





Waste Management and  
Environment-Integrating Management





## National Plan for the Management of Sewage Sludge from Municipal Wastewater Treatment Plants in Bulgaria




## The principles of Sludge Management Planning and Technical Guidance Provided

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page 1 of
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## Overview

### PART I

NSMP planning concept and summarization of project work flow


- General planning approach
- (Translation into) Steps of the Project
- Sludge management status quo in Bulgaria (as planning basis)

### PART II




Sludge Management Best Practice – Technical guide

- Objectives and Structure
- Content and what can be derived from it
- Application of the guidance for further planning steps

page 2 of
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## Requirements for a proper planning

- Scope** must be clear (e.g. -what's the core matter to deal with;  
-which time horizon is to be covered;  
-for which area )
- Goals** must be defined
- General framework** must be known  
(e.g. -what does the law require;  
-which situation do we start from;  
-who are the actors/stakeholders;  
-what capacities exist )
- An **outlook** towards the future  
(e.g. -how could the framework change [EU provisions, technical development, population size, number/age of plants, etc.] )
- Knowledge on the spectrum of **available techniques/options**
- Awareness on **influencing factors** (e.g. Costs, Public support)

page 3 of
NSMP Final Seminar October 30/31, 2013 Novotel Sofia



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## NSMP Planning baseline (1)

### Scope

- Core matter is **sludge** resulting from the processes of **treatment of wastewater** (sewage) **from municipalities**

*Specially important is here:*

- ⇒ not industrial wastewater (content of critical substances)
- ⇒ Relation with population size (wastewater generation, household connection rate)




### Outlook on quality and quantity







- Nationally applicable** and **regionally adaptable**
- Time horizon: up to **2020**

page 4 of
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## NSMP Planning baseline (2)

### Goals

- A **revision of the Previous National Plan** (strategy 2002-2025) that MoEW found was not practical and in need of adjustment to a changed situation
- Sludge management in accordance with **best practice**, meaning
  - *to reduce the amount of sludge needing disposal,*
  - *to minimize/eliminate the landfilling of sludge,*
  - *to adopt more secure and long-term solutions,*
  - *get wastewater treatment plants and authorities prepared to the challenges posed by stricter limits or even the exclusion of so far practiced disposal techniques in the EU*




**Project:** National Plan for the Integrated Management of Wastewater Treatment Plants, Bulgaria

**Sub-project:** ASO, Sewerage system, Assessment and Audit, B.P.


**Contract No.:** BG-2002-01-0000

**Final Report**



April 2002




page 5 of
NSMP Final Seminar October 30/31, 2013 Novotel Sofia



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## NSMP Planning baseline (3)




### General framework

- EU legislation** (Directive on Waste, Sludge Directive)
- National Legislation** (National Sewage Sludge Ordinance and recent amendments of 2011)
- Organisational setup** in the environmental sector in general and wastewater sector in particular (MoEW, RIEWs, WWTPs)

page 6 of
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## NSMP Planning baseline (4)

### Other requirements

**Establishment** and **translation into planning support** in the frame of the project

**Framework**

- e.g. any upcoming regulations based on the MS practices, new scientific evidence, drafts and the discussion surrounding them
- the status quo of sludge management (starting situation) in Bulgaria

**Outlook**

- e.g. sludge development prognosis and possible scenarios

**Spectrum of options**

- e.g. screening of sludge management best practice
- assessment of applicability in Bulgaria

page 7 of
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## Resulting project steps (1)

- WWTP site inspections in Bulgaria





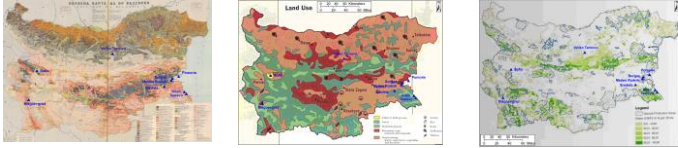



- Data collection and WWTP survey (w./ questionnaire)
- Data analysis (sludge mgt. status quo and capacities)
- Prognosis and scenario analysis on sludge development

page 8 of
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## Resulting project steps (2)

- Regional analysis (different sludge mgt. pre-conditions)
 
