ASSESSMENT OF SOCIO-ENVIROPMENT BENEFITS OF METHANE IN ULAANBAATAR

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Require for methane consumption

- Reduce Coal consumption in Ulaanbaatar city and its Nalaikh district

- Reduce air pollution in Ulaanbaatar city
- Reduce expense of households and commercial facilities
- Reduction GHG (CH_4 gas) emission

Air pollution in winter, Ulaanbaatar

concentration of harmful gases in air of UB city (mg/m3)

N	Name of district	CO	SO_2	NO_2
1	Khan-uul	1.2	9.0	32.0
2	Sukhbaatar	5.0	10.0	101.0
3	Bayanzyrkh	12.0	9.0	42.0

Main air pollution sources of Ulaanbaatar city

- Stoves and furnaces of Private houses or gers -135000
- HOBs for heating Schools, Health Facilities (Municipal Organizations) -more 250
- Vehicles -100000

Air Pollution Ulaanbaatar city and it's Nalaikh district

Air pollution is increasing because of coal burning in inefficient stoves

Smog concentration estimating experiment

	Chemical name		Stove-2	Average
1	**CO**	mg/m^3	1998.656	**1918.98**
2	**SO_2**	mg/m^3	2.3	**19.37**
3	**NO_X**	mg/m^3	2.8815	**12.44**
4	**Ash in gas**	mg/m^3	1531.8	**1222.88**
5	**GHG, CO_2**	mg/m^3	59028.75	**53030.2**

Overview of fuel consumption in Ulaanbaatar city and it's district Nalaikh

Nalaikh:

- ✓ Private houses or stoves – 9000
  annual coal consumption -37800 tn
- ✓ Heat only Boilers - 24GCal/h
  annual coal consumption -33800 tn

Total-71600 tn

Ulaanbaatar city:

- ➢ 130000 households –
  Annual coal consumption -540000 tn
- ➢ 100,000 vehicles-
  Annual gasoline consumption 2200*100000=220000 tn
- ➢ Heat only Boilers-
  Annual coal consumption 570*275000=156750 tn

Total- 696750 tn

Methane Demand and Fuel Consumption of Ulaanbaatar city (by 2008)

	Fuel type	unit	Fuel consumption
Combined heat and power-CHPs	Coal	Mln.tone	3.5
	CH_4	mln.m^3	1380
Heat-only boiler-HOBs	Coal	Thous.tone	156,7
	CH_4	mln.m^3	40
Private houses	Coal	Thous.tone	540
	CH_4	mln.m^3	189
vehicles	gasoline	Thous.tone	220
	CH_4	mln.m^3	110
Apartments, cooking	electricity	Mln.kW.h	200
	CH_4	mln.m^3	23.6
total			**890.5**
			1719

Methane Demand and Fuel Consumption of Nalaikh district (by 2008)

- Householders -1400m^3*9000=130,000m^3
- Heat-only boilers 11,000,000 m^3

TOTAL- 11,1 million m^3 (8136.0 tn)

Coal price and it's volume in the expences

- Price of Nalaikh's coal- 35…45 U$/tn
- Price of Baganuur's coal- 32…40 U$/tn
- Heating cost

  - In heat-only boilers… 24 u$/GCal.

  Coal price is 60% of heating cost.

- A household spends annually:

  ~ 4.5t (coal)* 45000₮ = 250000...300000₮ (260 US)

- Heat expenses rate is 30% in total expenses Schools, Health Facilities (Municipal Organizations)
- Price of gasoline and diesel - 1980 ₮ or 1,7 U$

Methane Parameters

Methane is the major component of natural gas, 90 percent by volume

- Methane rate:
  - Kuzbass coal mine 25-30 m^3/ton
  - Nalaikh coal mine 5 m^3/tonne
- Net Heating Value- 10000 kcal/kg (37 MJ/m^3)
- Density 0,72 kg/m^3
- Possibility of high pressure compression
- Price is three times low than coal's
- 4 times less Hazardous Gas Emission than Coal

