Technology Commercialization Opportunities in Mongolia

N.BAATARHUYAG

MONGOLIAN E-GOVERNMENT CENTER – MEGO

Agenda

1. MEGO Introduction
2. Smart Farm
3. Low quality Coal
4. Municipal Sewage
5. Copper product

1. MEGO Introduction

Mission, Vision

What we Do

Partners

Activities

What we DO

We do believe that our vision and mission statement will guide us to develop and deploy the Mongolian e-government/e-security training curriculums with their strategic plan by using variety of strategic development and collaboration of our experts in these major.

MeGO is dedicated to deliver most advanced innovation and technology to the Mongolian Government and business for its best performance.

Our strategy is to build a bridge between Government, Business, Research and Training institutes and Technology through our NGO. We believe that effective communication between Government, Business, and NGO is the key to the Mongolian successful ICT development, and e-services delivery.

Mego is planning to establish a professional network between developed countries and Mongolia in the field of information technology, information security(IS)and education.

Partners

Ministry of Education, Culture and Science (MECS)

Information Technology, Post and Telecommunications Authority

Communications Regulatory Commission

Science and Technology Fund

National IT Park (NITP)

- Arvis Systems /B.Jargal, Sales Director/ Tel:99118261jack@arvisys.mn
- Med Mongol /Tseden Khaliunaa, CEO/ Tel:99068377 haliunaa@medmongol.com
- Summit Computer Technology /T.Ganbat, CEO/ Tel:976-99119920 ganbat@summit.mn
- Super Assist Systems LLC : /Director –Buriad Erdenebayar/ Tel : 976-99180541 erbrmn@super-assist.com
- Microciti LLC: /Director –Tsend Nyamkhuu/ Tel : 976-96660246 nyamkhuu@microciti.com
- MXC LLC: /Batsaikhan-Sales Director/ Tel:976-99052673Batbileg@mxc.mn

Activities

International:

- The FCO's cyber security capacity building programme 2015-16
- "Smart Farm" Pilot Project in Batsumber, Mongolia with GCC, KAIST

Local:

- Consulting service for Supply chain management system - (Mining company) –
- Consulting service for ERP supplier selection module - (Mining company) –
- Consulting service for warehouse RFID - (Mining company) –
- Tech survey with National Technology park

2.Agriculture sector

Sector Overview

Demand

Challenges

Cooperation Opportunities – Smart Farm Project Proposal

Agriculture Sector Overview

Agricultural sector produces 21.7% of total GDP .

80% livestock and 20% crop sector.

40% of total working force is worked in agricultural sector.

Main crops are wheat-100% , potato -100%, vegetables-60% / local market total consumption /

Meat , and dairy products -100%

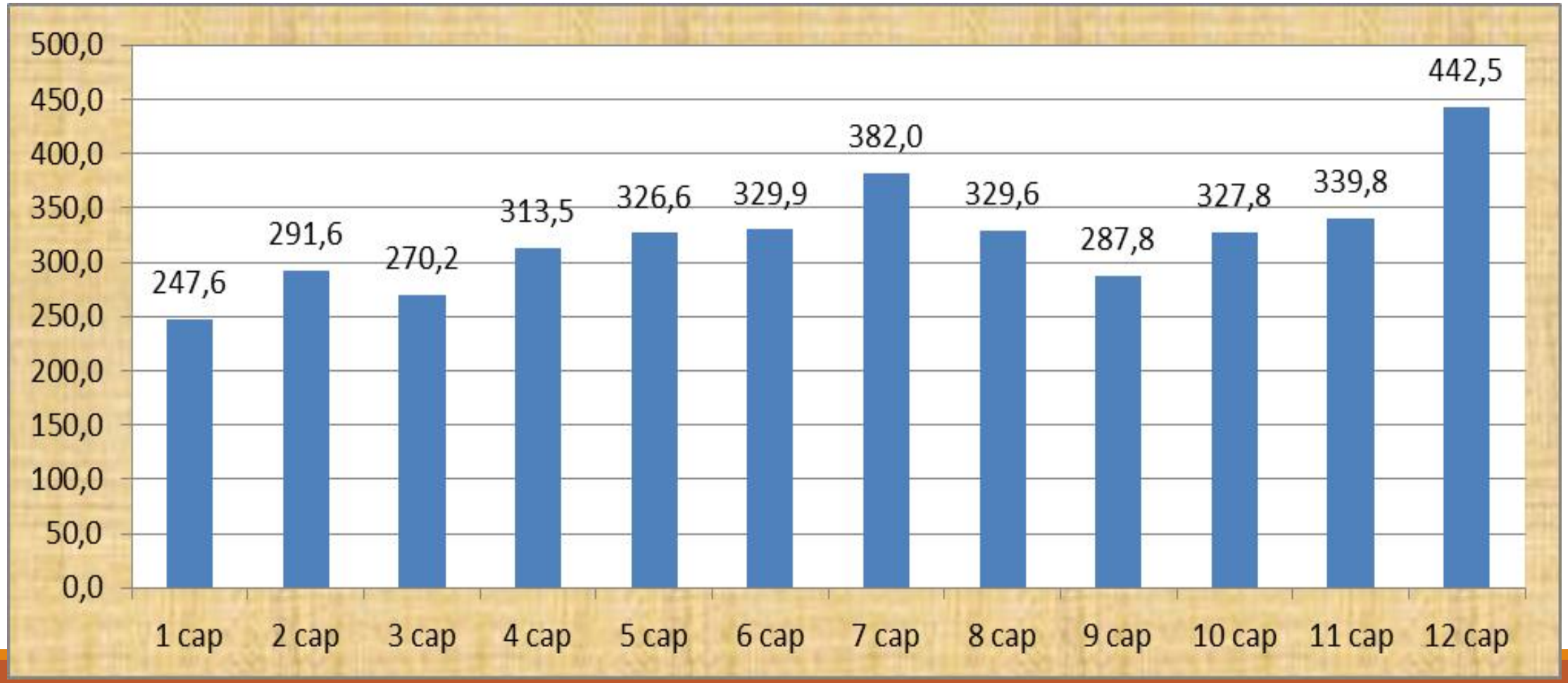
Total livestock at the end of 2016 has reached approximately 55 million herds.

Main agricultural export product: Leather, organic cashmere, meat, sheep and camel wool .