- EU screening (legal situation/sludge mgt. status quo in MS)
- Best practice screening (BREFs, internationally adopted practices and technology)
- Elaboration of the **NSMP** and supporting guidance
  - **Technical Guide on BAT for sewage sludge utilization**
  - **Guidance document Preparation for decision-making**
  - **Examples for regional NSMP implementation**
  - **Summary introducing the NSMP to the public**
- Final NSMP seminar

page 9 of NSMP Final Seminar October 30/31, 2013 Novotel Sofia

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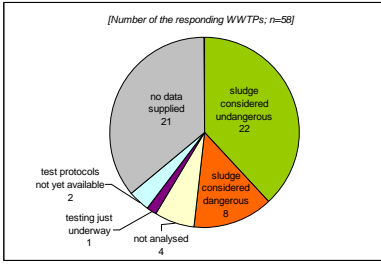
## Sludge Management Status Quo in Bulgaria (1)

### Data basis

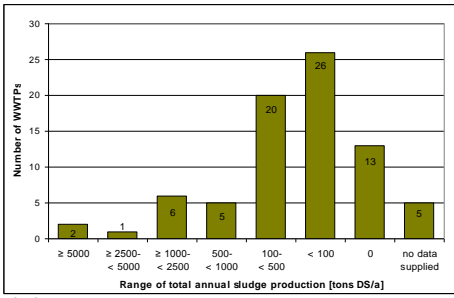
- Answers received from WWTP operators in the years 2010/2011
- Questionnaire distributed among 78 WWTPs >2,000 p.e.
- Analyses based on answers from 58 plants representative for 72 % of the population connected to wastewater treatment
- Some complementary data from MoEW

### Examples for data situation

(Number of the responding WWTPs; n=58)

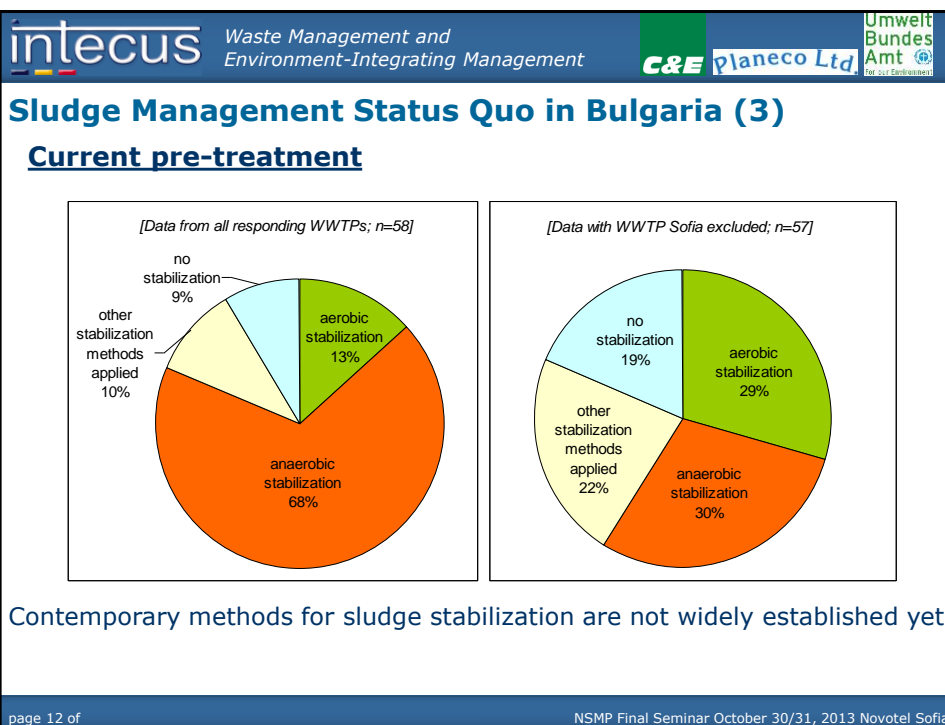
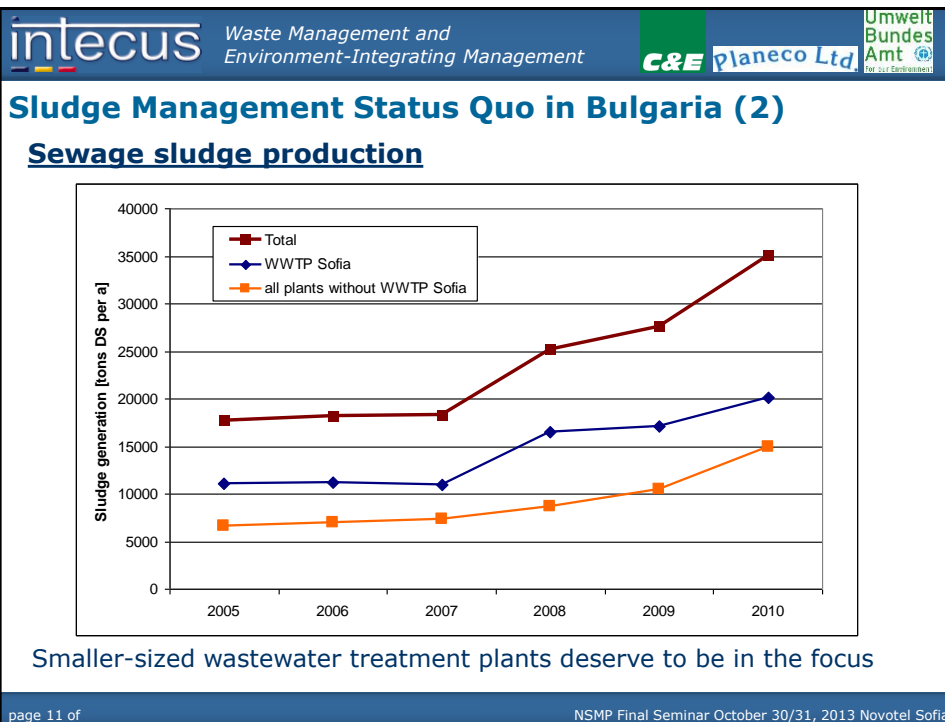