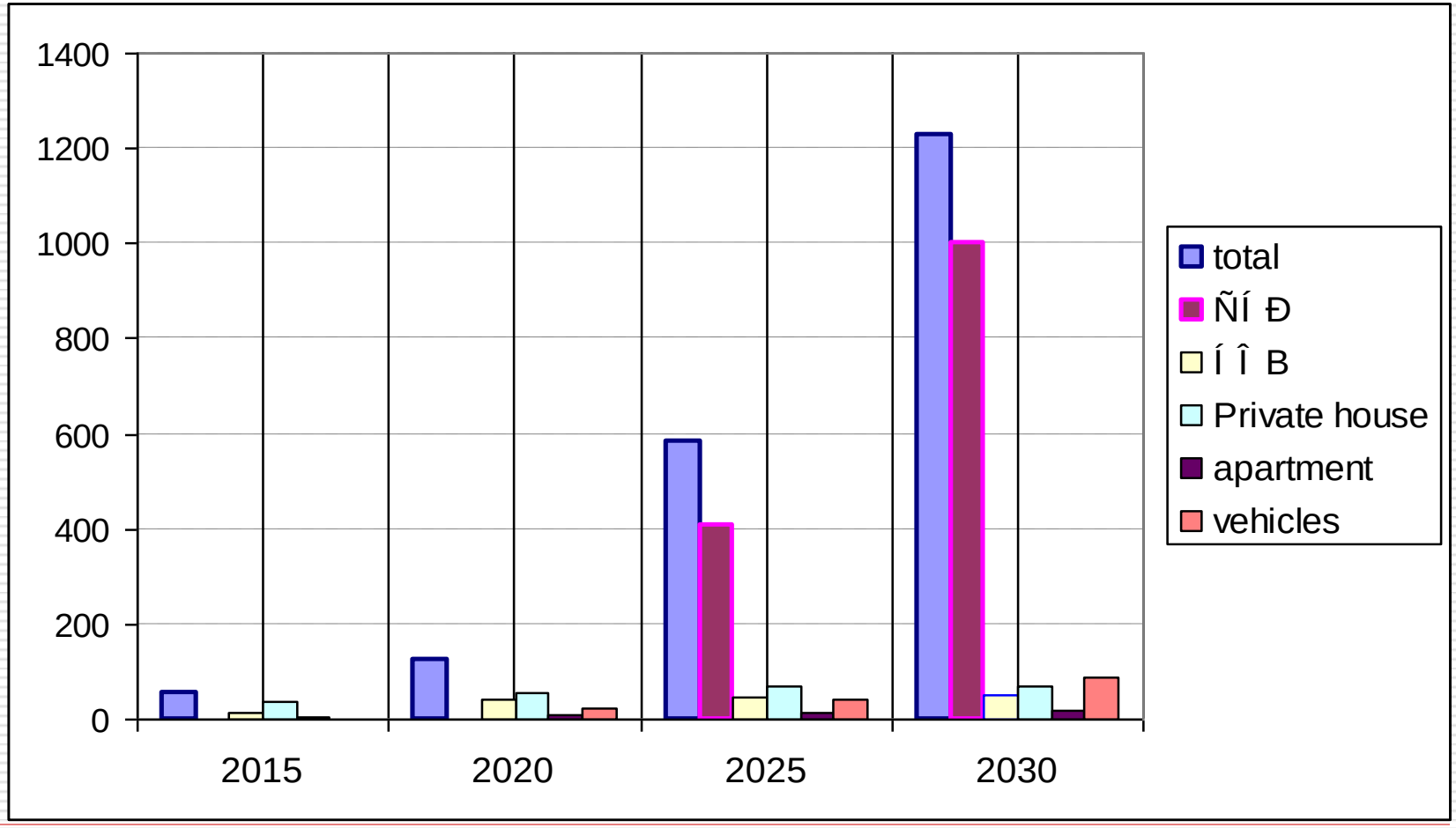
Total amount of Methane consumers

Consumer type	2015	2020	2025	2030
CHP	-	-	30% of annual total heat consumption	80% of annual total heat consumption
HOB	100000 Gcal	275000 Gcal	325000 Gcal	350000 Gcal
Private house	27000 households	40000 households	50000 households	50000 households
apartment	10000 Households	40000 households	60000 households	80000 households
vehicles	1000 cars	10000 cars	20000 cars	40000 cars

Annual Methane consumption (mln.m^3)

Consumer type	2015	2020	2025	2030
total	57.1	127.1	584.35	1226.2
CHP	0	0	410	1000
HOB	14.6	40.5	47.45	51
Private house	37.8	56	70	70
apartment	2.5	8.6	12.9	17.2
vehicles	2.2	22	44	88

Annual Methane consumption (mln.m^3)