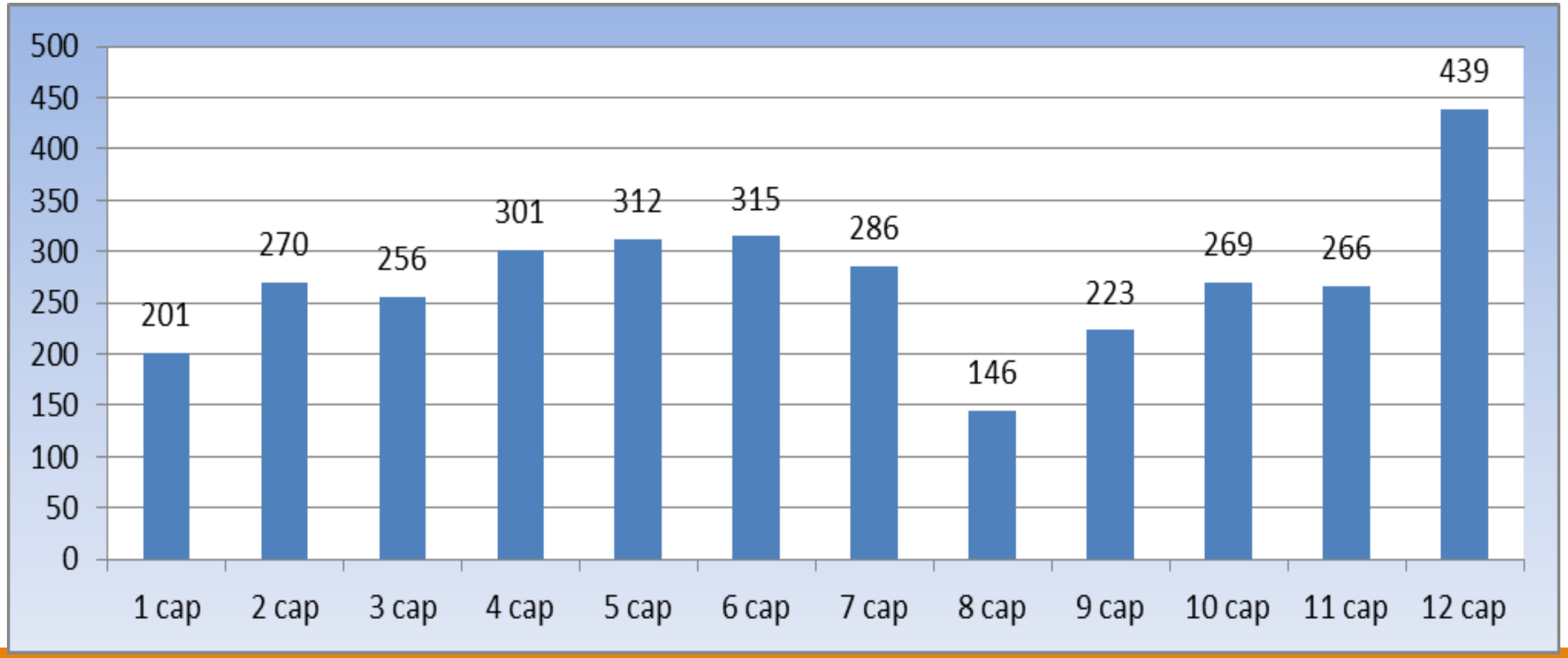
Production

- Domestic production supplies:
  - 98.2% of potato demand
  - 47.3% of vegetable demand
  - 25.0% of flour demand

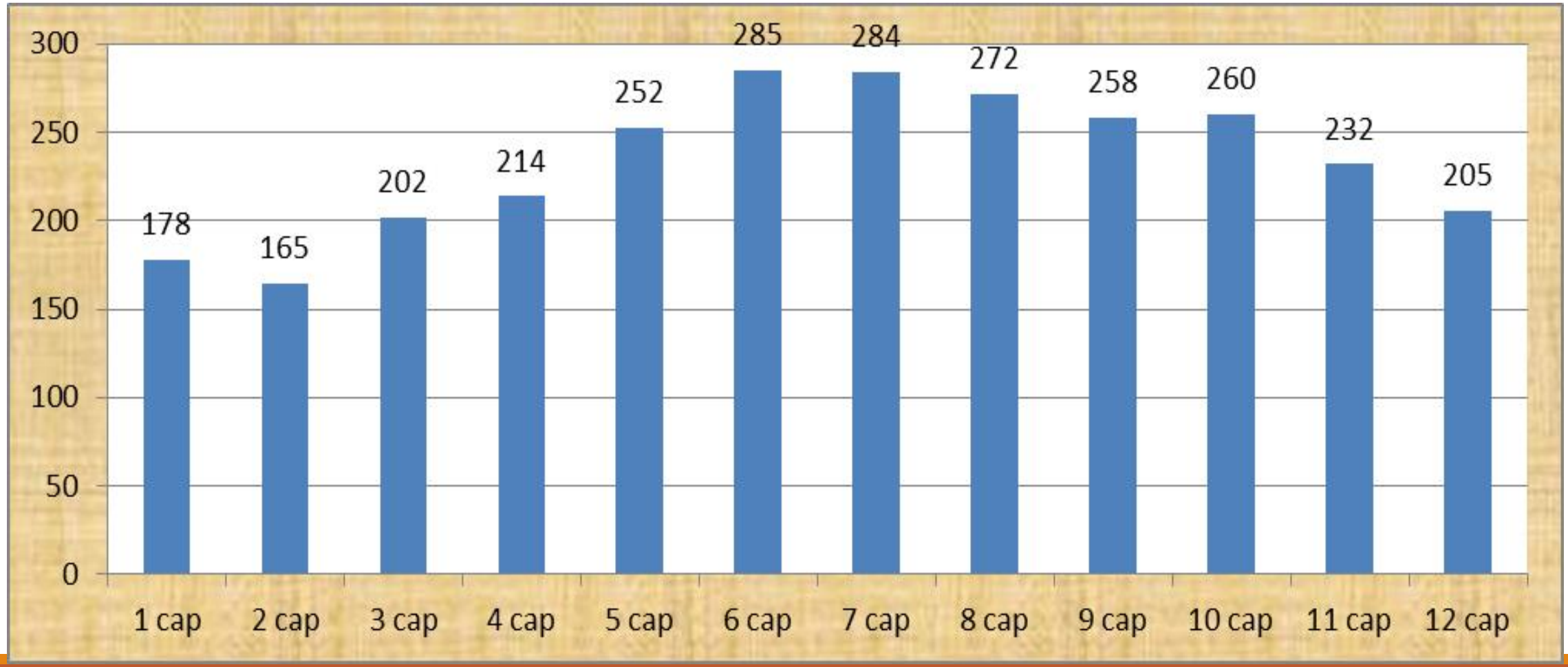
Demand – Tomato Import (4,210 t - year)