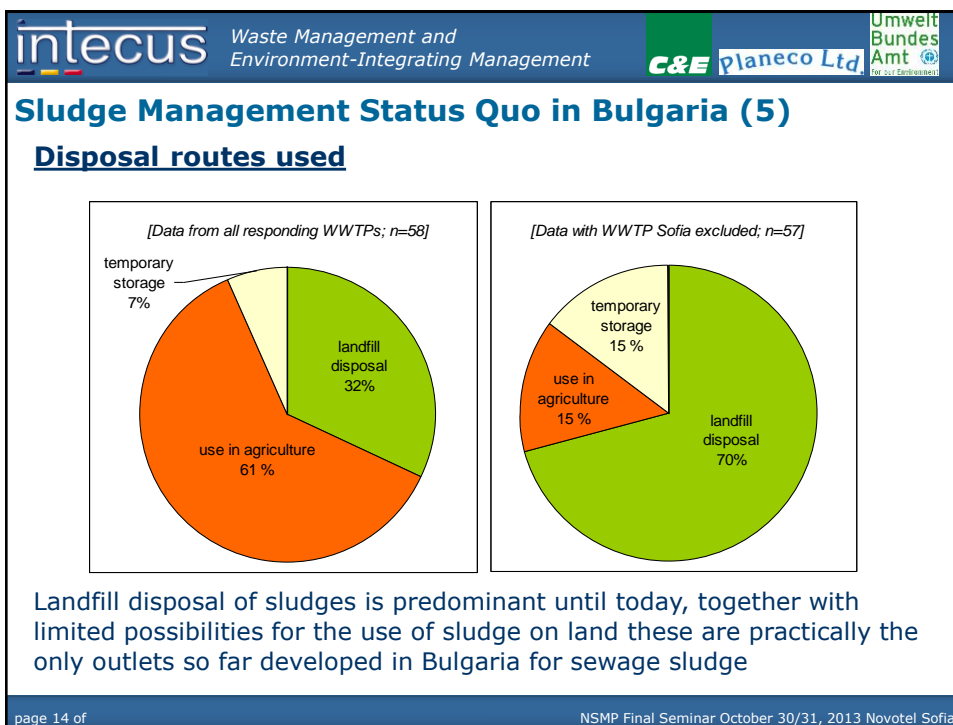
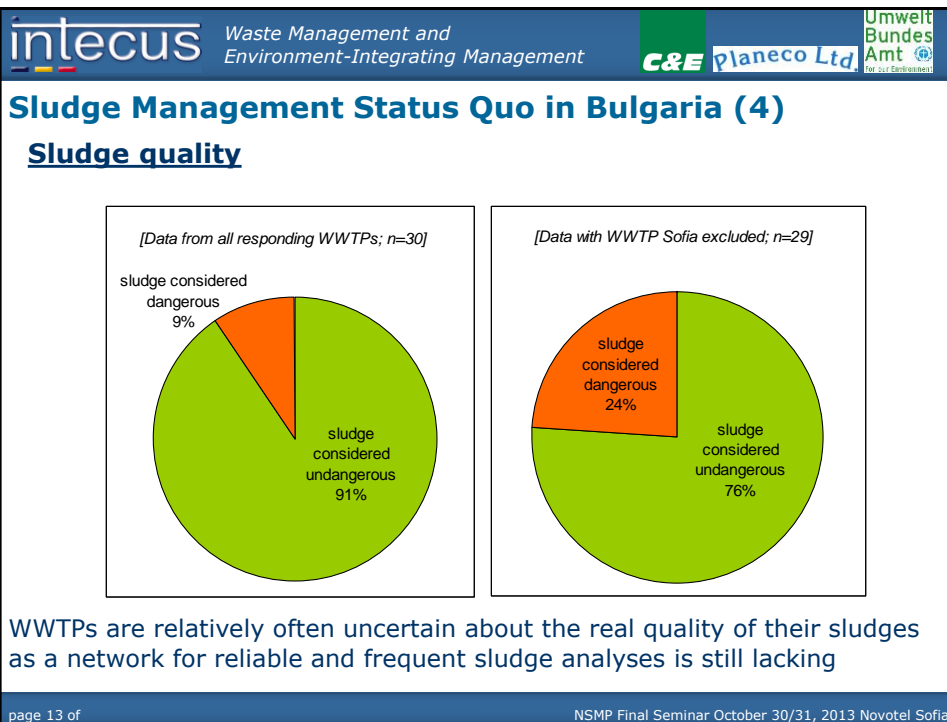
Sludge quality

