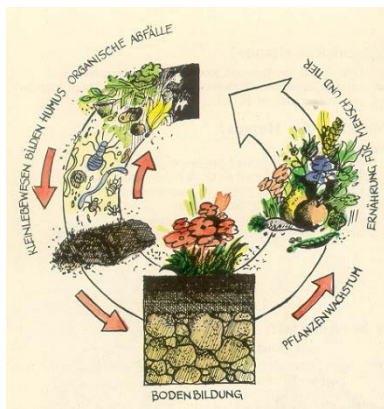


3rd INTERNATIONAL CONFERENCE on Sustainable Solid Waste Management Tinos, 2-4 June 2015



Industrial Emission Directive (IED)
- What composting and biogas plants may expect from the new Best Available Technique Reference document (BREF) for biological treatment of waste

Florian Amlinger



Industrial Emissions Directive 2010/75/EU (IED)

- ➔ Key instrument for minimising consumption and the emissions of industrial activities in Europe
- ➔ *General framework:*
 - **prevent** and, if not feasible, reduce pollution
 - high level of **protection for the environment as a whole**
 - **permit based on Best Available Techniques (BAT)**

BAT are determined by a Technical Working Group steered by the JRC (EIPPCB) and documented in **BREFs**

'BAT conclusions' are secondary legislation

Environmental scope of the IED



**emissions
to air**

**emissions
to water**

**prevention
and control
of accidents**

**waste prevention
and recovery**

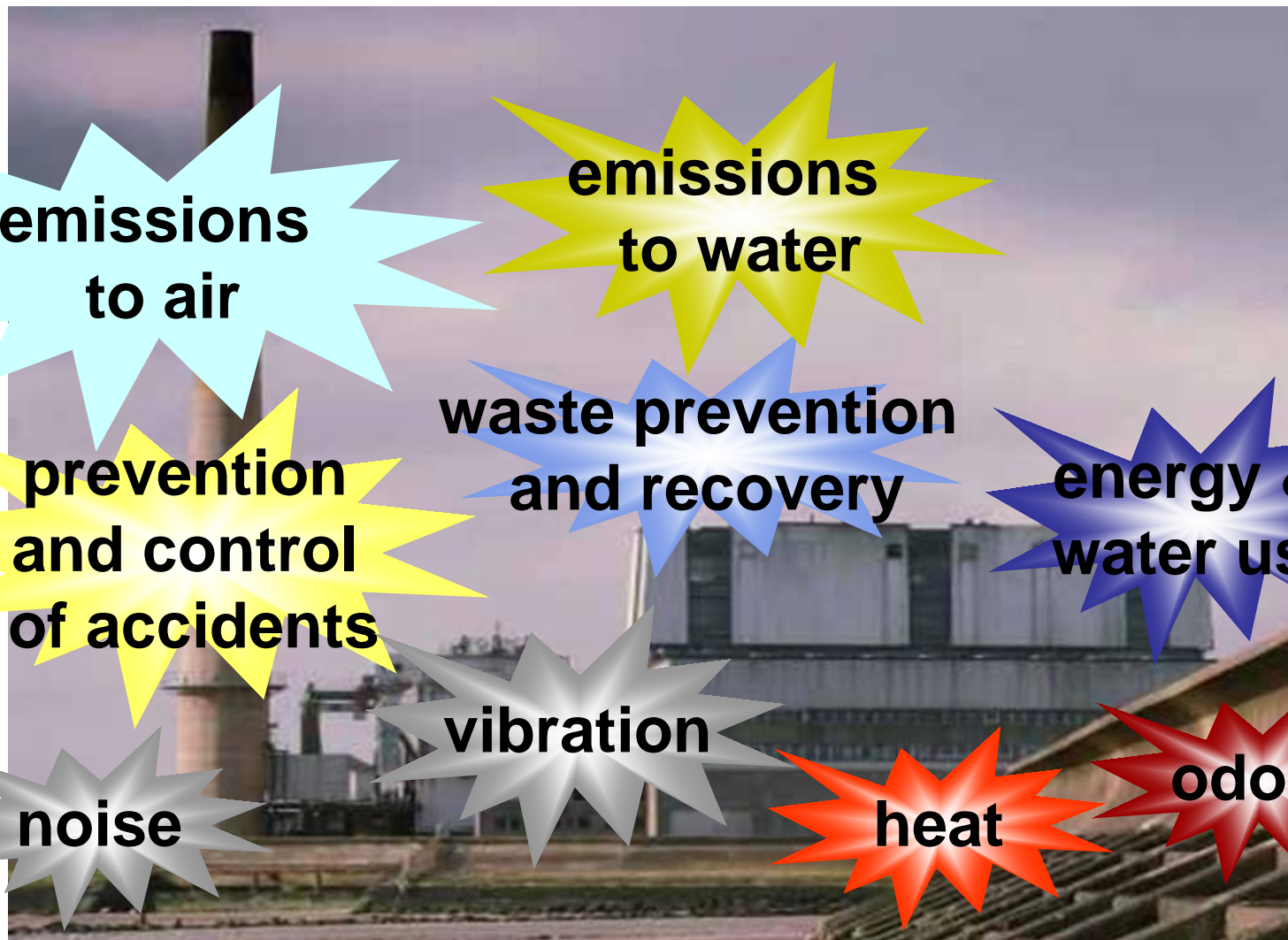
**energy &
water use**

noise

vibration

heat

odour



Definition of **BAT** in the IED



Best

Most effective in achieving a **high general level** of protection of the environment **as a whole**

Available

Developed on a scale which allows implementation in the relevant industrial sector, under **economically and technically viable conditions**

