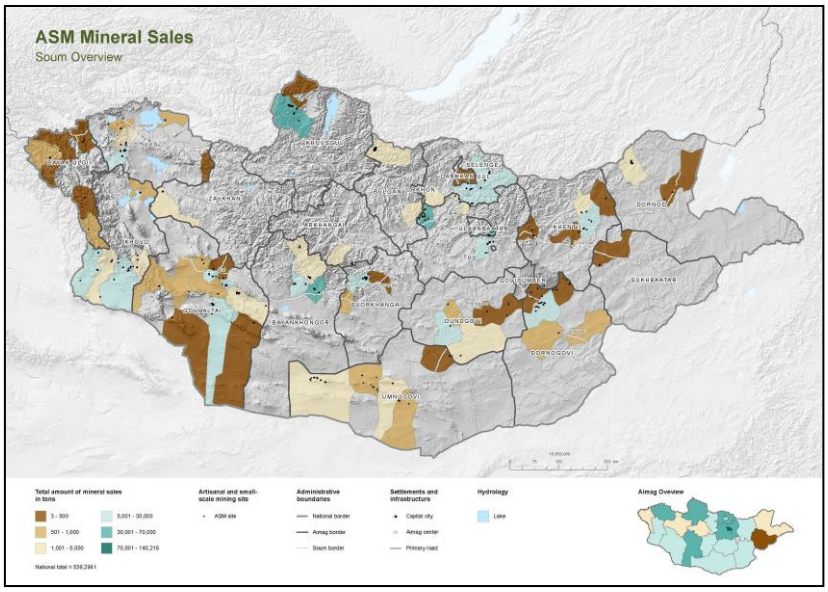


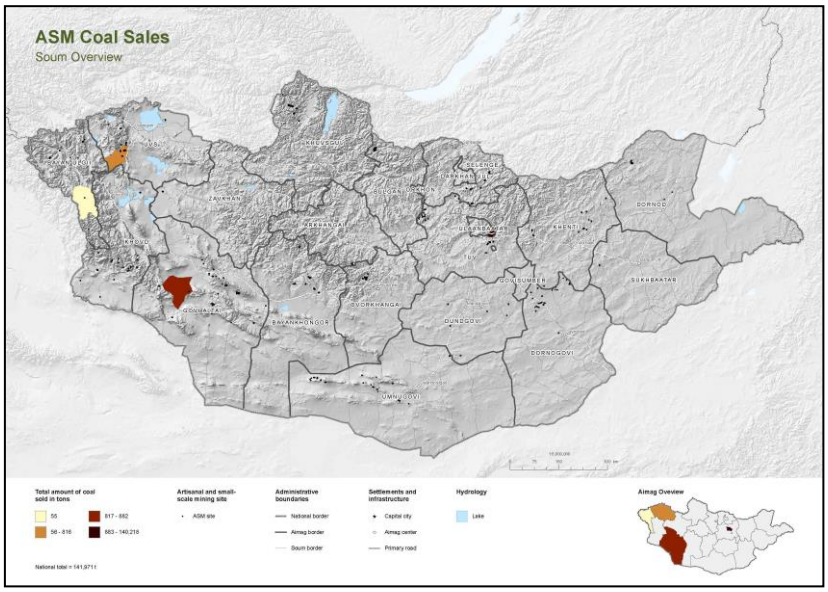
19 Soum Income



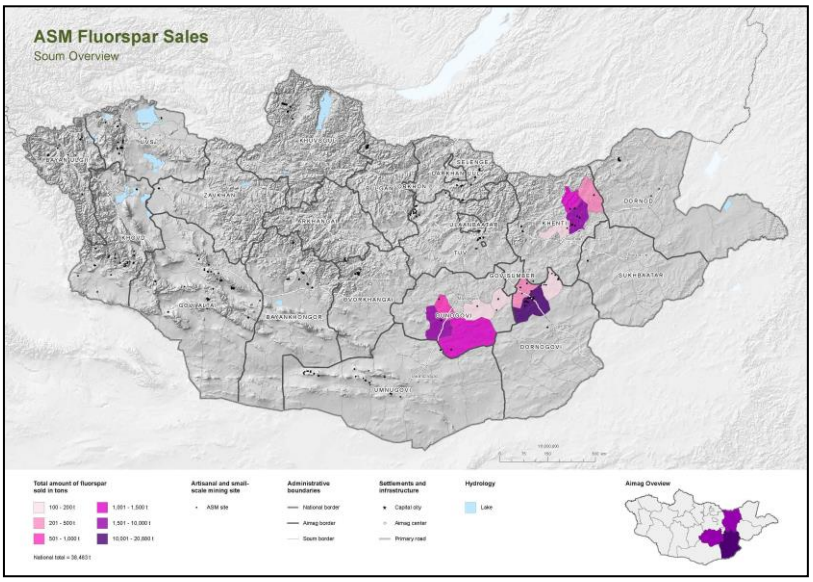
20 Soum Mineral Sales