Environmental benefits

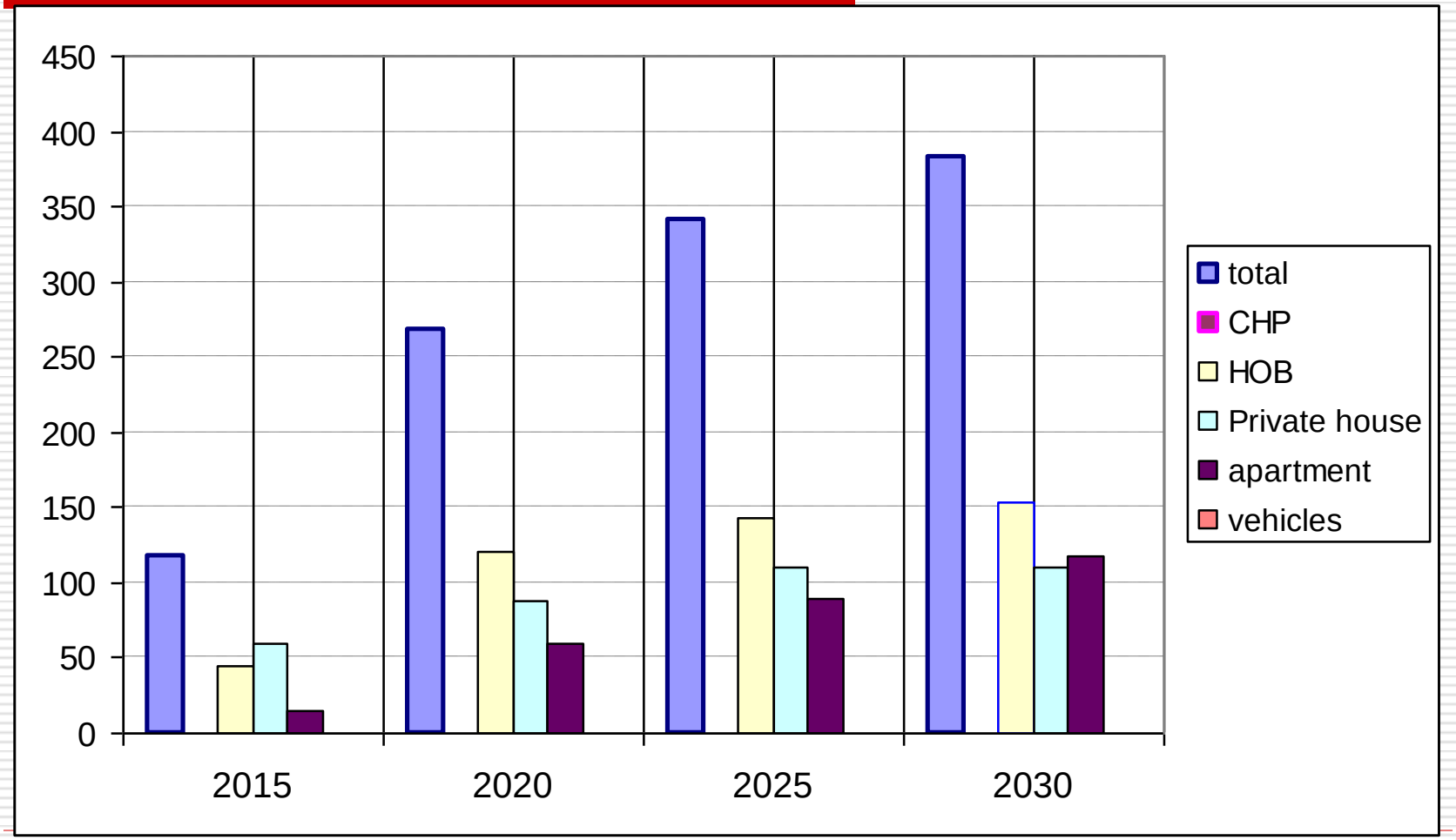
Reduction of GHG emission

- Per household: CO_2 - 2.2 tn/year
  NH_4 – 1.1 tn/year
- Per GCal heat: CO_2 – 0,33 tn/Gcal
  NH_4 – 0.1 tn/Gcal
- Per kW.h electricity: CO_2 – 1,1 kg/kW.h
  NH_4 – 0.086 kg/kW.h

Annual reduction of CO2 (GHG), $\mathrm{mln.m^3}$

consumer	2015	2020	2025	2030
total	118.2	268.2	341.8	382.4
CHP	0	0	0	0
HOBs	44	121	143	154
Private house	59.4	88	110	110
apartment	14.8	59.2	88.8	118.4
vehicles	0	0	0	0

