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# Mongolia's GHG Inventory - Waste sector

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# *1. Methane emissions from solid waste disposal sites*

## 1.1 Municipal solid waste

For estimation of methane emissions, it was used the IPCC Methodology Tier 1.

***The Municipal Solid Waste (MSW) depends on number of urban population and MSW generation per capita.***

***Total annual MSW disposed in solid waste disposal sites (SWDS)*** *= Population of Urban x MSW generation rate x Fraction of MSW disposed to SWDS*

Data availability

1. The number of urban population was available from the Statistical Yearbooks.
2. There is the World Heath Organization's report where calculated that an individual in Ulaanbaatar city produce 0.334 kg solid waste a day. According to this source, the MSW generation rate is assumed as 0.334 kg/person/day.
3. Fraction of MSW disposed to SWDS was assumed as 0.61 on the basis of the investigation for the information data collected from Ulaaanbaatar city service office.

# 1. Methane emissions from solid waste disposal sites

## Calculation results of total annual solid waste in disposal sites

| Year | Urban population of Mongolia | Solid waste generation per capita | Solid waste | Solid waste in disposal sites |
|---|---|---|---|---|
| | Thousand persons | kg/day | thousand tons/year | thousand tons/year |
| 1990 | 1225.00 | 0.334 | 149.34 | 91.10 |
| 1995 | 1240.00 | 0.334 | 151.17 | 92.21 |
| 2000 | 1377.00 | 0.334 | 167.87 | 102.40 |
| 2001 | 1397.10 | 0.334 | 170.32 | 103.90 |
| 2002 | 1421.00 | 0.334 | 173.23 | 105.67 |
| 2003 | 1465.20 | 0.334 | 178.62 | 108.96 |
| 2004 | 1498.20 | 0.334 | 182.65 | 111.41 |
| 2005 | 1543.30 | 0.334 | 188.14 | 114.77 |
| 2006 | 1579.50 | 0.334 | 192.56 | 117.46 |

# 1. Methane emissions from solid waste disposal sites

## 1.2 Methane Emissions from Solid Waste Disposal Site

***Methane Emissions from Solid Waste Disposal Sites*** *= Total Annual MSW Disposed to SWDSs (Gg MSW) x Methane Correction Factor x Fraction of DOC in MSW x Fraction of DOC which Actually Degrades x Fraction of Carbon Released as Methane x Conversion Ratio- Recovered Methane per Year, (Gg $CH_4$)*

***Identification of the factors and fractions for calculation of methane emissions***

| *The mane of factors and fractions* | *Sources or calculations of the factors and fractions* | *Actual values of the factors and fractions* |
|---|---|---|
| Methane correction factor | IPCC default value | 0.40 |
| Fraction of Degradable Organic Carbon (DOC) | DOC is calculated as DOC=(0.4*A)+(0.17*B)+(0.15*C)+(0.3*D) The coefficients are from report “Solid waste management” | 0.143 |
| Fraction of DOC which Actually Degrades | The IPCC Guidelines provide a default value of 0.77 for $DOC_F$ in IPCC 96, but it is Good Practice to use a value of $DOC_F$ in the range of 0.5-0.6 | 0.534 |
| Fraction of Carbon Released as Methane | Landfill gas consists mainly of CH4 and carbon dioxide (CO2). The CH4 fraction F is usually taken to be 0.5, but can vary between 0.4 and 0.6, depending on several factors including waste composition. | 0.50 |
| Conversion Ratio | Default value | 16/12 |
| Recovered Methane per year- Use recovered methane amount in current year | In Mongolia do not recover any methane | 0.00 |

# 2. Methane emissions from domestic and commercial wastewater handling

***Annual CH4 emission from domestic wastewater (Gg) =*** *Urban Population (1000 person)* Degradable Organic Component* (1-Fraction of BOD in sludge that degrades anaerobic)*Fraction of Wastewater Treated by the handling system*Methane Conversion factor for the handling system*Maximum Methane Producing capacity*(1-Methane Recovered)*

- *Urban Population* is taking from Mongolian Statistical Yearbooks.
- *Degradable Organic Component*. 14600 kg BOD/1000 person/year. Default value is taking from the IPCC guideline.
- *Fraction of BOD in sludge that degrades anaerobic*. There are not available enough data to estimate methane emissions from the handling system or indirect nitrous oxide emissions from human sewage. Therefore, emissions from those sources are not included National Inventory. This value is zero.
- *Fraction of Wastewater Treated by the handling system.* The fraction is accepted as 0.8. But is should be clarified in more detail for Mongolian condition.
- *Methane Conversion factor for the handling system* - 0.4 (by the default).
- *Maximum Methane Producing capacity*. The default value is 0.25.
- *Methane Recovered*. Use recovered methane amount in current year. In Mongolia do not recover any methane. Therefore, Recovered CH4=0