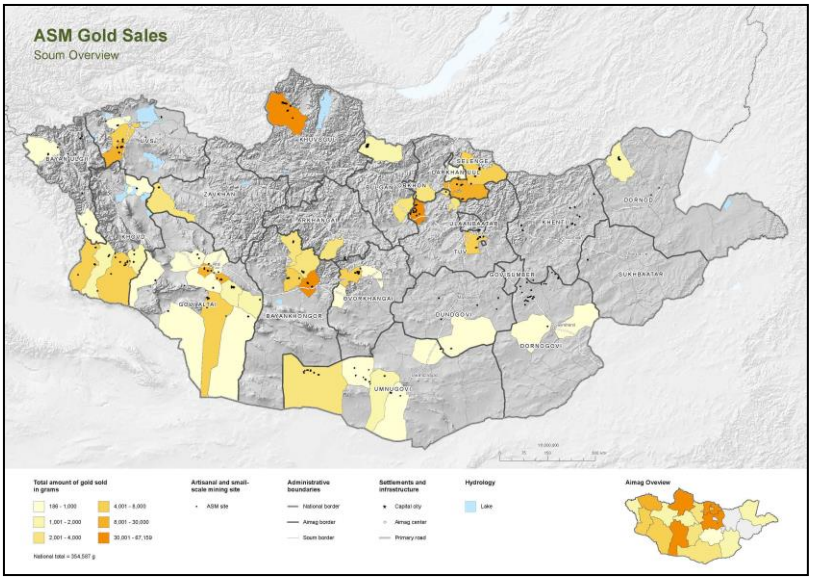
20a Soum Coal Sales



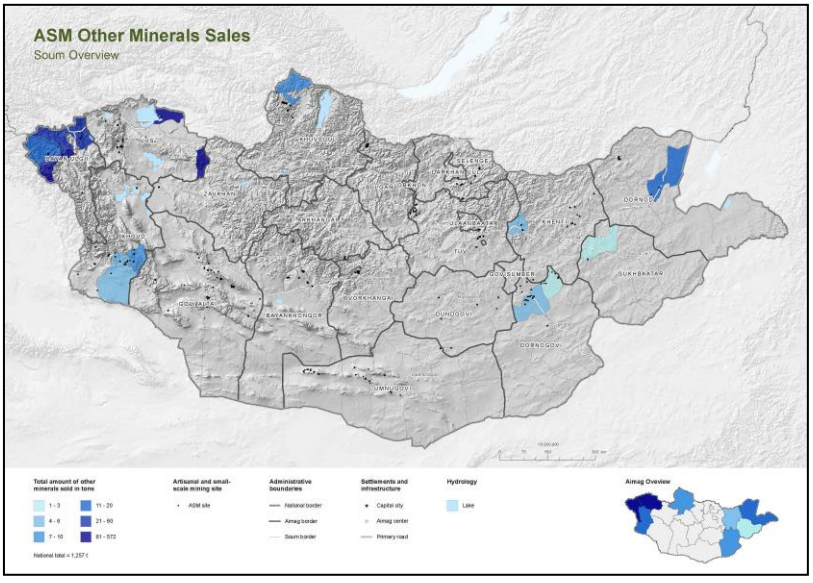
20a Soum Fluorspar Sales



20a Soum Gold Sales