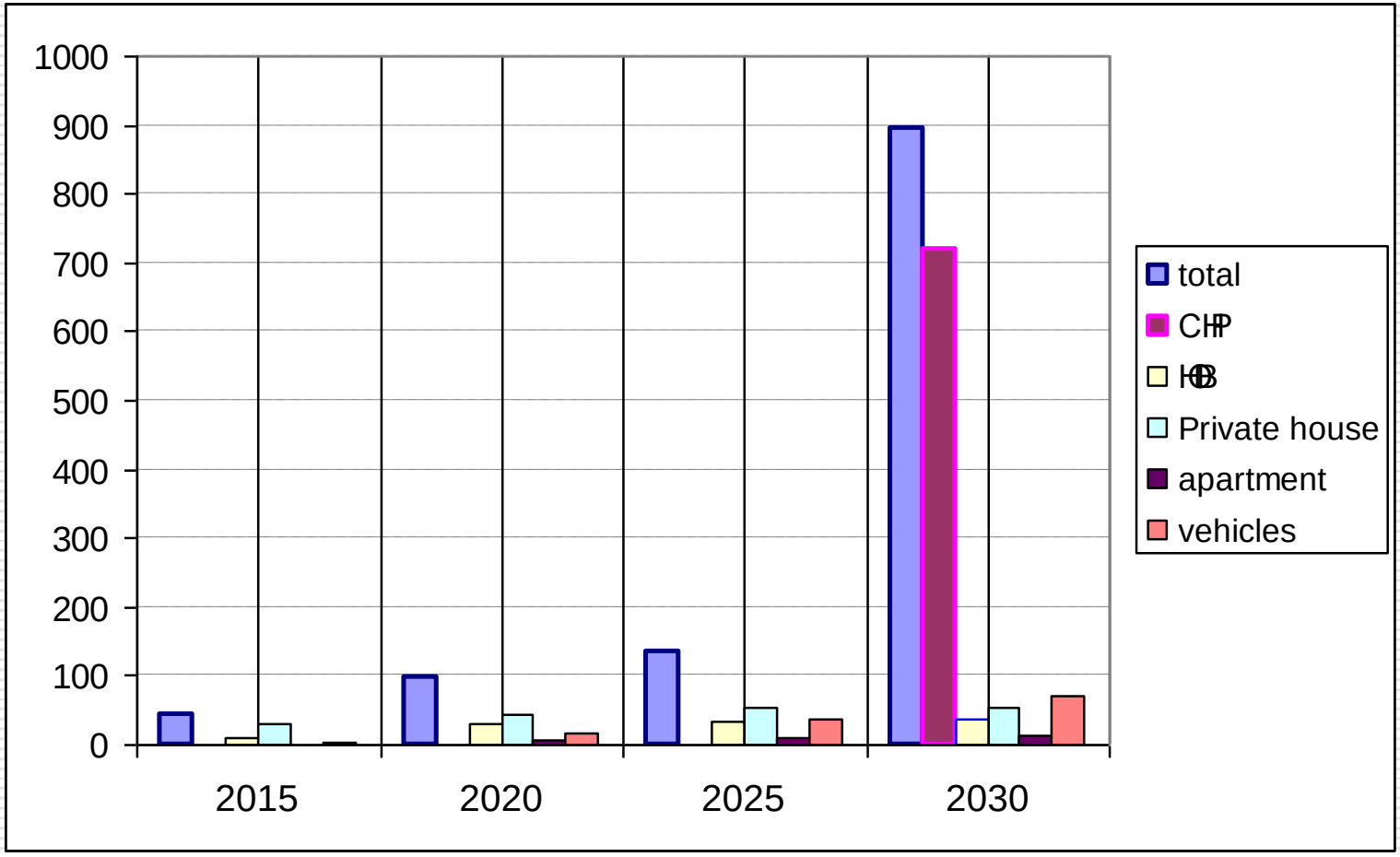
Annual reduction of CO2 (GHG), mln.m^3



Annual reduction of CH4 (GHG), $mln.m^3$

consumer	2015	2020	2025	2030
total	43.65	97.2	134.6	896.5
CHP	0	0	0	720
HOB	10.6	29	34.3	37.1
Private house	29.7	44	55	55
apartment	1.55	6.2	9.3	12.4
vehicles	1.8	18	36	72

Annual reduction of CH4 (GHG), mln.m^3



Clear view of Ulaanbaatar without air pollution

Economical benefits of Metane Consumption

a) **heat-only boilers will reduce their heating cost by 16000₮ or 14$/Gcal**

b) Householder will economy 100000₮ or 86 u$ in fuel expenses

c) Vehicle fuel expenses-500000₮ or 460$/year

in Nalaikh district

1. **heat-only boilers-66000*14=924000 $**
2. **Household's -9000*86=774000$**

total-1,9 million

In Ulaanbaatar

1. **heat-only boilers-275000*14=3,8 mln $**
2. **Household's -130000*86=11,2 mln $**
3. **Vehicles-80000*460=36,8 mln $**

total- 51,2 mln $

THANK YOU