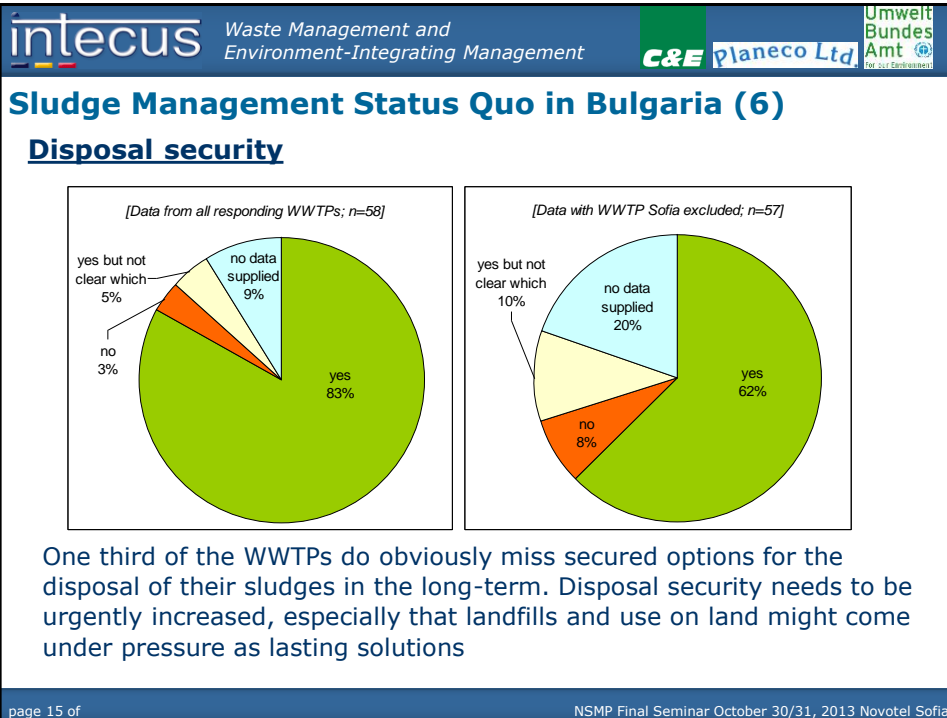


Sludge quantity

page 10 of NSMP Final Seminar October 30/31, 2013 Novotel Sofia







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## PART II

### Sludge Management Best Practice – Technical guide



- *Objectives and Structure*
- *Content and what can be derived from it*
- *Application of the guidance for further planning steps*


page 16 of NSMP Final Seminar October 30/31, 2013 Novotel Sofia





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## NSMP supporting guidance



**Remember planning requirements:**


- Knowledge on the spectrum of **available techniques/options**
  - **Technical Guide on BAT for sewage sludge utilization**
- Awareness on **influencing factors**
  - e.g. costs, cost developments
    - **Technical Guide on BAT for sewage sludge utilization**
    - **Guidance document Preparation for decision-making**
  - e.g. local conditions, capacities and particularities
    - **Examples for regional NSMP implementation**
  - e.g. public support
    - **Summary introducing the NSMP to the public**

page 17 of
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## Technical Guide on **BAT** for sewage sludge utilization

### Objectives:

- Help to select the appropriate disposal paths and technologies taking local needs and conditions adequately into consideration
- Facilitate decisions not driven by speculative or fashion effects, one-sided or imperfectly performed cost calculations or the ignorance of follow-up burdens