Techniques

Both the technology used and the way in which the installation is **designed, built, maintained, operated and decommissioned**

Note: in determining BAT, special consideration should be given to the criteria listed in Annex III of the IED



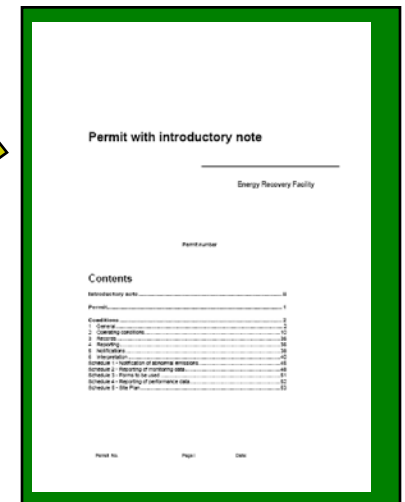
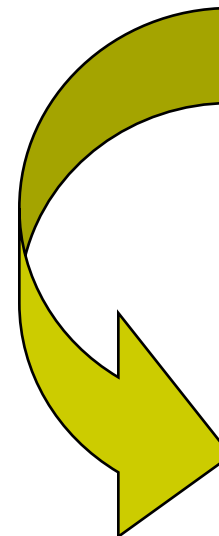
Role of BAT conclusions in IED permitting

BAT conclusions are the reference for setting permit conditions

Permits to contain emission limit values (ELVs) to ensure that, under normal operating conditions, **emissions do not exceed BAT-associated emission levels (BAT-AELs)**

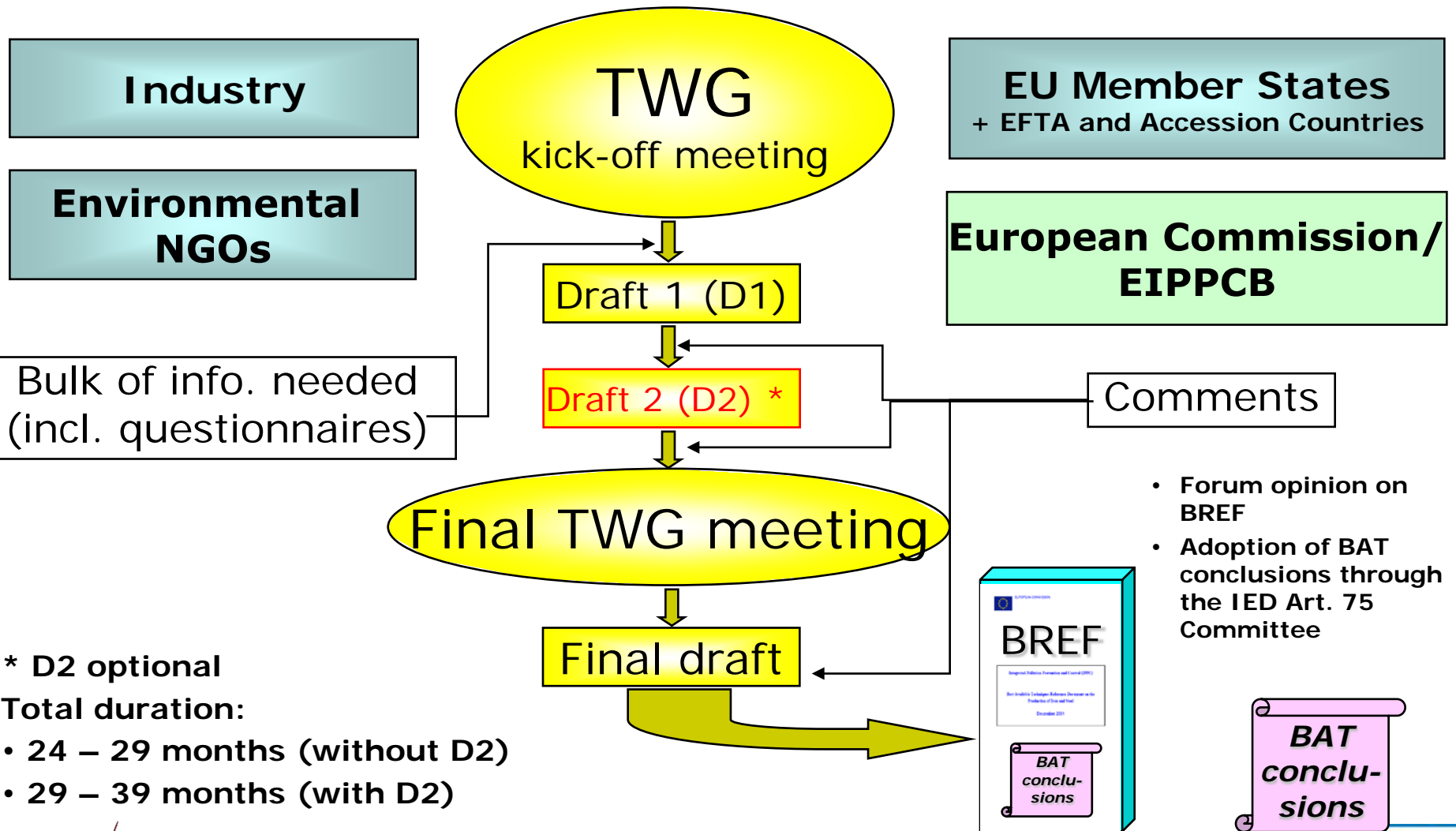
Derogation from BAT-AELs is only allowed in **specific and **justified** cases**

- Need to demonstrate that costs are disproportionately higher than benefits due to local/installation-specific situations
- Member States report to the public/Commission on use of derogations



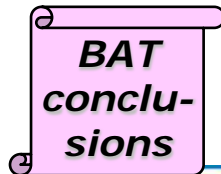


The 'Sevilla process'



* D2 optional
 Total duration:
 • 24 – 29 months (without D2)
 • 29 – 39 months (with D2)

- Forum opinion on BREF
- Adoption of BAT conclusions through the IED Art. 75 Committee



Which type of facilities are affected by the new IED?