20a Soum Other Sales



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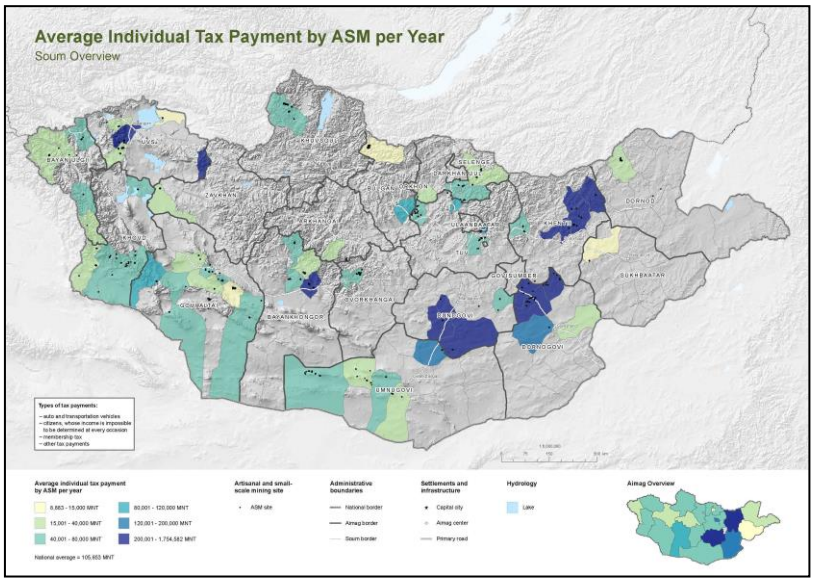
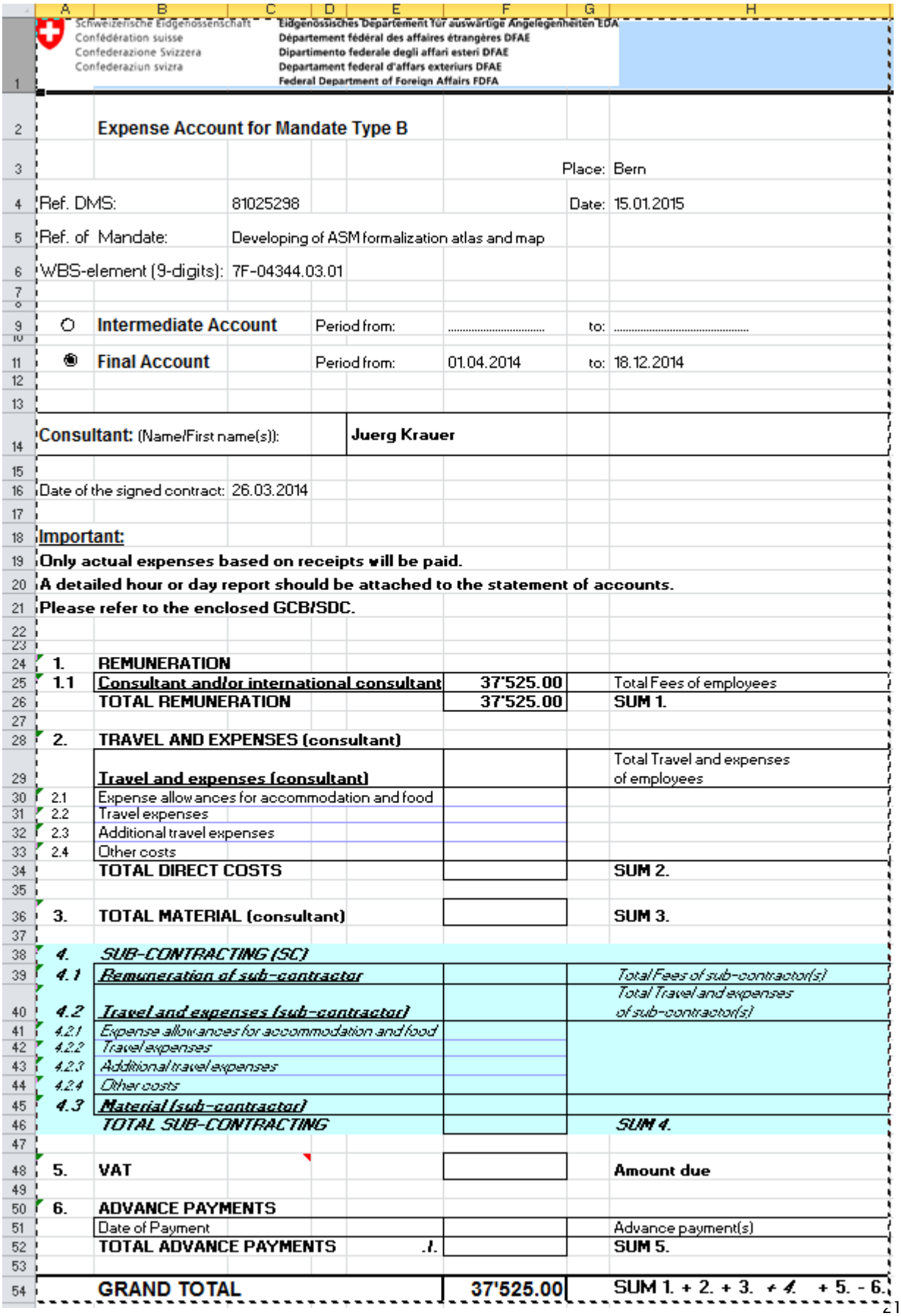