**No one process technology can claim to provide the "ideal" solution every application has its advantages and disadvantages!**

### Important links:

- Reference Document on Best Available Techniques for the Waste Treatment Industries
- Reference Document on the Best Available Techniques for Waste Incineration
- Reference Document on Best Available Techniques in Common Waste Water and Waste Gas Treatment / Management Systems in the Chemical Sector

page 18 of
NSMP Final Seminar October 30/31, 2013 Novotel Sofia

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**Structure:**

```

graph LR
    A[Sludge stabilisation] --> B[Dewatering]
    B --> C[Final outlets]
    B --> D[Conversion]
    B --> E[Drying]
    E --> D
    E --> C
    D --> C
  
```

- along the complete process (treatment) chain

page 19 of NSMP Final Seminar October 30/31, 2013 Novotel Sofia

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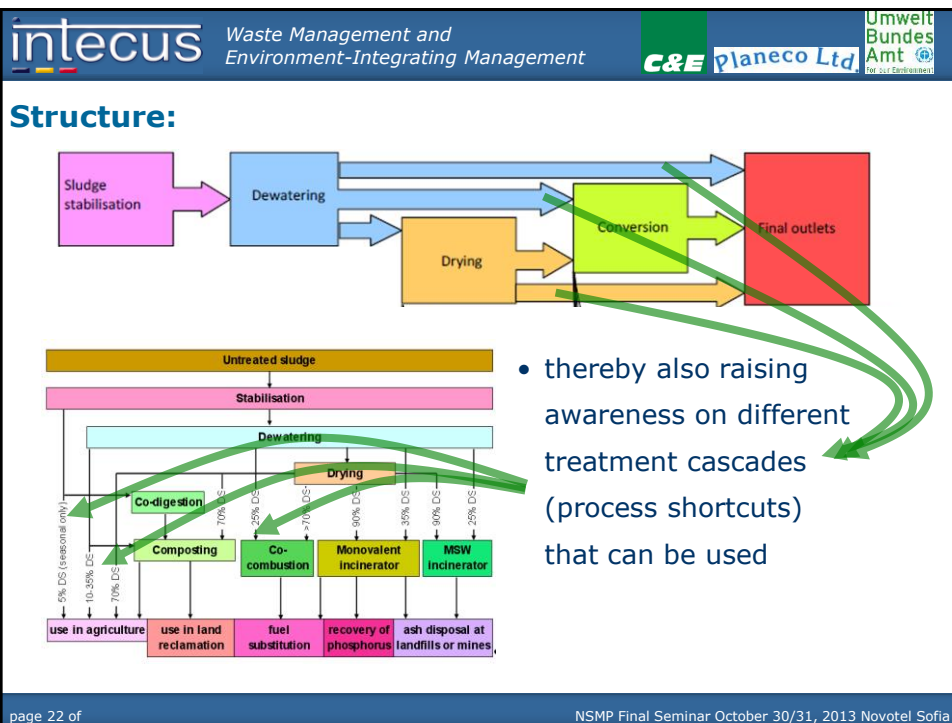
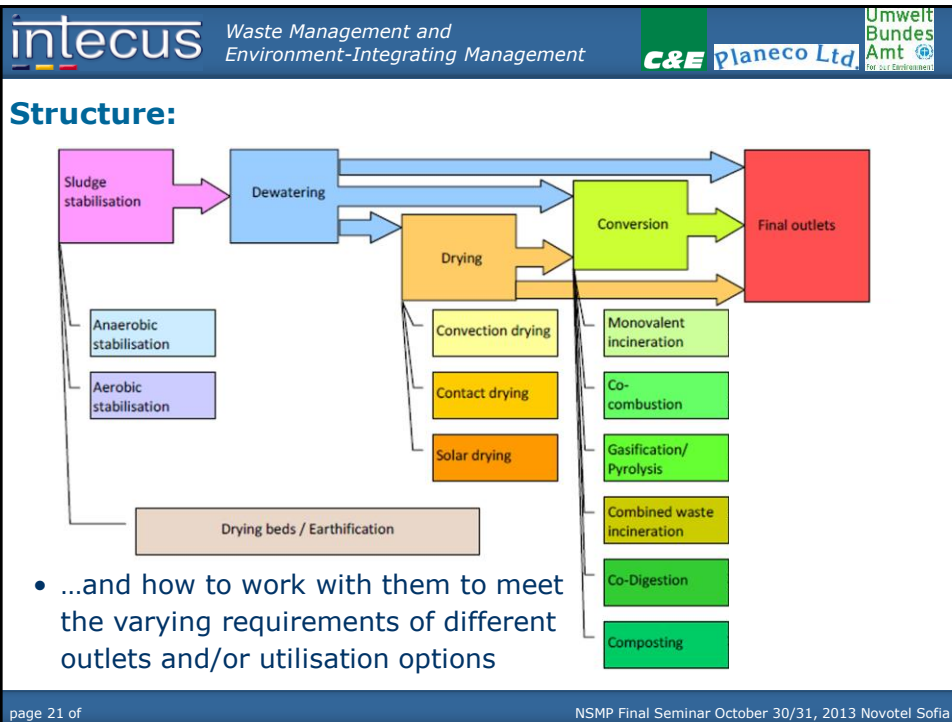
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    D --> C
  
```

- Explaining the various techniques with corresponding equipment...

page 20 of NSMP Final Seminar October 30/31, 2013 Novotel Sofia



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## Structure:

Technical descriptions enriched with additional information on the beneficial and the restrictive circumstances of each particular process

→ special scheme of colours and symbols to quickly draw attention on the various impacts and affected areas

	environmentally positive aspect
	energetically positive effect
	cost advantage
	positive operational impact or general efficiency advantage
	negative effect or adverse operational impact

page 23 of
NSMP Final Seminar October 30/31, 2013 Novotel Sofia

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## Content

### Type of information provided

- Application needs, e.g. not mandatory for sludge to be used in thermal processes, use in agriculture requires fully stabilised sludge
- Briefing on the process characteristics

Aerobic process path

Anaerobic process path

- Cost orientation, e.g. the specific investment costs for classic egg-shaped digesters come to 600-1000 EUR/m<sup>3</sup> digester capacity, additional staffing requirement is 8-10 hours/month