● Annex I of the IED includes:

- Biological treatment (recovery)
 - Composting → 75
 - Biogas Plants → 100 tonnes/day
- Biological treatment (disposal)
 - MBT → 50
 - Biogas Plants → 100 tonnes/day

Definition daily capacity:

'The maximum capacity to which the installation is limited technically or legally.

UK: Tonnes of composting piles on composting site / days of processing

AT: ... the daily average → e.g.:
 $75 \text{ t} \times 365 = 27.375 \text{ t/year}$





TWG subgroups

- Subgroup to **support the development of the questionnaire**
- Subgroup on **biological treatment**
(December 2013 – December 2015)
- Subgroup on **mechanical treatment**
- Subgroup on **physico-chemical treatment**

The BREF Chapters



Standard BREF structure:

- Preface
- General information about the sector Chapter 1
- Process/techniques used..... Chapter 2
- Consumption and emission levels..... Chapter 3
- Candidate BAT Chapter 4
- **BAT conclusions** **Chapter 5**
- Emerging techniques..... Chapter 6
- Concluding remarks and recommendation for future works (including suggestions for R&D)

200 to 1000
pages

Proposed techniques / processes

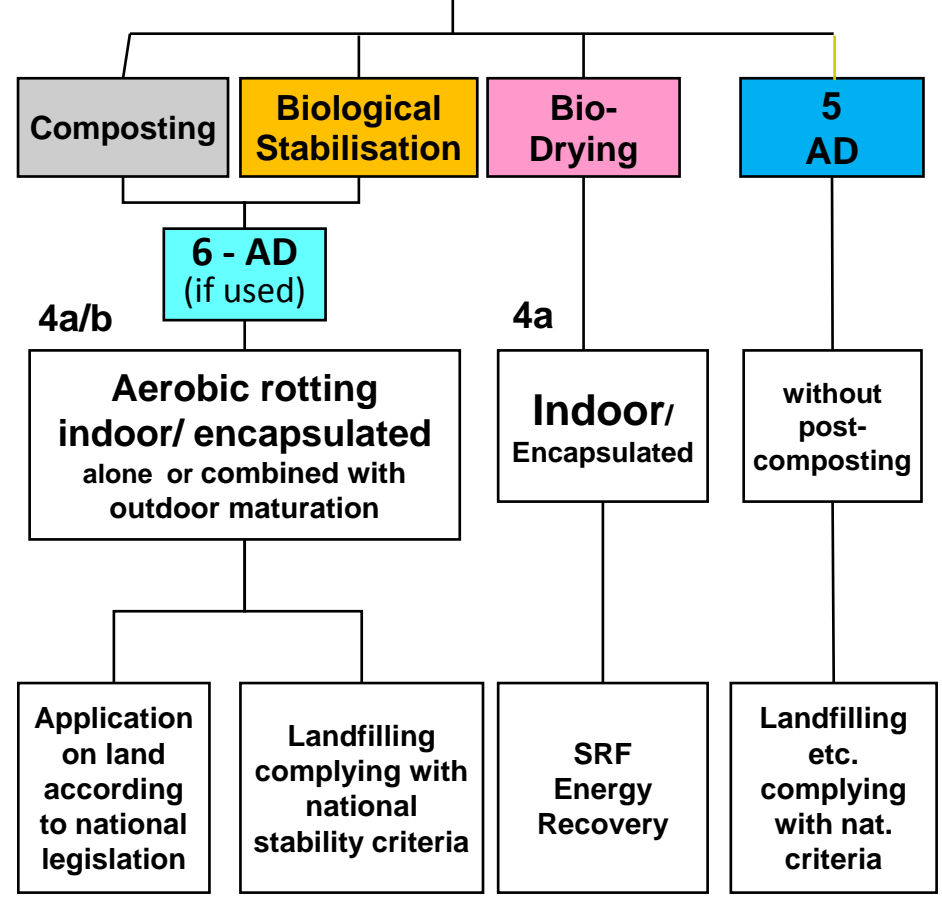
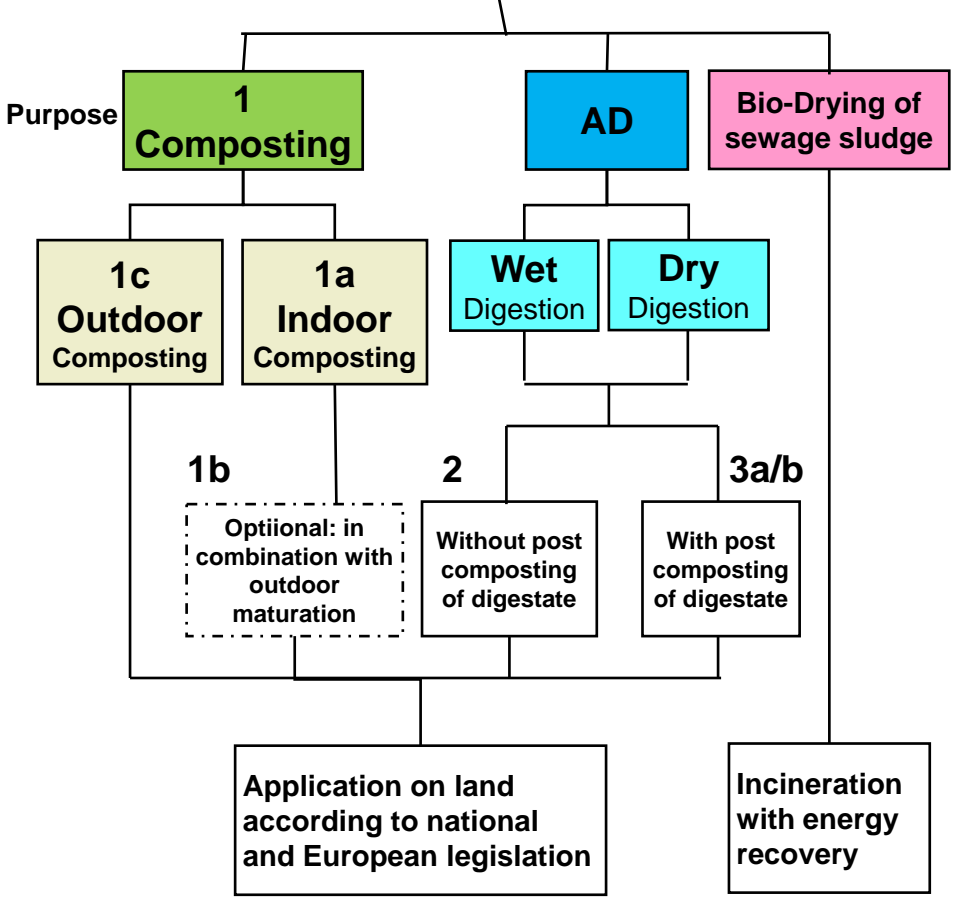
→ Categories



