Network meeting VERIFY
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CH4/N2O topic

Introduction: emission inventory bottom-up requirements / Waste

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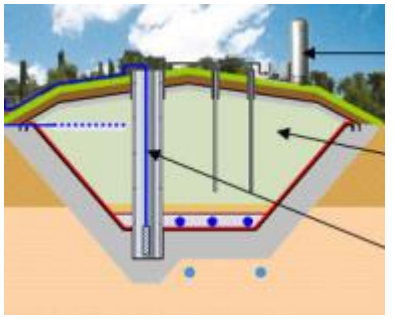
Inventory approach / Solid waste disposal sites

MRV specific requirements for solid waste disposal sites :



✓ **Monitoring / estimation of emissions** :

Need to take into account the temporal kinetics of waste decay over decades (according to IPCC 2006 for Annex I countries) :

- Even the closed SWDS are sources of GHG emissions
- The First Order Decay model : the decay rate depends on many factors like temperature and moisture; the amount of methane generated depends on fraction of degradable organic carbon which decomposes

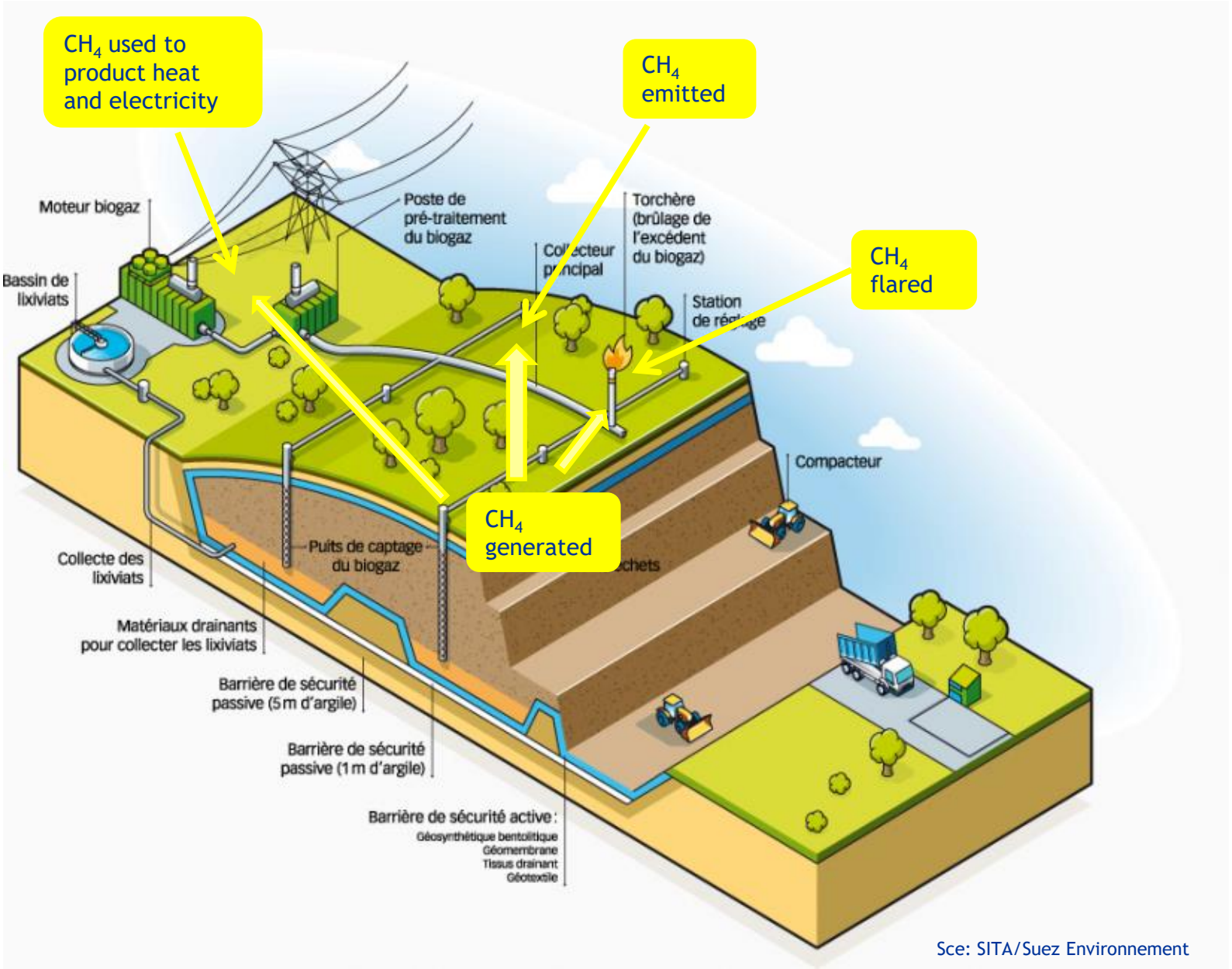
Methane emissions from solid waste disposal sites is the balance of :

- Degradation kinetics to estimate the amount of methane generated, minus
- Measurements of methane quantities flared and recovered for energy uses

✓ **Reporting** :

- Reporting of emissions but also AD & parameters, flared CH4 and CH4 recovery
- CO_2 is entirely generated from biomass in SWDS (so it's not included in national GHG inventory totals)

Inventory approach / Solid waste disposal sites



Sce: SITA/Suez Environnement

Inventory approach / Wastewater treatment

MRV specific requirements for wastewater treatment inventory

Monitoring / estimation of emissions, need of the :