Appendix 2: Accounting

2.1 Expense Account for Mandate B



Schweizerische Eidgenossenschaft
Confédération suisse
Confederazione Svizzera
Confederaziun svizra

Eidgenössisches Departement für auswärtige Angelegenheiten EDA
Département fédéral des affaires étrangères DFAE
Dipartimento federale degli affari esteri DFAE
Departament federal d'affars exteriurs DFAE
Federal Department of Foreign Affairs FDFA

Expense Account for Mandate Type B

Place: Bern

Ref. DMS: 81025298 Date: 15.01.2015

Ref. of Mandate: Developing of ASM formalization atlas and map

WBS-element (9-digits): 7F-04344.03.01

○ **Intermediate Account** Period from: ..... to: .....

◉ **Final Account** Period from: 01.04.2014 to: 18.12.2014

Consultant: (Name/First name(s)): **Juerg Krauer**

Date of the signed contract: 26.03.2014

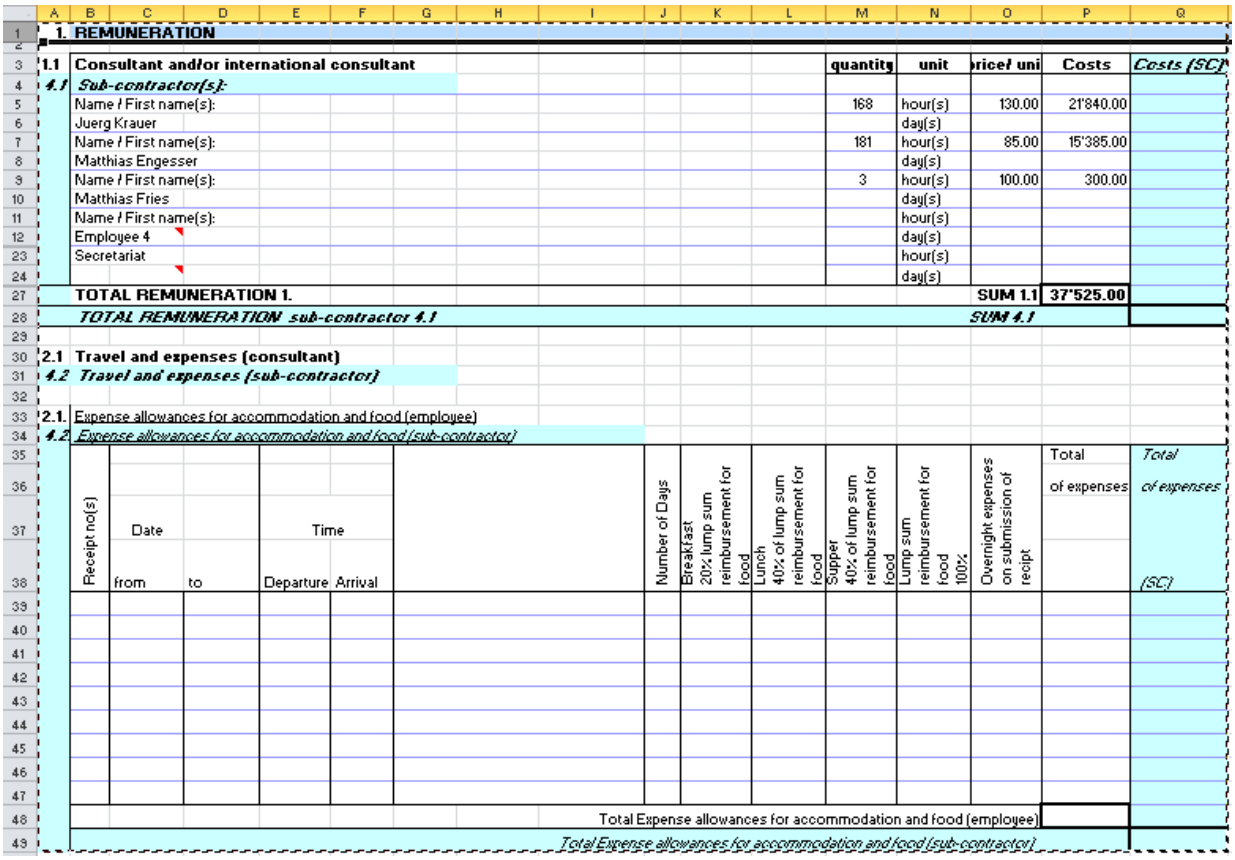
Important:

Only actual expenses based on receipts will be paid.
A detailed hour or day report should be attached to the statement of accounts.
Please refer to the enclosed GCB/SDC.

1.	**REMUNERATION**			