BIOLOGICAL TREATMENT

Source separated **biowaste** & sewage sludge

Mixed waste → **MBT**





Techniques / Processes described

- Waste (pre) acceptance procedures
- Storage & handling of incoming waste
- Preparation of wastes for composting process
- Process monitoring & control
- Emissions to water
- Emissions to air
 - Odour – Bioaerosols & Dust – Ammonia
 - Measures of waste gas treatment
- Energy efficiency measures
- Measures to reduce raw materials consumption
- Product preparation

Additional in
Chapter 4:



**Achieved environmental benefits – Cross-media effects –
Operational data – Applicability – Economics - Driving force
for implementation – Example plants – Reference literature**

Outdoor & Indoor Composting



- **OUTDOOR Composting** means composting techniques including reception, intermediate storage, pre-treatment, intensive rotting and maturation in an open, roofed or unroofed area, where gaseous emissions produced due to the biological decomposition process may be captured and purified by means of end of pipe abatement techniques only in case if negative aeration is installed during intensive rotting or maturation phase.



- **INDOOR Composting** means composting techniques including possibly reception, intermediate storage, pre-treatment, intensive rotting and maturation in an enclosed or encapsulated hall or vessel ('reactor') where the gaseous emissions produced due to the biological decomposition process are captured and purified by means of end of pipe abatement techniques.

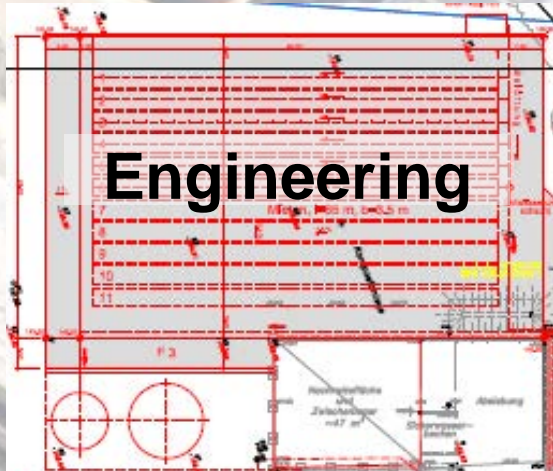




- Receipt control
- Intermediate storage



- Compost storage



Engineering



- Pre-treatment
- Conditioning
- Mixing



- Batch formation
- Intensive composting
- Maturation



- Refining the product

Plant design

→ dispersion modelling for impact prediction



Permit ... Diffuse Emissions

Integrated approach looking at THE WHOLE PLANT and process steps

Diffusion MODEL built on standard emission data, taking into account materials, quantities, local situation (climate and topography) processes, techniques and management for:

Emission / Impact Assessment & Prognosis

ODOUR

DUST

Requirements on LOCATION & Process / Operation

Process / Quality management > "Good Practice":
Reduction / Minimisation Measures