Demand – Cucumber Import (3,384 t - year)



Demand – Fabric Import (2,807 t - year)



Vegetable plant and harvest - 2016

Vegetable name	4 Season Greenhouse		Summer Greenhouse	
	Planted area – m²	Harvest (ton)	Planted area m²	Harvest (ton)
Cucumber	97 892	1 048	23 816	1 395
Tomato	42 062	462	100 309	626.6
Fabric	4 980	37,8	23 026	132
Strawberry	4 670	9	7 510	4.8

Challenges

Harsh, cold winter climate

- -25 to -40C temperature
- High Heating cost
- High Construction Cost

Lack of Expertise

- Green house is in infant stage
- Can not solve the agriculture problems – uncertainties

Market capacity

- Low market capacity

Smart Farm Project Proposal – Estimated Income Calculation

№	Vegetable Variety	Planting area (ha)	Harvest per squire meter (ton)	Yearly harvest (ton)	Price per kg (кг/USD)	Yearly income (USD) 10% wastage	Operational Cost /USD/ /52,0 %/	Profit (USD)
1	Cucumber	0.5	60	300	1.46	437 500	227 500	210 000
2	Tomato	0.5	50	250	1.9	468 750	243 750	225 000
3	Fabric	0.8	50	400	1.7	666 667	346 667	320 000
4	Baby Plant	0.2	100	500 000	0.34	66 667	34 667	32 000
Total		2		2150		**1 639 584**	**852 584**	**787 000**

Smart Farm Project Proposal – Estimated Economic Analysis

Year	Cash Flow	Accumulated Cash Flow	Present Value	Comment
0	-2,343,101	-2,343,101	-5,623	
1	708,136.99	-1,634,964	1,619	
2	708,136.99	-926,827	1,542	First three years pay only interest rate - 8%
3	708,136.99	-218,690	1,468	
4	258,849.56	201,442	830	From 4th year loan repayment + interest rate will be paid during 7 years / 287,917 USD/ which is deducted from Profit/
5	281,889.94	621,574	790	
6	304,930.33	1,041,706	752	
7	327,970.71	1,461,839	717	
8	351,011.09	1,881,971	682	
9	374,051.47	2,302,103	650	
10	397,091.85	2,722,235	619	
	NPV		4,045	
	IRR		25%	

Smart Farm Project Proposal – Investment

#	Item	Measuring Unit	Quantity	Unit Price	Total price USD	From which	
						Loan Investment	Own Investment
1	Land	hectare	4	50,000	200,000		200,000
2	Green House Construction	hectare	2	541,667	1,083,334	1,083,334	
3	Management S/W with Nutrient Delivery System	piece	2	370,118	740,236	740,236	
4	Heating System	piece	2	33,334	66,668	66,668	
5	Truck	piece	2	8,334	16,668		16,668
6	Equipment Custom Tax, VAT			68,383	68,383		68,383
8	Office building		1	25,000	25,000	25,000	
9	Warehouse	piece	1	12,500	12,500	12,500	
10	Other equipment, instrument				26,167	26,167	
	Total			2,238,956.00	**1,927,738.00**	285,051.00	