- Potentials for optimization, e.g. homogenization, steady feeding
- Reference plants, e.g. anaerobic process WWTP Pazardjik
- Additional aspects to consider, e.g. Capture of fermentation gases

page 24 of
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## Content

**Example Specifications for Dewatering Equipment**

Applied technology	Available throughput rate	Handling capacity kg DS/h	Energy demand kWh/m <sup>3</sup> sludge	Consumption of conditioning agent			achievable DS-content %
	m <sup>3</sup> sludge/h			Ca(OH) <sub>2</sub> kg/m <sup>3</sup>	FeCl <sub>3</sub> kg/m <sup>3</sup>	Polymer kg/t DS	
Decanter / centrifuges	1 - 200	20 - 6,000	1 - 1.6			8 - 12	~20 - 32
Chamber filter press			0.8 - 1	~15	~5 - 7.5	6 - 12	~22 - 40
Membrane filter press				~3 - 4	~1 - 1.5	~5	~30 - 45
Belt filter press	2 - 30	100 - 1,500	0.5 - 0.8			~6	~20 - 30
Screw press	1 - 30	5 - 1,000	0.2 - 0.3			0.01	~20 - 35

page 25 of NSMP Final Seminar October 30/31, 2013 Novotel Sofia

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## Content

**Example Solar drying solutions**

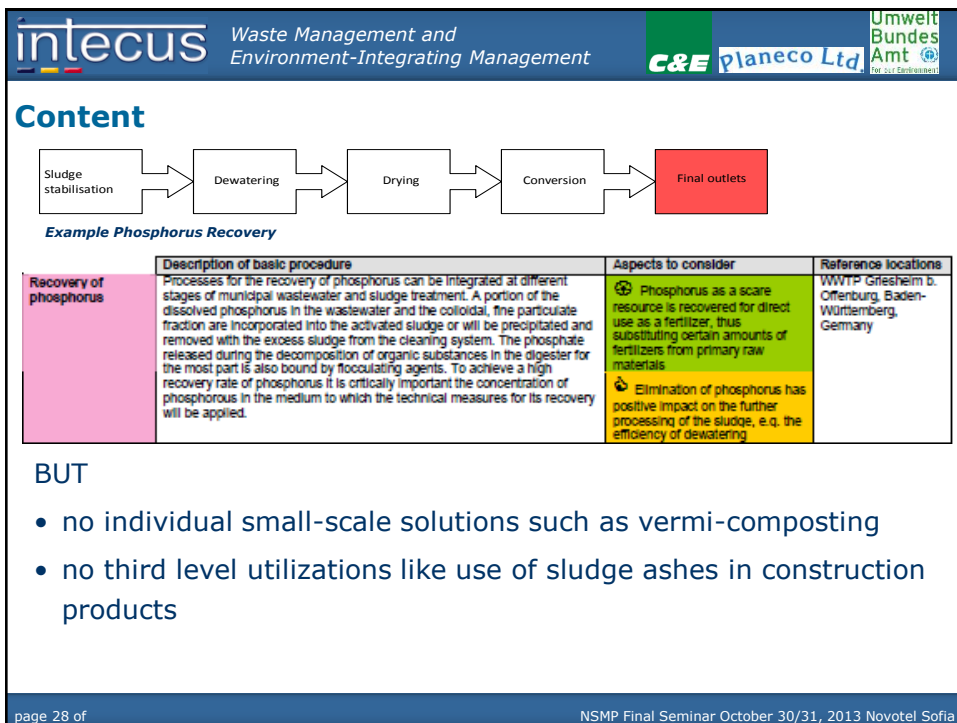
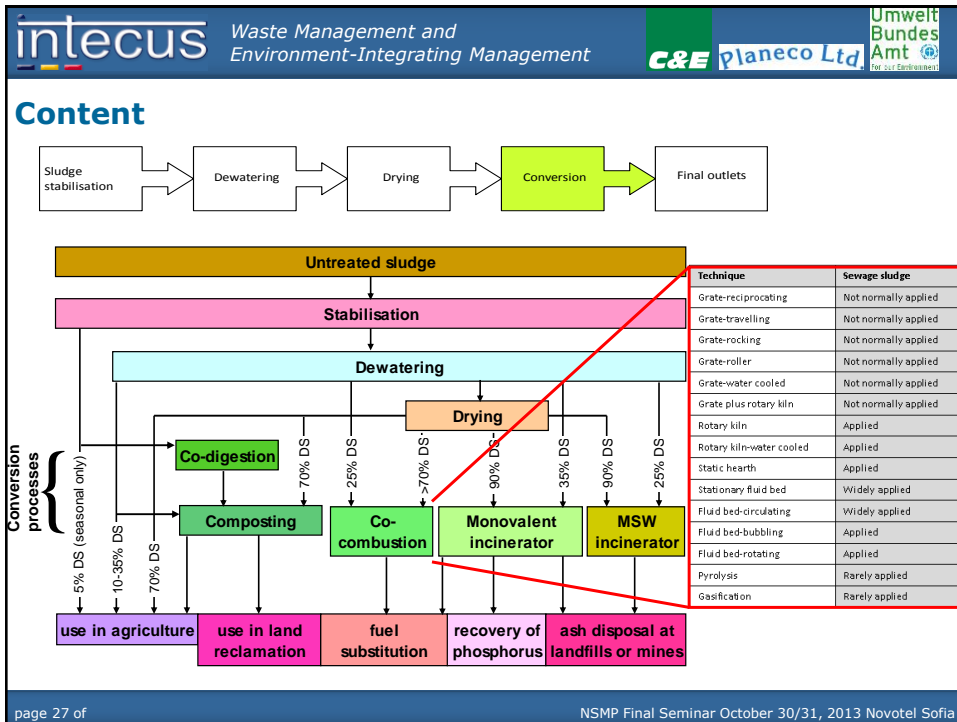
a: Scheme for the batch mode concept offered by the Thermo-System Industrie- und Trocknungstechnik GmbH  
(Picture source: IKrW GmbH)

b: Scheme for the continuous mode concept offered by the IST-Anlagenbau  
(Picture source: IKrW GmbH)

Pict.c: Solar drying plant in Iffezheim  
(Picture source: IST-Anlagenbau GmbH)

Pict.d: Solar drying plant in Bredstedt  
(Picture source: Thermo-System Industrie- und Trocknungstechnik GmbH)

page 26 of NSMP Final Seminar October 30/31, 2013 Novotel Sofia




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## Application in further planning process

*Example of reference values used in NSMP*

- **Average sludge application rate on land**  
3.5 t DS/ha for land applications
- **Thermal utilisation rate in cement industry**  
maximum 5 mass-% of total cement clinker
- **Thermal utilisation rate in power plants**  
maximum 5-10 mass-% of total fuel input



Disposal route	Present	Current potential	2015 potential	2020 potential
	% coverage of total sludge generation			
Use in agriculture	26	100	100	100
Re-cultivation	23	50	50	49
Landfill remediation	n.a.	10	10	8
Co-combustion in power plants	0	0	0	36
Co-combustion in cement kilns	0	0	22	22