1.1	**Consultant and/or international consultant**	**37'525.00**		Total Fees of employees
	TOTAL REMUNERATION	**37'525.00**		**SUM 1.**
2.	**TRAVEL AND EXPENSES (consultant)**			
	Travel and expenses (consultant)			Total Travel and expenses of employees
2.1	Expense allowances for accommodation and food			
2.2	Travel expenses			
2.3	Additional travel expenses			
2.4	Other costs			
	TOTAL DIRECT COSTS			**SUM 2.**
3.	**TOTAL MATERIAL (consultant)**			**SUM 3.**
4.	***SUB-CONTRACTING (SC)***			
4.1	***Remuneration of sub-contractor***			*Total Fees of sub-contractor(s)*
4.2	***Travel and expenses (sub-contractor)***			*Total Travel and expenses of sub-contractor(s)*
4.2.1	*Expense allowances for accommodation and food*			
4.2.2	*Travel expenses*			
4.2.3	*Additional travel expenses*			
4.2.4	*Other costs*			
4.3	***Material (sub-contractor)***			
	TOTAL SUB-CONTRACTING			***SUM 4.***
5.	**VAT**			**Amount due**
6.	**ADVANCE PAYMENTS**			
	Date of Payment			Advance payment(s)
	TOTAL ADVANCE PAYMENTS .1.			**SUM 5.**
	GRAND TOTAL	**37'525.00**		**SUM 1. + 2. + 3. + 4. + 5. - 6.**