Coal

Sector Profile

Demand

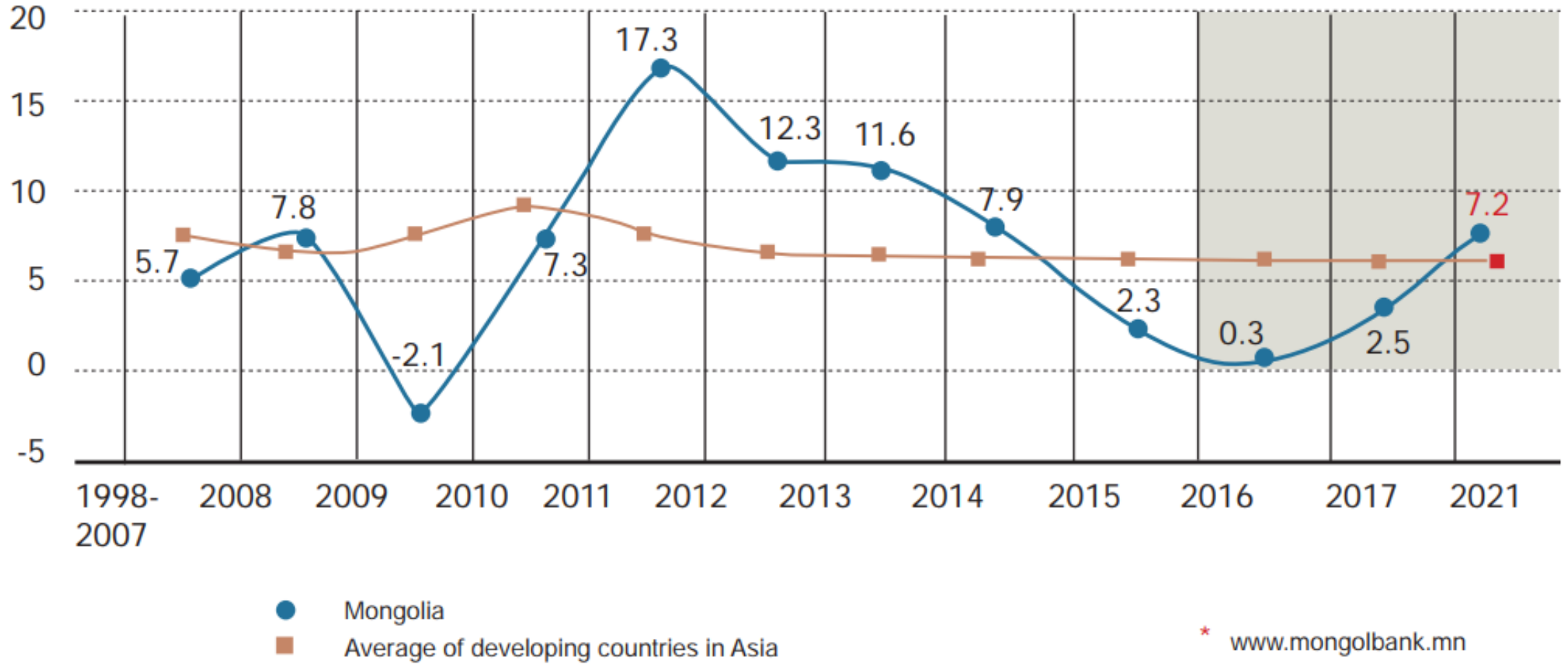
Challenges

- Ulaanbaatar City Air Pollution

Cooperation Opportunities

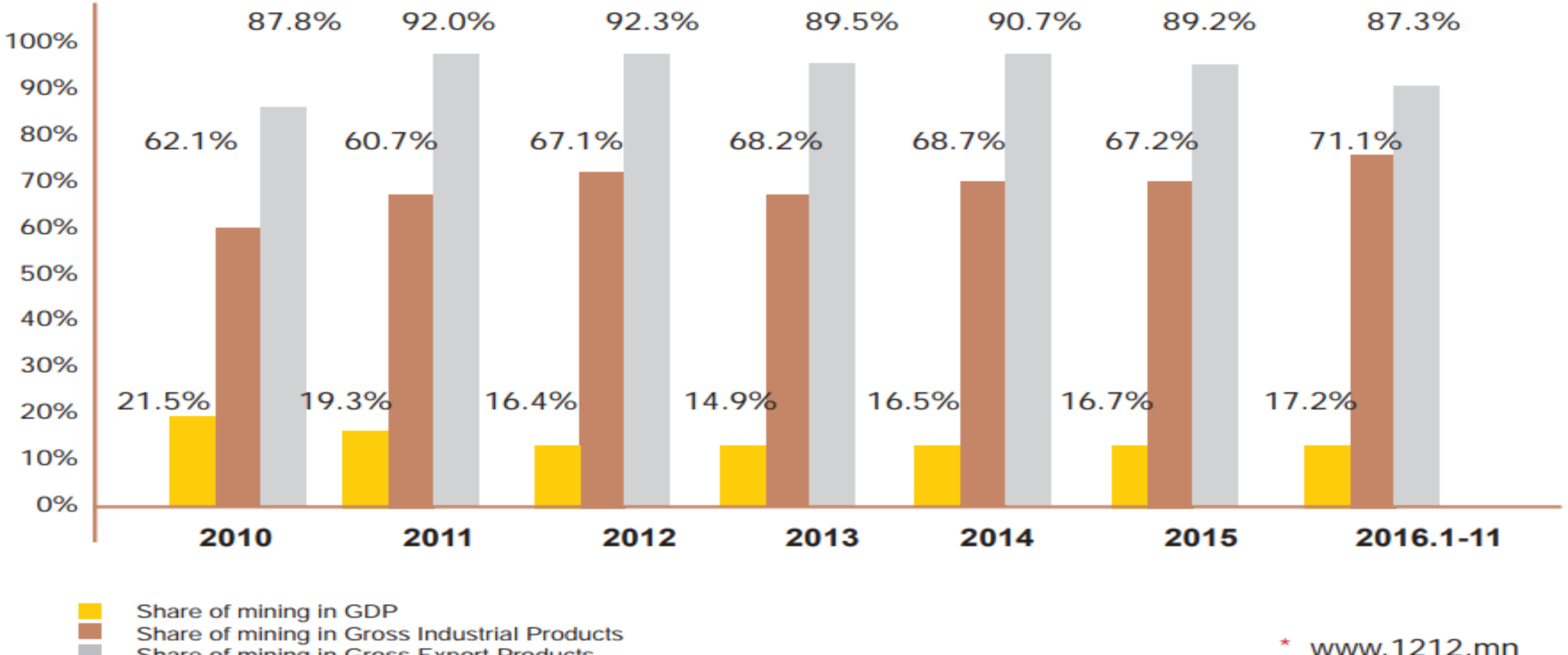
Mongolian economic growth

Figure 2. Economic growth of Mongolia and its prospects



Share of Mining in GDP and GIP

Figure 3. Share of mining in GDP and Gross Industrial Products *



* www.1212.mn

Coal Sector Overview

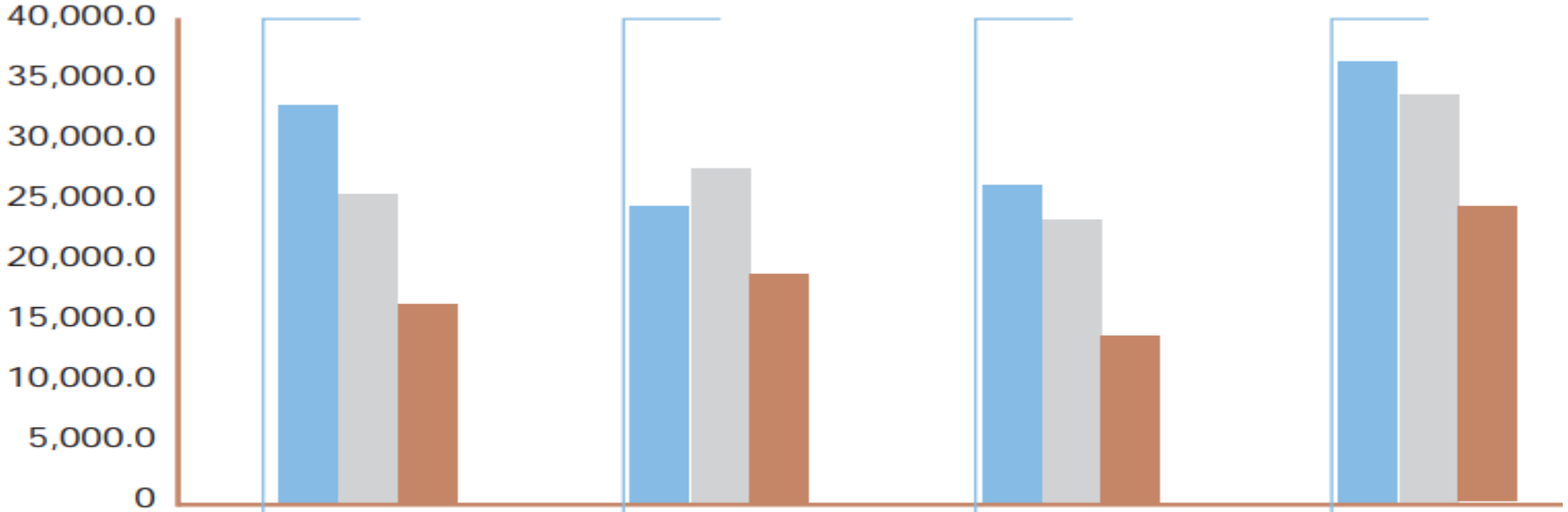
Mongolia had registered coal reserves of 37.4 billion tons as of December 31st, 2016 and 171 entities are holding 296 coal mining licenses.