Documentation/
Information

3rd party inspection and certification

Failure Management

Odour/Dust

Improvement of Process Management & Control

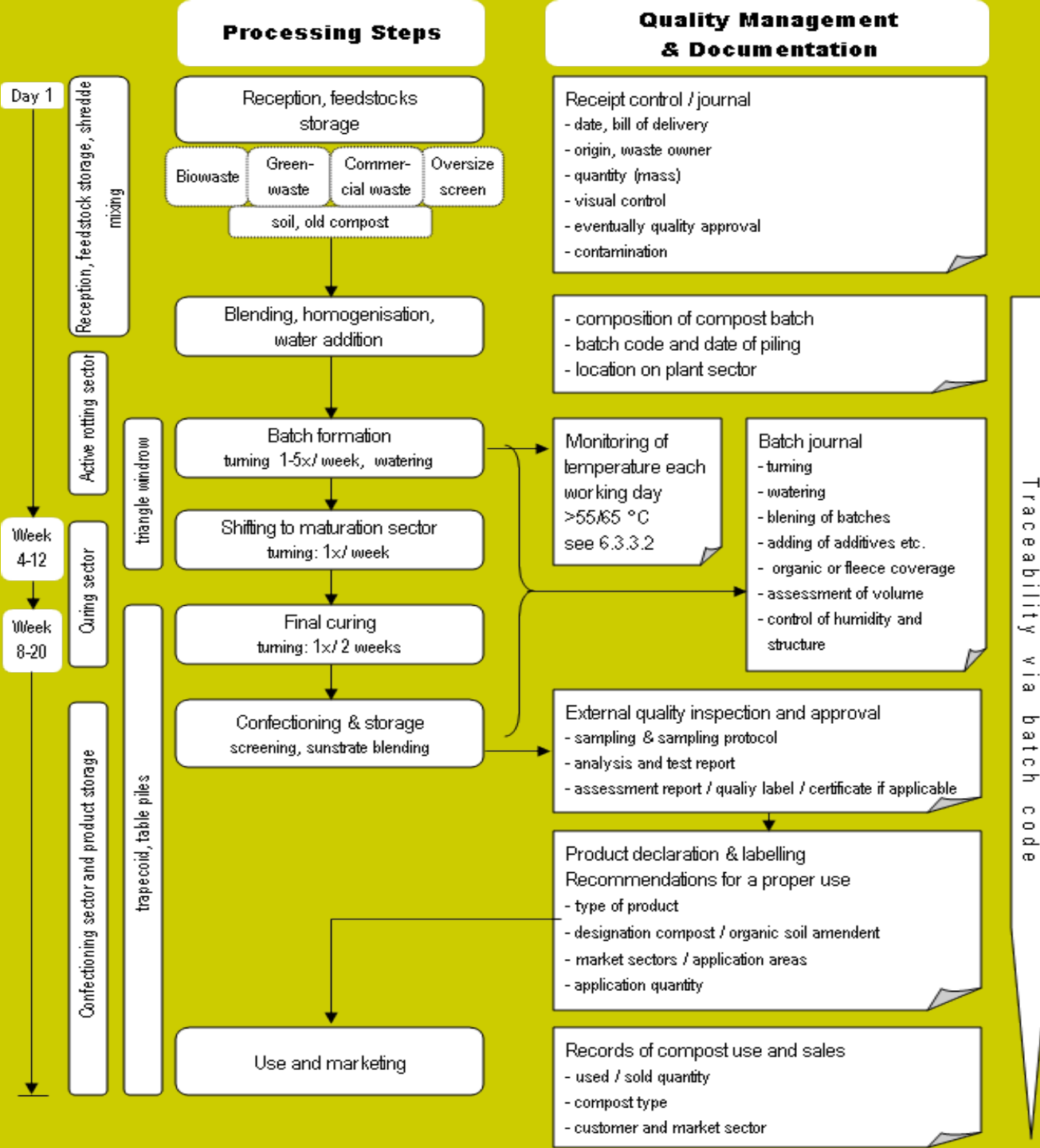
Measurements in order to evaluate success

Apply monitoring

Documentation & Environmental quality management



- Documentation – Waste tracking system: Input → Output
 - Pre-acceptance / Acceptance of waste
 - Type / Date / Quantity / Origin / Refusal // Foreseen treatment / Location of storage
- Environmental quality management systems
 - EMS: ISO 14001 / EMAS / National Systems / Branch related EMS
 - Training and technical competence
 - Risk management / regulatory implications / Emission control / incidents & emergency management ...
 - Documented operations and maintenance system
 - Accidents / incidents / non-conformance ... management plan and documentation system



Traceability via batch code

The Process Model

with measures of quality management & documentation



Registered Composting Plant

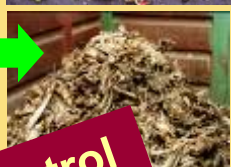


Storage

Mixing

Conditioning

batch composition ...
batch monitoring ...
°C, turning, watering ...



INPUT

Receipt Control

Residues

Compost = Product

QM: the principle of a traceably documented process



[PRE] Acceptance procedures

- Pre-acceptance procedure
 - Communication with waste owner
 - Waste type / Approval of compliance / Suitability for treatment
 - Quantities and delivery schedule
- Waste characterisation
 - Visual assessment or sampling/analysis
- Acceptance procedure
 - Visual inspection
 - Trained staff
 - Criteria for rejection
 - Controlled unloading at dedicated site
 - Contingency plan



- **2.1.2 Waste acceptance at composting sites**

- **Visual inspection – compliance with permitted waste codes sorting of impurities – decision of acceptance / reject**





Storage and handling of incoming waste

- Sufficient capacity
- Separated locations for odorous/putrescible and woody green waste
- Adapting material type, storage time and mixing to reduce odour emission potential
 - Limit size of stockpiles
 - Mix and / or cover with shredder material
- Complete emptying / cleaning /
- Impermeable surface & sealed drainage and leachate collection for putrescible / waste
- Minimise storage time (24 to 72 hrs)
- Prevention of wind drifting of light impurities
 - fences, walls, dams with hedges, fleece coverage





Pre-treatment and process control

- Pre-treatment

- Screening/removal of impurities
- Composting
 - Sufficient porosity of the initial mix for composting
 - Balancing the C:N ratio
 - Adjustment to proper moisture content
 - Adapting the feedstock blend according to the technique used.
 - Rapid compost batch formation



- Process control plan – prevent uncontrolled emissions

- Temperature control and monitoring / Moisture assessment
- Process management documentation and traceability





Odour management

- **All BIOLOGICAL TREATMENTS**

- Minimise intermediate storage
 - ➔ odorous feedstock → **1 working day**
 - ➔ fresh grass / leaves → **72 hours**
- Odour management plan // Complaints management