# 3. Methane emissions from industrial waste water

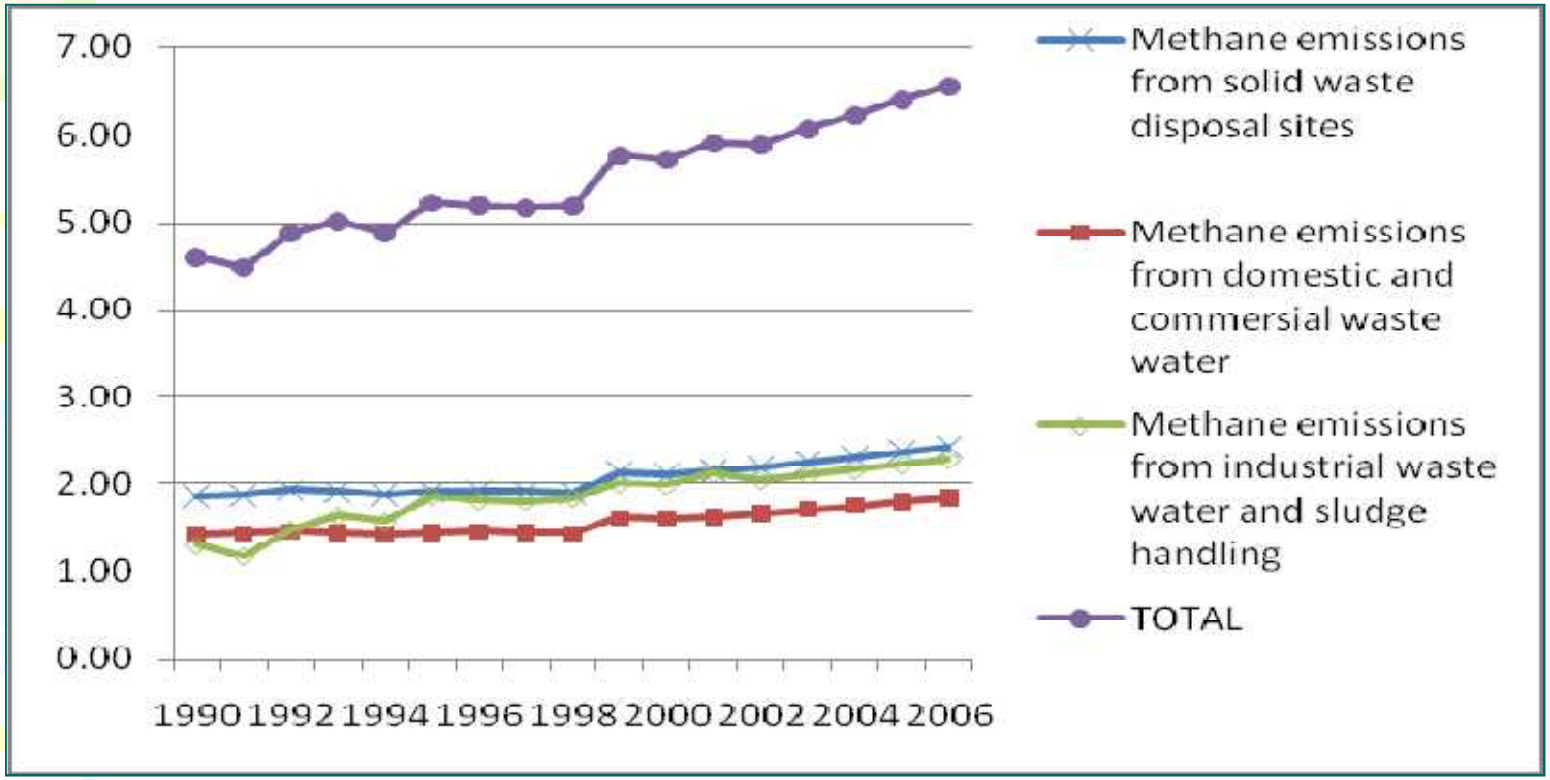
***Total Organic Wastewater from Industrial Source*** *= Total industrial Output x Degradable organic component x Wastewater produced x fraction of Degradable organic component Removed as Sludge*

- Total industrial Output, ton/year (Statistical yearbook)
- Degradable organic component -0.4 kg COD/$m^3$ wastewater. (by the default)
- Fraction of Degradable organic component Removed as Sludge -0

***Annual $CH_4$ emission from industrial wastewater*** *= Total Organic Wastewater from Industrial Source x Fraction of Wastewater Treated by the handling system x Methane Conversion factor for the handling system x Maximum Methane Producing capacity x(1- Methane Recovered) x$10^{-6}$.*