In 2016, coal production in Mongolia reached 35.096 million tons, 33.83 million tons were sold and 25.8 million tons were exported.

Coal production increased 152.9%, sales increased 152.9% and export increased 178.4% in 2016 from 2015 levels.

Coal Mining and Sales

Figure 36. Coal mining, sales and export (thousand tones)



	2013	2014	2015	31.12.2016
Mining	33,340.5	24,449.3	24,146.1	**35,096.5**
Sales	26,076.2	27,305.0	22,125.4	**33,831.7**
Export	18,188.3	19,513.0	14,467.5	**25,809.3**

Ongoing projects on Coal Processing

Five coal-to-liquid and coal-to-gas projects have had their feasibility study approved and are moving towards implementation.

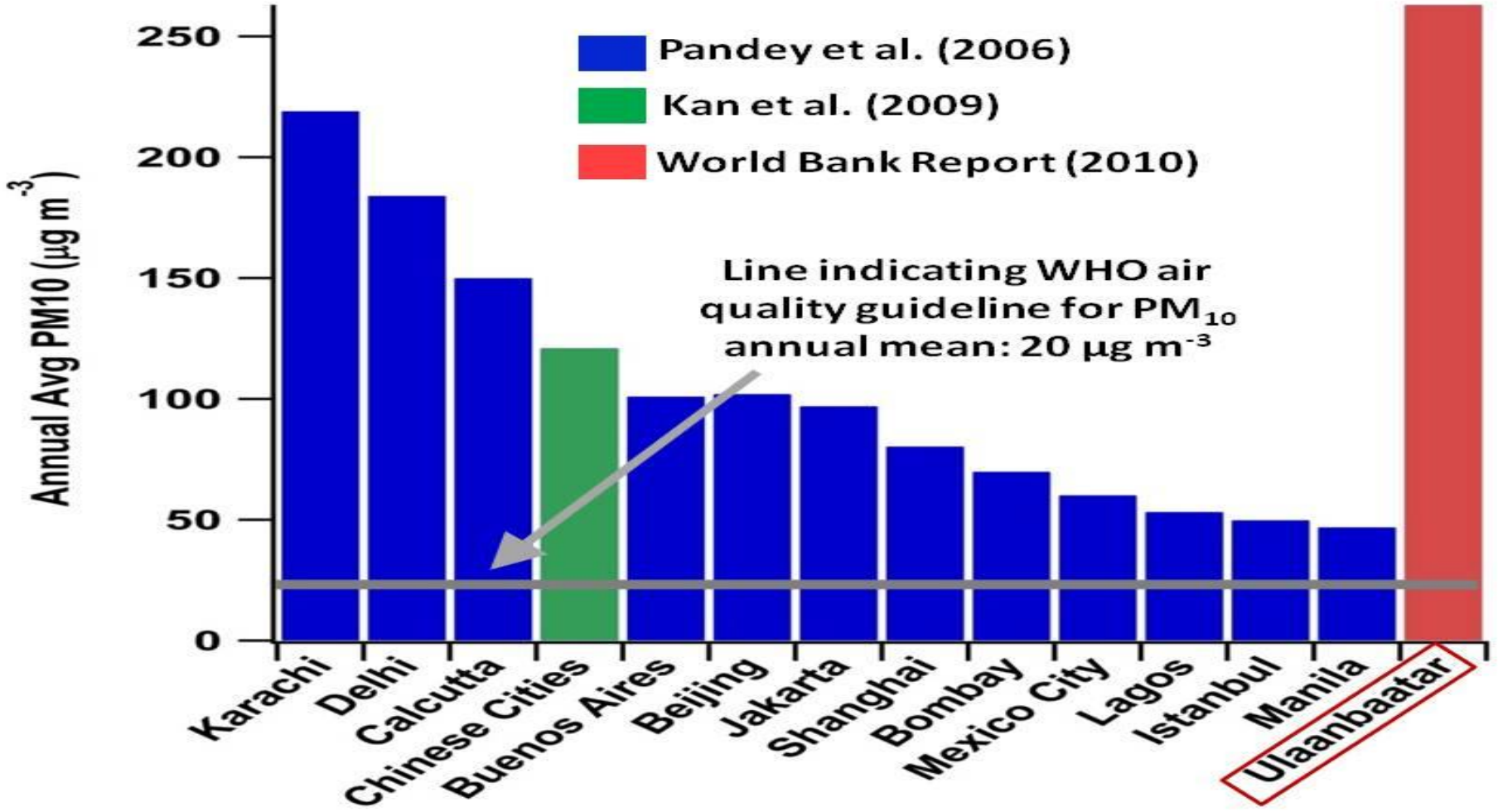
Their locations have been selected according to several criteria, including raw material availability, logistics for delivery of products and potential market proximity.

One is at the Aduunchuluun coal mine in Dornod aimag, one at the Tugrug Nuur coal deposit in Tuv aimag, and one at the Baganuur coal mine, in central and eastern Mongolia.

These plants will have the most suitable technologies (eg the Fischer Tropsch process, the Bergius process, SRC-I and SRC-II), depending on coal properties, output volume and compliance with standards.

These plants will need investment of USD$ 1.1-2.4 billion, and are expected to process 2.5- 3 million tonnes of coal per year. They will produce 0.4-1.2 million tonnes of engine fuel, 50- 100 000 tonnes of liquefied gas, 200-300 megawatts of electricity and other by-products. Investment recoupment is estimated between 8 to 15 years.