- **COMPOSTING general**

- Adequate aeration and moisture adjustment during the initial active composting phase
- Balanced C:N ratio
- Consideration of weather conditions and wind direction
- Draining off surface water from stored biowaste/compost
- Dirty water collection and management

- **Outdoor COMPOSTING**

- Measures against moisture surplus
- Measures to improve structure
- Windrow structure
- Decomposition process management



INDOOR Composting – abatement techniques

- Exhaust air capture, collection and treatment with sufficiently dimensioned ventilation systems
- End of pipe treatment
 - Biofilters with requirements for biofilters management and optimisation
 - Bio Scrubber
 - Chemical scrubbers, including wet scrubbers, and acid scrubbers
 - Activated carbons
 - (Ozone treatment)
 - Dust filters/separators
- Emission abatement at the point of source
 - Encapsulation by means of semipermeable membrane covers



Water management

● ALL BIOLOGICAL TREATMENTS

- Reuse and surface water segregation
- Waste water management plan
- Collection and treatment of dirty waters
- Discharge and use of waste water
- Separate collection and treatment of clean surface waters
- Dimensioning of intermediate waste water tank(s)
- Impermeable surface of processing areas
- Draining off surface water from stored biowaste/compost
- Quality management measures
- Ensuring effective discharge of water
- Use of clean water.



Direct and & indirect discharge of waters:

→ According to national regulations



Dust and Bioaerosols

- ALL BIOLOGICAL TREATMENTS

- Dust mitigation measures
- Machines and road cleaning
- Physical barriers
- Maintaining scrubbers and biofilters



- COMPOSTING

- Effective overall management and maintaining adequate moisture content
- Appropriate consideration of weather conditions and wind direction
- Spatial orientation Windrows



Ammonia emissions

- **COMPOSTING general**

- Balancing C:N ratio of N-rich feedstock
- Optimise moisture of material according the water capacity during the composting stages
- Maintain an adequate pore structure Bulking/structural materials

- **Indoor COMPOSTING**

- Use of an acid scrubber to reduce ammonia in the exhaust air

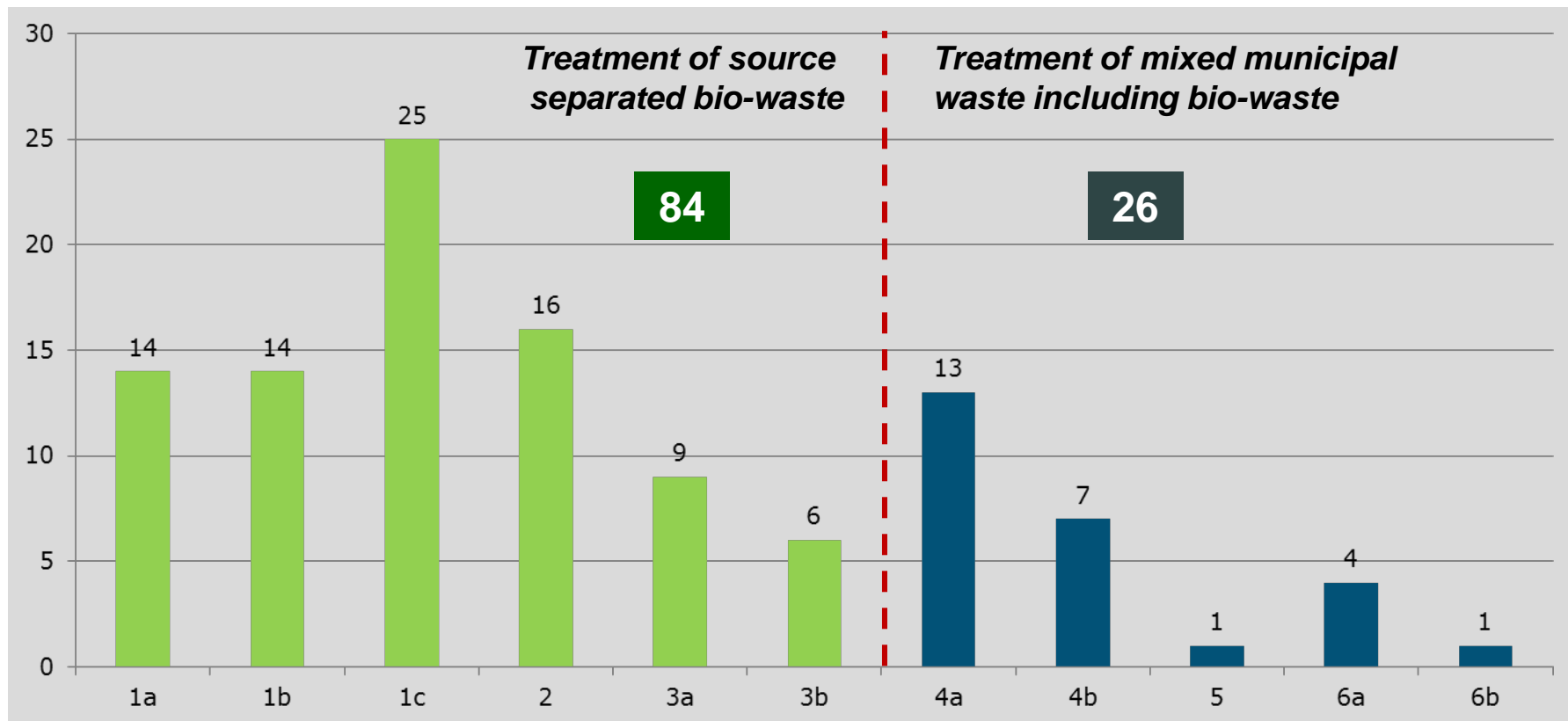


Further aspects

- **Product preparation**
 - Adjust moisture before drum screening
 - Compost storage
- **Noise** → reference to national legislation
- **HAZOP** - Hazard and Operability Study
 - evaluate problems that may represent risks to equipment, or prevent efficient operation
- **Energy and resource management plans**
 - internal assessment of the energy and raw material consumption