Appendix 2: Accounting

2.2 Remuneration



1	**1. REMUNERATION**																	
3	**1.1**	**Consultant and/or international consultant**											**quantity**	**unit**	**price/ uni**	**Costs**	*Costs (SC)*	
4	*4.1*	*Sub-contractor(s):*																
5		Name / First name(s):											168	hour(s)	130.00	21'840.00		
6		Juerg Krauer												day(s)				
7		Name / First name(s):											181	hour(s)	85.00	15'385.00		
8		Matthias Engesser												day(s)				
9		Name / First name(s):											3	hour(s)	100.00	300.00		
10		Matthias Fries												day(s)				
11		Name / First name(s):												hour(s)				
12		Employee 4												day(s)				
23		Secretariat												hour(s)				
24														day(s)				
27		**TOTAL REMUNERATION 1.**													**SUM 1.1**	**37'525.00**		
28		*TOTAL REMUNERATION sub-contractor 4.1*													*SUM 4.1*			
30	**2.1**	**Travel and expenses (consultant)**																
31	*4.2*	*Travel and expenses (sub-contractor)*																
33	**2.1.**	Expense allowances for accommodation and food (employee)																
34	*4.2*	*Expense allowances for accommodation and food (sub-contractor)*																
35																Total	*Total*	
36																of expenses	*of expenses*	
37			Receipt no(s)	Date		Time			Number of Days	Breakfast 20% lump sum reimbursement for food	Lunch 40% of lump sum reimbursement for food	Supper 40% of lump sum reimbursement for food	Lump sum reimbursement for food 100%	Overnight expenses on submission of recipt				
38				from	to	Departure	Arrival										*(SC)*	
39																		
40																		
41																		
42																		
43																		
44																		
45																		
46																		
47																		
48																Total Expense allowances for accommodation and food (employee)		
49																	*Total Expense allowances for accommodation and food (sub-contractor)*	