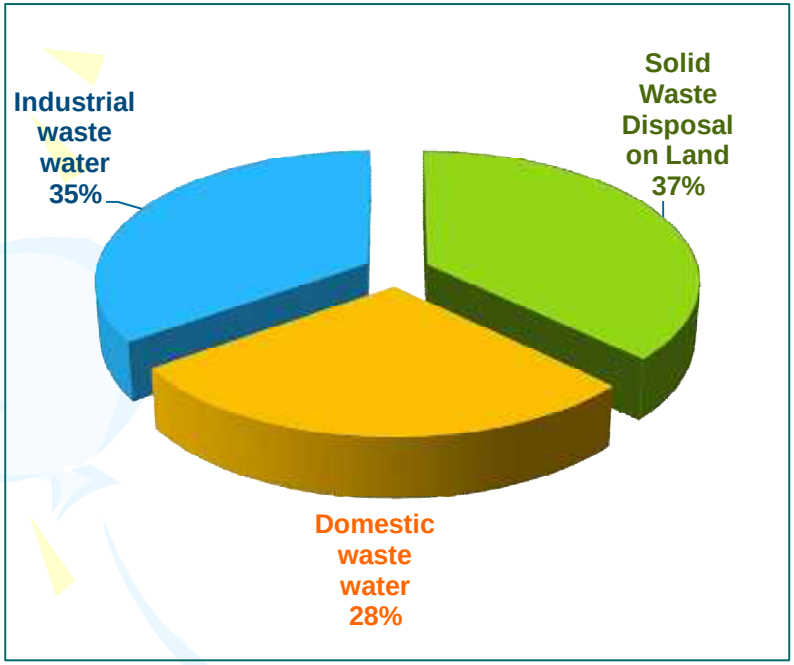
- Fraction of Wastewater Treated by the handling system – 0.8. It should be calculated for Mongolian conditions
- Methane Conversion factor for the handling system -0.4 (by the default).
- Maximum Methane Producing capacity. The default value is 0.25.
- Methane Recovered. Use recovered methane amount in current year. In Mongolia do not recover any methane. Therefore, Recovered CH4=0

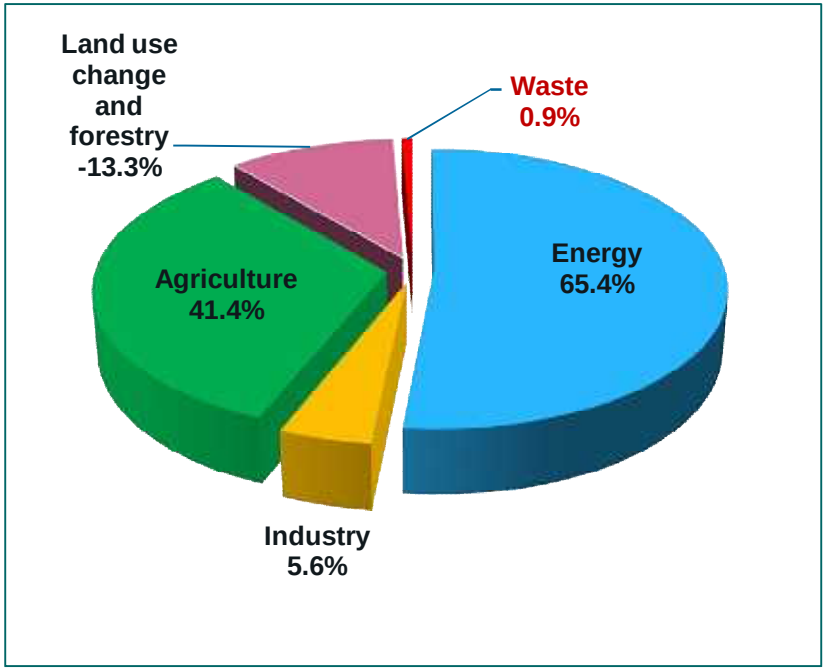
# 4. Methane emissions from waste sector




Methane emissions from waste were estimated at 4.59 Gg in 1990 and this amount increased to 6.55 Gg in 2006. During the period of estimations, about 37% of CH4emissions came from solid waste disposal sites and 63% came from waste water treatment. The trend for emissions shows that the annual emissions of CH4 from solid waste disposal sites and waste water treatment have increased continuously year after year

# 4. Methane emissions from waste sector



## 4. Methane emissions from waste sector

Mitigation of GHG emissions from the waste sector is generally not a high priority because the methane emissions from waste sector are relatively low. But waste disposal is a problem in Mongolia in terms of land use and sanitation, especially in Ulaanbaatar. Almost half of Mongolia's population lives in the capital city. At present, the total amount of waste generated in UB is estimated to be 552.8 tons per day. 58.2% of this waste is thought to final disposal sites, while 21.4% is dumped illegally in open spaces. All collected waste in the city of Ulaanbaatar is disposed in three landfills without any further processing. The management of municipal waste is emerging as a problem of prime importance.

The following mitigation options can be implemented:

- Improve solid waste disposal facilities;
- Improve Storage and collection system;
- Recycling;
- Incineration.

# Thank you for attention