Main Challenge – Air Pollution in UB city



Main Challenge – Air Pollution

Source	PM_{10}	$PM_{2.5}$	SO_2	Height of emissions, meters	Spatial distribution
Ger households	19,731	15,785	8,784	3–5	Throughout ger areas
HOBs	1,077	646	4,360	10–20	Dispersed over UB surroundings
CHPs	18,589	7,436	33,600	100–200	3 point sources to the west of UB center
Vehicle exhaust	1,161	1,161	1,354	<1	Dispersed along main road system mainly throughout the central city areas
Dry dust from roads					
Paved	5,142	771		<1	Mainly throughout the central city areas
Unpaved	4,812	722		<1	Mainly throughout the ger areas

Main Challenge – Air Pollution

Main Reason

- 180 000 households live in “Gher” area, burning raw coal as a heater

Solution

Implement Coal Processing Project in Baganuur, Mongolia, 130 km east to UB city.

Main source of raw coal.

HCK or Hybrid Sludge Fuel with Green Carbon

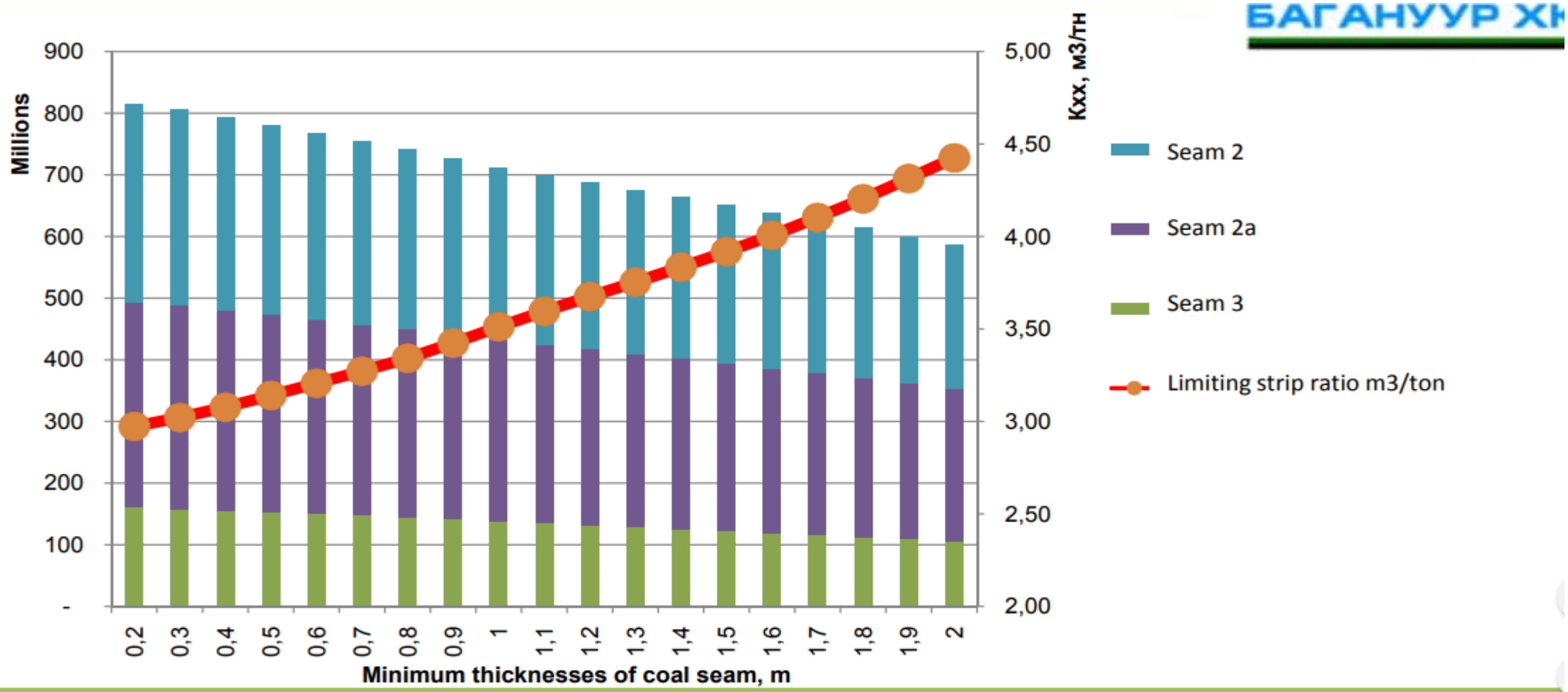
Total capacity 200 000 tons per year. UB city's annual consumption is around 300 000 tons of coal.

Coal price is 13.2 USD per ton.

Baganuur Coal's quality:

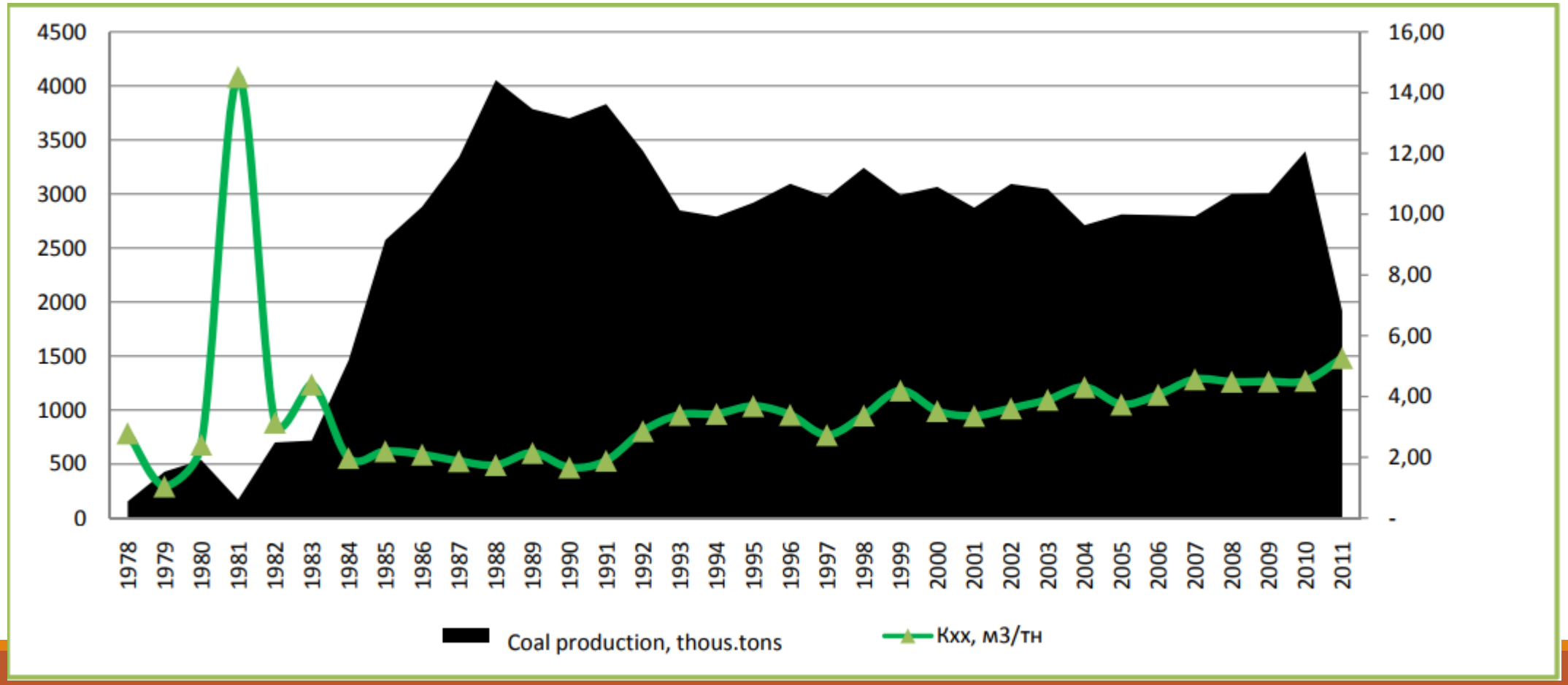
Type of coal size	Ash content /%/ $<A^r$	Moisture /%/ $<W^r$	Sulfur content /%/ S^d_t	Volatile matter /%/V	Calorific value $<Q^r_t$	
					Kkal/kg	KJ/kg
Brown coal type -B2	17.5	37.5	0.5	45	3360	13.0