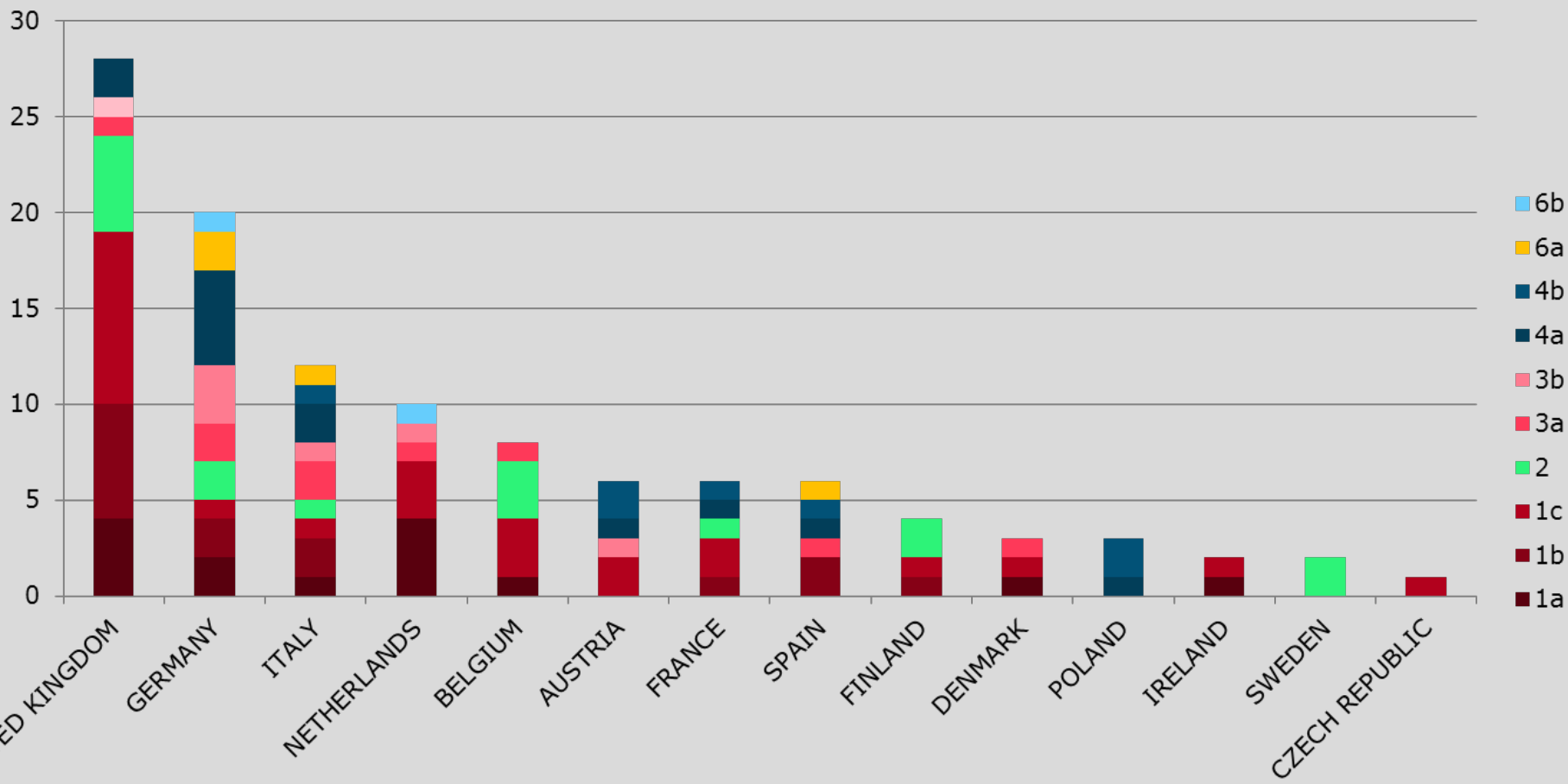


Questionnaire - Number of plants

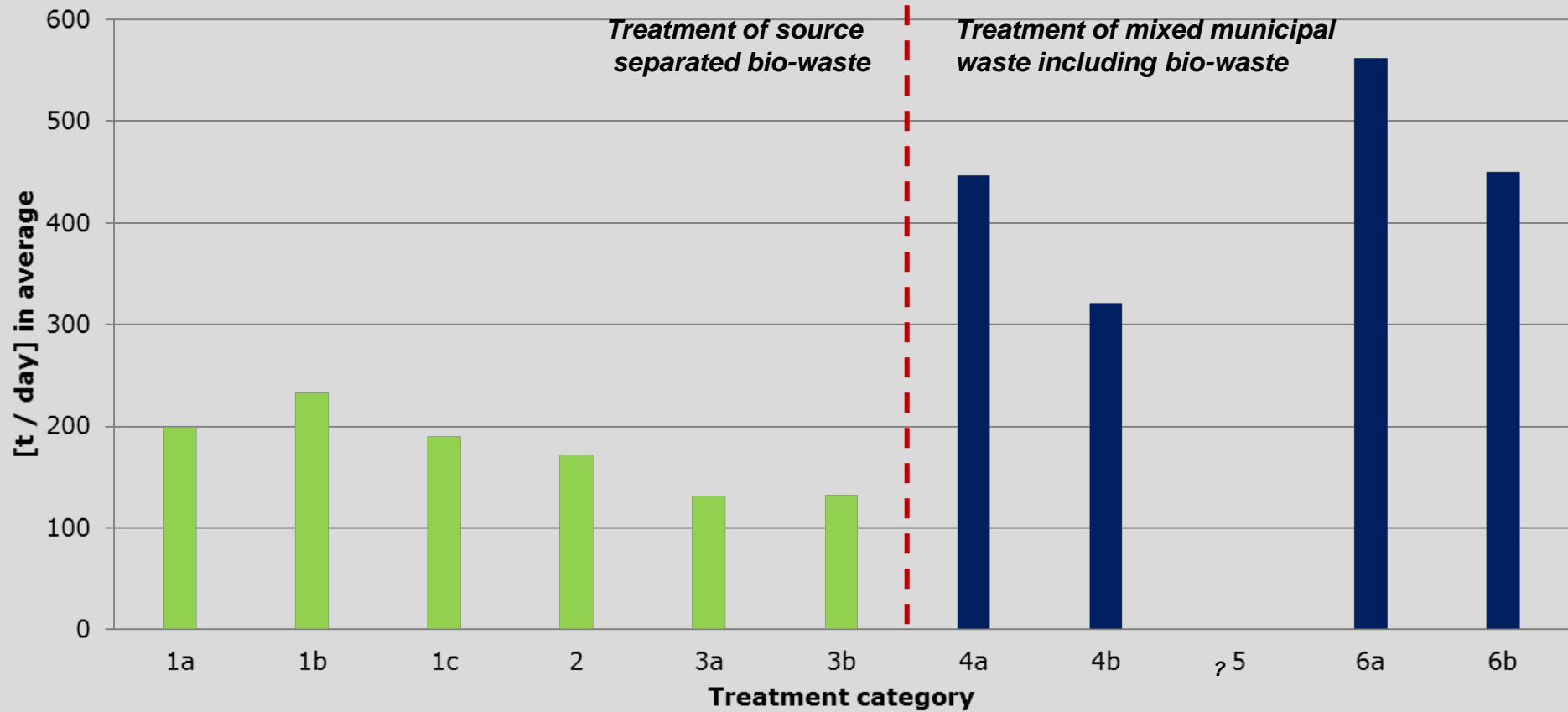


In total 110 questionnaires.

Questionnaire - Country profile



Daily treatment capacities





Example: Abatement via Biofiltering

- 50 plants indicated that they use biofiltering as primary abatement technique for air emissions (possibly with wet scrubber / heat exchanger)
 - 7 plants did not give information on any monitoring of air emissions
 - 4 plants did provide emissions only via gas engine
 - 8 plants use additional air abatement technique at the site

Parameter	Volume	T	O2	Odour	NH3	H2S	TOC / TVOC	Dust	CH4	N2O*	NOx
Unit	m3 / h	°C	Vol-%	OU/m3	mg / m3	mg / m3	mg / m3	mg / m3	mg / m3	mg / m3	mg / m3
MIN	1,945	7.0	20.1	30	0.0	0.00	0.40	0.00	5.09	2.00	2.97
MAX	585,000	41.9	20.9	12,967	265.0	1.03	21.00	9.35	895.00	46.00	14.33
AVERAGE	81,055	31.1	20.5	1,297	18.7	0.26	10.00	1.37	248.53	24.00	8.65
No. of plants	29	26	3	26	21	10	10	11	4	2	2
No. of value entries	142	131	33	105	229	68	62	60	15	4	5
Range limits CA	-	-	-	200-4,500	5-50	1.5-10	20-100	5-30	-	-	150
Plants with limit	-	-	-	12	11	5	7	8	-	-	1

* ... One plant additionally indicated a limit of 100 g per ton input, set by the Competent Authority.