- ✓ Distinction between collected water and uncollected water
  - ⇒ Need to know or estimate the splitting rate
- ✓ Distinction between different treatment systems for the collected wastewater (aerobic wastewater plant and related sludge, anaerobic lagoon and reactor,…)
  - ⇒ Need to know the treatment systems distribution
  - ⇒ Need to know the nitrogen treatment efficiency
- ✓ Distinction between different treatment systems for the uncollected wastewater (septic tanks, latrines, river discharge…)
  - ⇒ Need to know the treatment systems distribution
  - ⇒ Need to know the nitrogen content in the wastewater effluent

Reporting :

- ✓ Reporting of GHG emissions: CH_4 and N_2O; but CO_2 not reported as coming from biomass
- ✓ Reporting also of AD & parameters, flared CH4 and CH4 recovery

Inventory approach / Wastewater treatment

Monitoring / estimation of emissions - specificities

CH_4 emissions :

- ✓ Existence of anaerobic conditions
- ✓ Proportional to the organics loadings of wastewater (BOD / COD)
- ✓ Depend on the process conditions (temperature, pH,…) more or less favorable for anaerobic bacteria (Lagoon ; Septic tanks ; Latrines ; Stagnant aquatic environment)
- ✓ Depend on organic loading in the aquatic environment discharge

N_2O emissions :

- ✓ Degradation of nitrogen components in the wastewater
  - ➢ Plants with nitrogen reduction (nitrification/dénitrification)
  - ➢ Aquatic environment discharge (after treatment or not)

Inventory approach / Waste

Main uncertainties and gaps

- ✓ More or less good information on the waste generation rate from the population
- ✓ More or less good information concerning landfill depth and compaction status
- ✓ More or less good information concerning the composition of wastes in landfills
- ✓ More or less good information concerning industrial waste (generation and treatment)
- ✓ More or less good information concerning closed landfills
- ✓ **Possible difficulties to get/estimate the full historical data (since ~1950)**
- ✓ High uncertainties associated with the methodology, its implementation and the set of default parameters

Verification of UNFCCC GHG national inventories (cf. IPCC 2006 guidelines)

- ✓ Top-down inverse modelling based on atmospheric measurements : one possible complementary independent verification of national GHG inventories.
- ✓ But with a more feasible implementation at regional level or for group of countries, because of the complexity, the need of atmospheric modelling expertise, the need of a lot of atmospheric measurement data… (i.e. different additional resources vs national inventory resources).

Inventory approach / waste : Uncertainties
Examples of the FR and EU inventories

France IPCC Source Category	Gas	Emissions 1990 kt CO2e	Emissions 2018 kt CO2e	Uncertainties on activity data - 2018 (%)	Uncertainties on emission factor - 2018 (%)	combined uncertainty 2018 (%)	combined uncertainty in % of total	Uncertainty in trend on total waste (%)
5A Solid Waste Disposal on Land	CH4	12 594	12 003	15	175	176	121.2	5.5
5B Biological treatment of solid waste	CH4	261	1 021	15	100	101	5.9	4.4
5B Biological treatment of solid waste	N2O	51	190	15	100	101	1.1	0.8
5C Incineration and open burning of waste	CO2	2 209	1 427	15	20	25	2.1	1.1
5C Incineration and open burning of waste	CH4	20	25	30	50	58	0.08	0.02
5C Incineration and open burning of waste	N2O	92	66	15	30	34	0.1	0.05
5D Wastewater treatment and discharge	CH4	1 491	2 258	35	100	106	13.8	4.7
5D Wastewater treatment and discharge	N2O	724	398	35	100	106	2.4	2.0
						Uncertainty on total waste emissions (%)	**122**	**8.8**

-> **Uncertainties in level** for total waste GHG:
122% for FR, 32% for EU

-> **Uncertainties in trend** for total waste GHG:
9% for FR, 19% for EU

Table 7.18 Sector 5 -Waste: EU-KP uncertainty estimates

Source category	Gas	Emissions Base Year	Emissions 2018	Emission trends Base Year-2018	Level uncertainty estimates based on MS uncertainty estimates	Trend uncertainty estimates based on MS uncertainty estimates
5.A Solid Waste Disposal	CO2	0	0		0.0%	
5.A Solid Waste Disposal	CH4	188 684	99 050	-47.5%	27.8%	0.1%
5.A Solid Waste Disposal	N2O	0	0		0.0%	
5.B Biological treatment of solid waste	CO2	0	0		0.0%	
5.B Biological treatment of solid waste	CH4	641	5 452	751.0%	79.3%	3.4%
5.B Biological treatment of solid waste	N2O	247	2 533	926.6%	84.2%	4.0%
5.C Waste Incineration	CO2	5 109	3 096	-39.4%	28.5%	0.6%
5.C Waste Incineration	CH4	215	90	-58.0%	28.5%	0.3%
5.C Waste Incineration	N2O	202	213	5.6%	89.4%	0.5%
5.D Wastewater treatment and discharge	CO2	0	0		0.0%	
5.D Wastewater treatment and discharge	CH4	36 459	19 577	-46.3%	50.2%	0.1%
5.D Wastewater treatment and discharge	N2O	8 732	7 038	-19.4%	450.7%	4.2%
5.E Other	CO2	20	18	-11.2%	300.2%	0.3%
5.E Other	CH4	2	6	147.0%	176.8%	1.2%
5.E Other	N2O	0	67		60.0%	
Total - 5	all	240 311	137 140	-42.9%	31.7%	19.1%

THANK YOU FOR ATTENTION

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