Landfill disposal+temporary storage	49	-	-	-

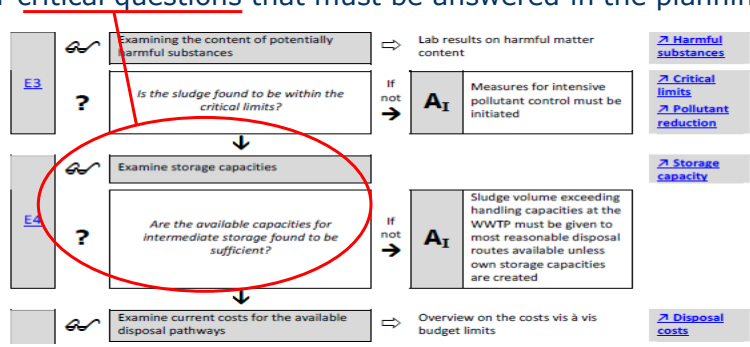
page 29 of NSMP Final Seminar October 30/31, 2013 Novotel Sofia

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## Associated guidance

### Guidance document Preparation for decision-making




The decision-making guidance is a recommended proceeding for WWTP operators to develop their own management concepts for the future. WWTP operators, with the technical guide have a pool of information at their disposal that helps them finding orientation / an answer for critical questions that must be answered in the planning process.



page 30 of NSMP Final Seminar October 30/31, 2013 Novotel Sofia




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## Detailed technical specifications

More details and technical specifications on part of the spectrum of sludge management technologies and equipment can be found in the form of technical fact sheets on the INTECUS information tool



**Best Practice  
Municipal Waste Management**

Link: <http://www.umweltbundesamt.de/themen/abfall-ressourcen/abfallwirtschaft/abfalltechnologietransfer>

**Example Fact Sheet Fluidized Bed Combustion**

Fact Sheet		Sheet index		WT1-03_FBC	
<b>For the description on:</b>					
Process	X	Equipment		Material	
<b>Specifications</b>					
Thermal waste treatment - Fluidized Bed Combustion (without hot gas cleaning) <b>See also fact sheet: "Hot gas cleaning", sheet index WT-04-FBC</b>					
<b>Application objective</b>					
Reduction of volume and risk potential of waste from incineration Energy recovery from waste					
<b>Define an application (incineration site, incinerator, where required)</b>					
<b>Particularly applicable for the application:</b>					
Most hazardous waste	X	Light weight packaging		Domestic	
Pre-treatment		Other		Only waste from industrial household appliances	X
Screening		Wood waste	X	Other waste	X
Waste oil	X	Old paint & lacquer	X	Waste tires	X
Hazardous waste	X	Only part of the combustible fraction			
Household waste	X	Only combustible materials, particularly of small particle size (e.g. pieces of the paper industry)			
Other waste streams	X	Only combustible materials, particularly suited for incineration			