Appendix 3: Working Hours

Working hours project ASM formalization atlas and map							
Programme	**Code**	**Name**	**Date**	**Remarks**	**Krauer Juerg**	**Enggesser Matthias**	**Fries Matthias**
ASM formalization atlas	P235	Krauer, Jürg	25.02.2014	Projektproposal, mails			
ASM formalization atlas	P235	Krauer, Jürg	28.02.2014	mails, admin			
ASM formalization atlas	P235	Krauer, Jürg	07.03.2014	Data prep			
ASM formalization atlas	P235	Krauer, Jürg	25.03.2014	contract, proposal			
ASM formalization atlas	P235	Krauer, Jürg	26.03.2014	contract			
ASM formalization atlas	P235	Krauer, Jürg	31.03.2014	data prep			
ASM formalization atlas	P235	Krauer, Jürg	19.05.2014	mails, admin			
ASM formalization atlas	P235	Krauer, Jürg	20.05.2014	data prep			
ASM formalization atlas	P235	Krauer, Jürg	21.05.2014	data comp			
ASM formalization atlas	P235	Krauer, Jürg	12.06.2014	Conceptual development			
ASM formalization atlas	P235	Krauer, Jürg	13.06.2014	SAM daten			
ASM formalization atlas	P235	Krauer, Jürg	16.06.2014	Preparation geodata for SAM with Matthias Engesser			
ASM formalization atlas	P235	Krauer, Jürg	17.06.2014	Geodata composition for Matthias Engesser			
ASM formalization atlas	P235	Krauer, Jürg	18.06.2014	Mails and conceptual development			
ASM formalization atlas	P235	Krauer, Jürg	24.06.2014	Mails			
ASM formalization atlas	P235	Krauer, Jürg	25.06.2014	Access database			
ASM formalization atlas	P235	Krauer, Jürg	30.06.2014	mail and new data for SAM			
ASM formalization atlas	P235	Krauer, Jürg	10.07.2014	test different hillshades			
ASM formalization atlas	P235	Krauer, Jürg	11.07.2014	CodePage Problem			
ASM formalization atlas	P235	Krauer, Jürg	14.07.2014	Geodaten und AccessDB			
ASM formalization atlas	P235	Krauer, Jürg	15.07.2014	CodePage und Geodaten			
ASM formalization atlas	P235	Krauer, Jürg	16.07.2014	Miners on GoogleEarth			
ASM formalization atlas	P235	Krauer, Jürg	18.07.2014	corrchecking miners on GoogleEarth			
ASM formalization atlas	P235	Krauer, Jürg	15.08.2014	Mail und data sets			
ASM formalization atlas	P235	Krauer, Jürg	19.08.2014	Various compilations	61		
ASM formalization atlas	P235	Engesser, Matthias	24.06.2014	SAM Projekt Mongolei			
ASM formalization atlas	P235	Engesser, Matthias	25.06.2014	SAM Atlas Mongolia			
ASM formalization atlas	P235	Engesser, Matthias	26.06.2014	SAM Atlas Mongolia			
ASM formalization atlas	P235	Engesser, Matthias	10.07.2014	SAM Atlas Mongolia			
ASM formalization atlas	P235	Engesser, Matthias	11.07.2014	SAM Atlas Mongolia			
ASM formalization atlas	P235	Engesser, Matthias	16.07.2014	SAM Atlas Mongolia			
ASM formalization atlas	P235	Engesser, Matthias	17.07.2014	SAM Atlas Mongolia		38.4	
ASM formalization atlas	P235	Fries, Matthias	15.07.2014	UTF-8 Support ArcGIS miners.db			3
ASM formalization atlas	P235	Engesser, Matthias	06.10.2014	SAM Atlas Mongolia			
ASM formalization atlas	P235	Engesser, Matthias	21.10.2014	SAM Atlas Mongolia			
ASM formalization atlas	P235	Engesser, Matthias	23.10.2014	SAM Atlas Mongolia			
ASM formalization atlas	P235	Engesser, Matthias	27.10.2014	SAM Atlas Mongolia			
ASM formalization atlas	P235	Engesser, Matthias	03.11.2014	SAM Atlas Mongolia		18.5	
ASM formalization atlas	P235	Krauer, Jürg	23.10.2014	ASM data	2		
ASM formalization atlas	P235	Engesser, Matthias	04.11.2014	SAM Atlas Mongolia			
ASM formalization atlas	P235	Engesser, Matthias	06.11.2014	SAM Atlas Mongolia			
ASM formalization atlas	P235	Engesser, Matthias	07.11.2014	SAM Atlas Mongolia			
ASM formalization atlas	P235	Engesser, Matthias	10.11.2014	SAM Atlas Mongolia			
ASM formalization atlas	P235	Engesser, Matthias	11.11.2014	SAM Atlas Mongolia			
ASM formalization atlas	P235	Engesser, Matthias	12.11.2014	SAM Atlas Mongolia			
ASM formalization atlas	P235	Engesser, Matthias	14.11.2014	SAM Atlas Mongolia			
ASM formalization atlas	P235	Engesser, Matthias	13.11.2014	SAM Atlas Mongolia			