Resource and Reserve of BN coal

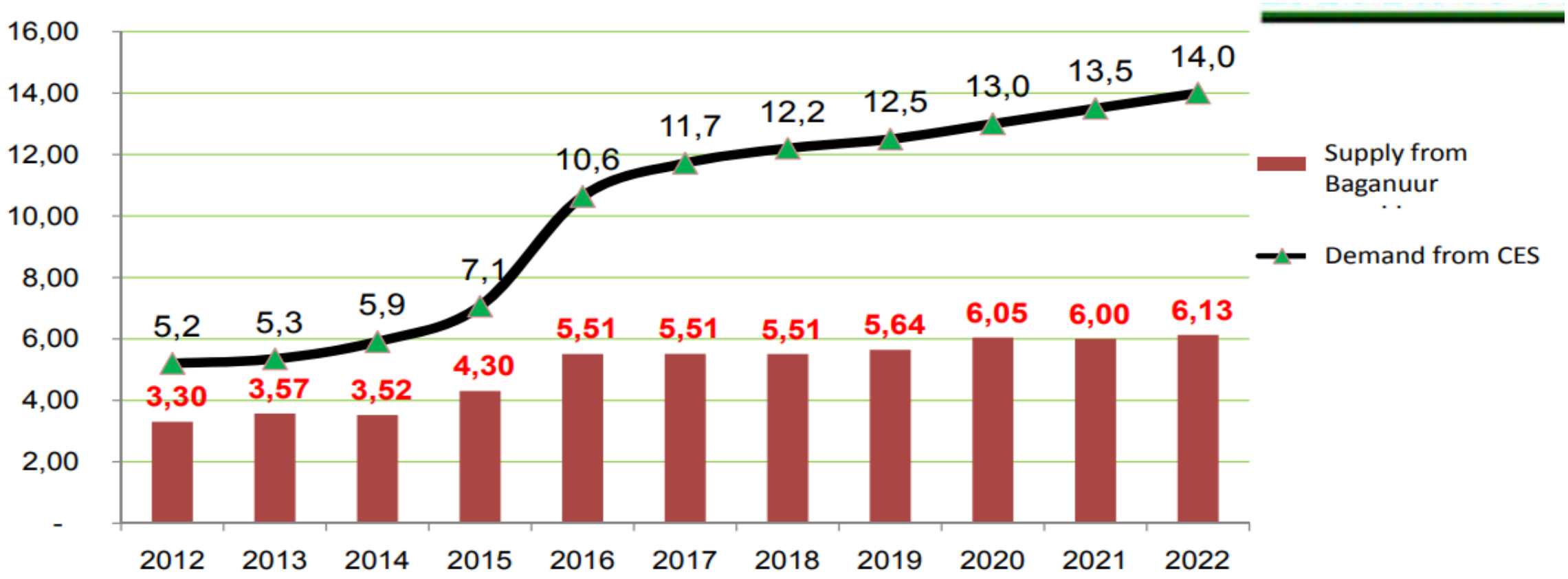


Reserve can be elevated up to 700 million tones depending on the availability of minable coal seam thicknesses.

Coal Production – BN coal



Supply and Demand of BN coal



- 30% of coal consumption to TPP-5 which will be built with 820 MW capacity in 2012-2016.
- 100% of coal consumption to Baganuur power plant which will be built with 270MW in 2013-2016.
- projected coal production of the mine is 6 million tons by 2020.

3.Copper

Sector Profile

Demand

Challenges

Cooperation Opportunities

Copper Industry Overview

2. Production of main metallic and industrial minerals commodities (2015)		
Copper concentrate	ths t	1,334.7
Molybdenum concentrate	t	5,207
Gold (note: gold contained in copper concentrate not included)	kg	14,556.2
Fluorspar concentrate	ths t	230.8
Iron ore	ths t	6,173.4
Zinc concentrate	ths t	89.6
Lead concentrate		no information