Remark: Bio-aerosols (Total Bacteria, Gram Negative Bacteria, Aspergillus Fumigatus and Mesophilic Bacteria) have been monitored only at five plants from two MS and the parameters CO, HCl, HF, Hg, HC and PCDD/PCDF have been monitored each at only one site. By that, these parameters were excluded from de-tailed illustration.



Discussed KEI & AEL

	Open (1c)	Closed (1a)	AD* (2)	MBT aerobic (4a+4b)	MBT AD (5)	MBT aerobic+ AD (6a + 6b)
Odour	L; in case of odour problems	✓ L	✓ L	✓ L	✓ L	✓ L
NH₃	---	✓ G/P	✓ G/P	✓ G/P	✓ G/P	✓ G/P
Screening in case of odour problems:						
Dust	✓ L	✓ L	✓ L	✓ L	✓ L	✓ L
TOC or NMVOC	---	✓ L/G/P	---	✓ L/P	---	✓ L/P
H₂S	---	✓ L/P	✓ L/P	✓ L/P	✓ L/P	✓ L/P
Linked to detection (AD)						
CH₄	---	---	✓ G	---	✓ G	✓ G
In case of the use of RTO (check functioning of abatement technology)						
N₂O	---	---	---	✓ G	---	✓ G

L ... local nuisance

G ... global impact

P ... process monitoring

Next steps



- Draft 1
 - Sept/Oct 2015
- Consultation
 - 8 weeks
 - Meeting with Subgroup Biological Treatment to discuss key issues of concern
- Final meeting of TWG
 - Mid to end 2016 (!)
- New BREF/WT
 - 2017



ευχαριστω πολυ



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