ASM formalization atlas	P235	Engesser, Matthias	17.11.2014	SAM Atlas Mongolia			
ASM formalization atlas	P235	Engesser, Matthias	18.11.2014	SAM Atlas Mongolia			
ASM formalization atlas	P235	Engesser, Matthias	20.11.2014	SAM Atlas Mongolia			
ASM formalization atlas	P235	Engesser, Matthias	25.11.2014	SAM Atlas Mongolia			
ASM formalization atlas	P235	Engesser, Matthias	26.11.2014	SAM Atlas Mongolia		77.5	
ASM formalization atlas	P235	Krauer, Jürg	04.11.2014	SAM Atlas Mongolia			
ASM formalization atlas	P235	Krauer, Jürg	07.11.2014	SAM Atlas Mongolia			
ASM formalization atlas	P235	Krauer, Jürg	10.11.2014	Data, mails			
ASM formalization atlas	P235	Krauer, Jürg	11.11.2014	Mails und Meeting Matthias			
ASM formalization atlas	P235	Krauer, Jürg	13.11.2014	Support			
ASM formalization atlas	P235	Krauer, Jürg	14.11.2014	Mails und support			
ASM formalization atlas	P235	Krauer, Jürg	17.11.2014	Mails und support			
ASM formalization atlas	P235	Krauer, Jürg	18.11.2014	Data, Statistics			
ASM formalization atlas	P235	Krauer, Jürg	19.11.2014	daten, support			
ASM formalization atlas	P235	Krauer, Jürg	20.11.2014	Support			
ASM formalization atlas	P235	Krauer, Jürg	21.11.2014	Data and support			
ASM formalization atlas	P235	Krauer, Jürg	24.11.2014	Atlas support			
ASM formalization atlas	P235	Krauer, Jürg	25.11.2014	Atlas, data, support			
ASM formalization atlas	P235	Krauer, Jürg	26.11.2014	Atlas support			
ASM formalization atlas	P235	Krauer, Jürg	27.11.2014	Atlas support			
ASM formalization atlas	P235	Krauer, Jürg	28.11.2014	Atlas support			
ASM formalization atlas	P235	Krauer, Jürg	01.12.2014	SAM support			
ASM formalization atlas	P235	Krauer, Jürg	02.12.2014	Mapping, modelling			
ASM formalization atlas	P235	Krauer, Jürg	03.12.2014	SAM support			
ASM formalization atlas	P235	Krauer, Jürg	08.12.2014	ASM support			
ASM formalization atlas	P235	Krauer, Jürg	09.12.2014	SAM support			
ASM formalization atlas	P235	Krauer, Jürg	12.12.2014	SAM support			
ASM formalization atlas	P235	Krauer, Jürg	13.12.2014	SAM support			
ASM formalization atlas	P235	Krauer, Jürg	14.12.2014	SAM support			
ASM formalization atlas	P235	Krauer, Jürg	04.12.2014	SAM support			
ASM formalization atlas	P235	Krauer, Jürg	15.12.2014	SAM support	88		
ASM formalization atlas	P235	Engesser, Matthias	27.11.2014	SAM Projekt Mongolia			
ASM formalization atlas	P235	Engesser, Matthias	28.11.2014	SAM Atlas Mongolia			
ASM formalization atlas	P235	Engesser, Matthias	01.12.2014	SAM Atlas Mongolia			
ASM formalization atlas	P235	Engesser, Matthias	02.12.2014	SAM Atlas Mongolia			
ASM formalization atlas	P235	Engesser, Matthias	03.12.2014	SAM Atlas Mongolia			
ASM formalization atlas	P235	Engesser, Matthias	08.12.2014	SAM Atlas Mongolia			
ASM formalization atlas	P235	Engesser, Matthias	17.12.2014	SAM Atlas Mongolia			
ASM formalization atlas	P235	Engesser, Matthias	18.12.2014	SAM Atlas Mongolia		47	
ASM formalization atlas	P235	Krauer, Jürg	16.12.2014	Accounting reporting			
ASM formalization atlas	P235	Krauer, Jürg	17.12.2014	Accounting reporting	17		
Total working hours					**168**	**181.4**	**3**