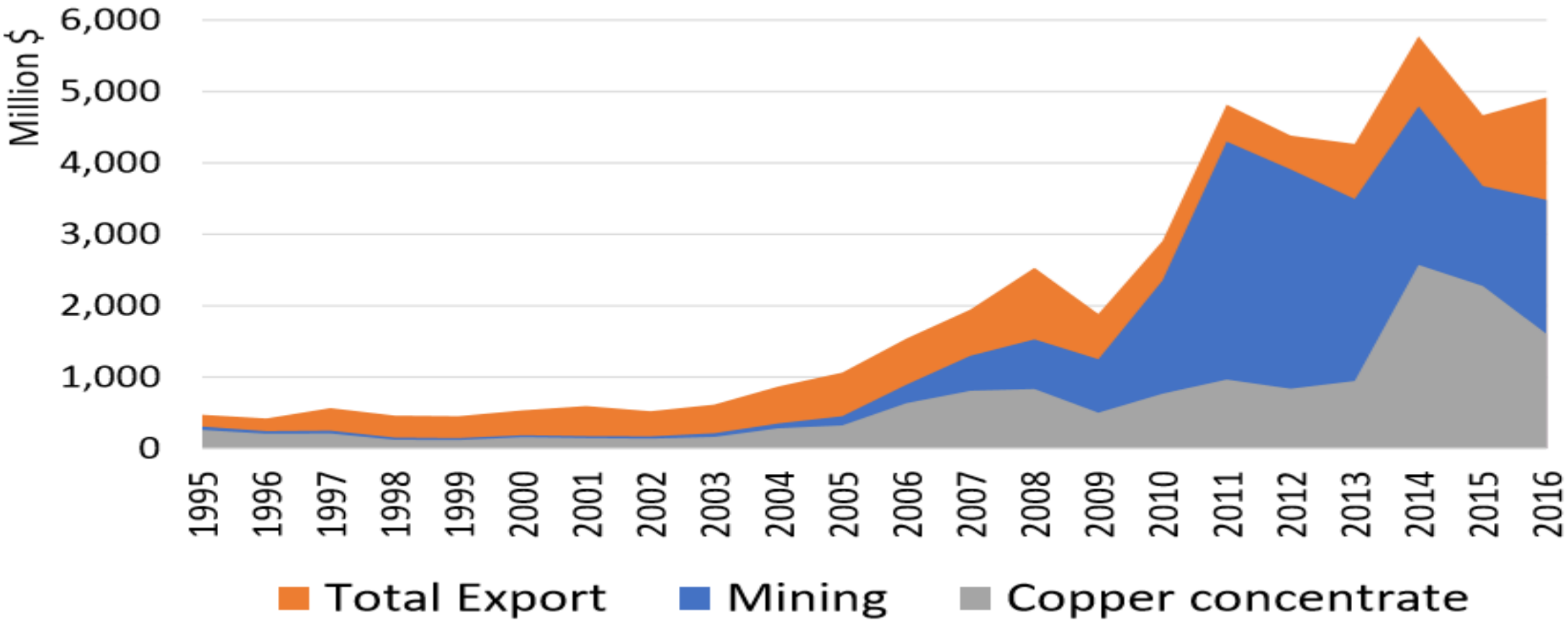
Production and export of copper and coal

			Production	Export	
Commodity	units	Year	volume	volume	value
Copper concentrate	ths t, ths t, ths $	2012	517.9	574.3	838,579.3
		2013	803.0	649.8	948,951.0
		2014	1,080.4	1,378.1	2,573,621.8
		2015	1,334.7	1,477.8	2,280,135.3
Coal (bituminous and lignite)	ths t, ths t, ths $	2012	28,561.0	20,915.5	1,901,773.5
		2013	29,163.6	18,373.1	1,122,204
		2014	24,927.1	19,499.0	849,039.5
		2015	24,148.9	14,472.7	555,926.7

Main Players in Copper Mining

	Oyu Tolgoi mine	Erdenet mine	Tsagaan Suvarga mine
Operator	Oyu Tolgoi corporation Joint venture by Turquoise Hill Resources (66%) and Mongolian Government (34%)	Erdenet mining Joint venture by Mongolian (51%) government and Mongolian copper Co Ltd (49%)	Mongolian Alt corporation (MAK)
Location	Khanbogd, Omnogobi	Bayan-Undur, Orkhon	Mandakh, Dornogobi
Type	Porphury copper	Porphury copper	Porphury copper
Mineral	Copper, gold and silver	Copper and molybdenum	Copper and molybdenum
Mine Development	2013	1978	2018 (forecast)
Ore reserves	3.5 Bt	1.5 Bt	Oxide ore: 10 Mt Sulfide ore: 240 Mt
Ore grade	Open pit: 0.51% Cu Underground mining: <1.68% Cu	0.51% Cu	Oxide ore: 0.42% Cu Sulfide ore: 0.53% Cu
Copper grade	Open pit: 23-25% Cu Underground mining: 23-35% Cu	23-25% Cu	25.6% Cu
Copper reserves	25.1 Mt	4-6 Mt	1.6 Mt
Method of mining	Open pit Underground mining	Open pit	Open pit
Life	98 year	32-42 year	18 year (forecast)

Total Export, Mining and Copper export



Main producers of Copper

	Erdmin Co., Ltd	Achit Ikht Co., Ltd	New manufacture plan (Feasibility Study)
Operator	Erdenet Concern LLC, RMC of USA	Achit Ikht (66%) Erdenet Mining Corporation (34%)	Mongolia 10% (Total investment 700 mill US$
Location	Bayan-Undur, Orkhon (area around Erdenet mine)	Bayan-Undur, Orkhon (area around Erdenet mine)	Bor-Undur, Khenti (06.2016)
Source	Low-grade ore	Low-grade ore	Erdenet, OT, Tsagaan suvarga
Process type	Hydrometallurgic smelting (SX-EW)	Hydrometallurgic smelting (SX-EW)	SX-EW
Life (Contract with Erdenet)	40 year	20 year	NA
Manufacture Development	1997	10.2014	2018-2019 (forecast)
Current products, capacity	Cathode copper (LME A grade) 2750 t/y Rolled copper 2000 t/y Copper wire 3800 m/y Electric copper wire 3800 m/y	Cathode copper (LME A grade) 10,000 t/y	Cathode copper 125,000 t/y

Forecast

As a result of Ouy-Tolgoi's second phase investment /4.6 billion USD/, from 2022 Mongolian total Copper concentrate export will reach to 2 million ton.

China still play main role in Copper market

- Copper demand in China will be stable
- China has a plan to continuously expand Copper processing technology until 2030

Since 2016 Copper price has growing and WB and IMF estimated to reach 5788 usd, and 5400 usd respectively

Conclusion for Copper

Mongolia is exporting

- 1,5 million tons of copper concentrate
- 15 thousand tons of pure copper (only 1 percent is processed)

Need to invest in Copper processing industry using advanced technology such as KIMS metal powder in order to contribute to the economy by creating value-added manufacturing

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THANK YOU FOR YOUR ATTENTION! ANY QUESTIONS?