<b>Pre-treatment of the input material:</b> The input material must be freed from disintegrating components such as large metal parts and should not contain any radioactive substances (maximum content 5 % concentrate must be submitted to obtain the material certificate)					
<b>Options for the utilization of the generated output:</b> Combustion chips and part of the ashes can be deposited but also be used in other applications after pre-treatment. The pre-treatment involves the removal of metals from the slag and a comprehensive separation of the 10 mm material can be used for construction purposes.					
<b>Options for disposal/handling of the generated output:</b> Combustion residues are generally suitable for landfilling, however residues from hot gas cleaning must be handled as hazardous material and need to be deposited in facilities which are suitable and approved for this type of material <b>See fact sheet on "Hazardous waste landfill", sheet index WT-05-FBC</b>					
<b>Material management:</b>					
Prevention: Residues from the combustion must be handled and disposed of in accordance with the applicable regulations. When waste incineration residues are removed, a container must be properly followed. Waste incineration using state-of-the-art cleaning technologies are normally considered as an incineration process (see also fact sheet on "Waste incineration", sheet index WT-06-FBC).					
<b>Potential health risks:</b> A release of untreated dust poses a health risk which can be avoided if contemporary cleaning technology and protective measures are introduced in the hot gas cleaning process and properly followed. Waste incineration using state-of-the-art cleaning technologies are normally considered as an incineration process (see also fact sheet on "Waste incineration", sheet index WT-06-FBC).					
<b>Stable burning mechanism:</b> To ensure the incineration of waste, changes should be reported to the generator of the waste. Also suitable is the introduction of an incineration site or additional waste treatment for specifically for the combustible waste the size of which should be to ensure that only the non-combustible, non-toxic parts of the generated waste are transported to incineration.					

page 31 of

NSMP Final Seminar October 30/31, 2013 Novotel Sofia



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page 32 of

NSMP Final Seminar October 30/31, 2013 Novotel Sofia